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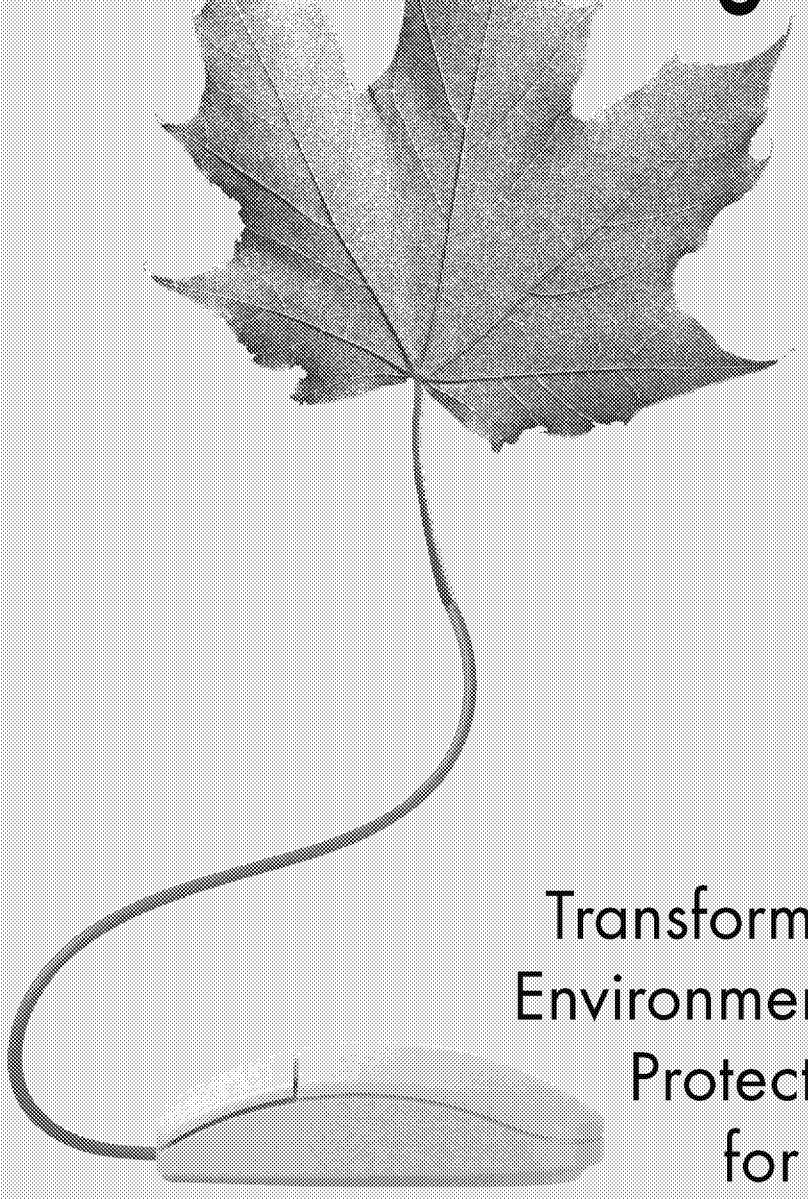

Transforming Environmental Protection for the 21st Century

The views expressed in this document are those of the panel alone. They do not necessarily reflect the views of the Academy as an institution.

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Environment.Gov: Transforming Environmental Protection for the 21st Century

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Foreword

With this report, *Environment.gov*, the National Academy of Public Administration completes its 1993 charge from the Congress of the United States: to analyze trends and efforts in environmental protection, and to provide advice, strategies, and insights for the future. As did the first two volumes of our work, *Setting Priorities, Getting Results: a New Direction for EPA*, and *Resolving the Paradox of Environmental Protection: An Agenda for Congress, EPA and the States*, this report challenges national, regional, state, local, business, and community leaders to come together to address the remaining environmental challenges facing the country. Furthermore, it offers specific approaches those individuals and groups can undertake, both immediately and in the future.

In 1993, Congress asked the Academy whether EPA was investing its own energies and encouraging the nation to invest its resources in addressing the most important environmental issues. The 1995 report examined risk management, EPA's organization and management, and the agency's relationship with states, local governments and regulated entities. In 1995, Congress asked whether EPA had implemented the Academy's recommendations and whether environmental protection had improved as a result. In 1997, Congress asked for this report, assessing innovative efforts by EPA and others to improve environmental protection.

Together these three reports offer a picture of environmental protection that is unmatched in its scope, independence, and depth. Each offers specific recommendations, based on research and on the judgment of the seasoned experts and public officials who have served on project panels. Like their predecessors, the members of the distinguished Academy panel that guided this third report worked diligently and long, carefully framing their questions, deliberating their findings, and structuring their recommendations. The result of their efforts is a significant plan to ensure that our children's children can enjoy the natural heritage of this nation.

In addition, this third report serves as a model for how to conduct an unbiased, external review of new agency initiatives; and for the important role the Academy can play in the nation's governance. Sixteen research teams gathered information to inform the Academy's own research and the panel's deliberations.

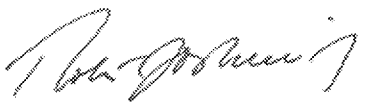
Any effort of this magnitude is the result of true collaboration. Our thanks and appreciation go out to the exceptional researchers, and to those of their peers who reviewed their results; to

the agency and program managers who allowed examination of their initiatives; to those senior EPA officials who helped us ask the right questions, and draw meaningful conclusions; and to the numerous business leaders and federal, state, and local government officials who gave generously of their time and their expertise. The report is stronger for all those contributions.

Our professional pride and personal pleasure at the scope and promise of this report are tempered by our sorrow at the death of Al Alm, a truly visionary environmental protector. Al served his country with distinction as Deputy Administrator of EPA and as Assistant Secretary of Energy. His passing leaves a void in the community of those committed to the future of America's natural resources. We are grateful that Al was able to be such an integral part of this panel report, as well as that he was a colleague and friend.

In addition, we will greatly miss DeWitt John and Rick Minard, the founders of the Center for the Economy and the Environment. They leave the Academy a stronger, better place for their presence. As they accept new challenges, we wish them well. The Academy is also delighted to note that Suellen Keiner will be the Center's next director. Keiner contributed significantly to this report as one of the authors of a research paper on the changing relationships among EPA and the states.

We commend this report and its strategies to the nation's environmental leaders—elected, appointed, career, and volunteer—and to all its citizens as well. There is much for all of us to do.



Robert O'Neill, Jr.
President
National Academy of Public Administration

Executive Summary

The nation's current environmental protection system cannot deliver the healthy and sustaining world that Americans want. Absent significant change in America's environmental governance, the accumulation of greenhouse gases will continue to threaten the stability of the global climate and all the systems that depend on it; the uncontrolled runoff of fertilizers and other pollutants will continue to choke rivers, lakes, and estuaries with oxygen-depleting algae; smog will continue to degrade the health of millions of Americans. The regulatory programs in place in this country simply cannot address those problems at a price America can afford. A different kind of program can, however.

That "program" is a transformation of the nation's environmental governance. From the Environmental Protection Agency (EPA) through states and communities, from regulatory agencies to businesses, individuals and organizations with an impact on the environment need to adopt new roles and accept new responsibilities. Furthermore, they will need to use 21st Century tools to address the problems of the 21st Century. Innovators throughout that system of governance have already demonstrated the effectiveness of many of those new tools, but the overall system has proved resistant to change.

This report, a product of the National Academy of Public Administration's Center for the Economy and the Environment, examines those attempts to innovate, and recommends the best approaches for broader implementation. The report considers not only specific policy tools, but also the respective roles that public and private institutions, as well as individuals, must play. The report also calls for organizational change and management improvement at both EPA and its state counterparts.

The Academy panel responsible for the report directs its recommendations to the next administrator of EPA, the next commissioners of the 50 states' environmental regulatory agencies, to Congress and the state legislatures, to environmental activists and business leaders, to all Americans committed to providing a healthy environment for their childrens' children.

Summary Recommendations

The next EPA administrator should:

1. Tackle the big environmental problems

a. Select two or three of the most difficult remaining environmental challenges and engage the nation and Congress in developing strategies to address them. By necessity, such an undertaking will require the administrator to adopt innovative tools to address those problems. The panel suggests three environmental issues as worthy of a national commitment of energy, resources, and innovation:

   reducing nutrients in watersheds

   reducing smog

   preparing to reverse the accumulation of greenhouse gases

b. Define the challenges in terms of measurable environmental improvements.

c. Commit the agency to deploy the most cost-effective tools to achieve those results.

d. Build the nation's familiarity with the market-based tools that will eventually reduce greenhouse gas emissions.

e. Encourage states to experiment with bold forms of regulatory and non-regulatory management, such as facility-wide permits, performance-based management contracts, cap-and-trade systems, pollution taxes or fees, information requirements, collaborative approaches to setting goals and designing strategies for protecting watersheds, and compliance-assistance tools of various kinds.

f. Work with Congress to secure the authority and appropriations necessary to make those innovations work. The administrator should seek explicit congressional authorization to use cap-and-trade systems to reduce nutrients in watersheds and the components of smog in air. That authorization should enable EPA to issue group permits in airsheds and watersheds where states or EPA regions are capping pollution allowances, and using trading systems rather than traditional permits.

2. Invest in information and assessment

a. The administrator should work with Congress to create an independent, well-funded bureau of environmental information. In the meantime, the administrator should strengthen the existing Office of Environmental Information by leading efforts to integrate and rationalize the data systems of the media programs, and to develop other objective data of high quality. In addition, the administrator should strongly support the office's efforts to work with the states to create a cooperative federal-state data system based on uniform definitions and comparable scientific methods.

b. The administrator should invest money and political capital in building a credible and comprehensive system to monitor the quality of the nation's surface waters. That could

be done by insisting that all the states have delegated authority to implement federal water-quality standards, and that they bring their monitoring networks and report protocols up to high, consistent standards that would provide sufficiently detailed water-quality data to make sound management decisions.

c. The administrator should *use* environmental data in decisionmaking at the national level, and when negotiating with states on National Environmental Performance Partnership System (NEPPS) agreements. The administrator should hold political and career managers accountable for achieving measurable environmental improvements.

d. The administrator should build the agency's capacity to improve federal and state programs by investing in an external, peer-reviewed evaluation network.

3. Hold states accountable for results

a. The administrator should redefine EPA's expectations of states in terms of environmental results, rather than only of process.

b. The administrator and the state commissioners should revitalize NEPPS, requiring that states and regional offices base priorities and work plans on serious self-assessments informed by public participation. EPA should provide to those states with effective environmental programs substantial discretion in how they manage and deploy those programs. Regional offices should audit the effectiveness of such state programs, rather than review individual permits or activities.

c. The administrator should also complete the transfer of routine regulatory functions from regional offices to the states.

4. Use all the tools available to change management cultures and practices to focus on achieving critical environmental goals

a. Revamp EPA's planning and budgeting systems to move the agency towards strategic, performance-based management consistent with the intent of the Government Performance and Results Act (GPRA), eliminating those practices that reinforce fragmented programs and relationships.

b. Develop and implement a strategy for addressing the outdated organizational structure of the agency, starting with reorganization of the regional offices. If necessary, EPA should seek statutory changes to allow reorganization that would end the fragmentation of the agency into separate media offices. In the meantime, the administrator should delegate more decisionmaking authority and management flexibility to those offices, while holding regional administrators responsible for achieving environmental progress. The administrator should give regional administrators budget-implementation authority to facilitate regional accountability and flexibility.

c. Delegate decisionmaking authority clearly and demand expeditious, thoughtful decisions. Ensure that disagreements among program offices or among regions and headquarters are identified promptly and resolved. Replace the agency's casual demand for "consensus" with an explicit bias for action. Make certain, however, that actions are coupled with evaluation and accountability.

d. Build EPA's management skills now to avoid a crisis as senior employees retire. The next cadre of managers will need new skills: expertise in place-based, cross-media management; economics and business; information technologies and communication; biotechnology; and international trade.

Congress should:

5. Authorize EPA and the states to use the tools they need to tackle the big problems

a. Authorize EPA and the states to implement allowance-trading systems to reduce pollution in air and water, explicitly liberating such systems from the constraints of traditional facility-based permitting, provided that trades would not result in unacceptable risks in local areas.

b. Empower EPA to let states try new approaches to address water quality and related problems in watersheds, including alternatives to total maximum daily loads (TMDLs) where those alternatives appear likely to improve the environment more effectively or efficiently than TMDLs could.

c. Authorize and encourage state experiments with performance-track systems that replace traditional permits with whole-facility agreements or "beyond-compliance" strategies.

d. Work with the administrator to create a statutory basis for continued experimentation and innovation in the nation's environmental system. Support innovation through the appropriations process.

6. Invest in information

a. Appropriate sufficient funds for major improvements in environmental data and in program assessments.

b. Authorize establishment of an independent bureau of environmental information and assessment.

c. Direct EPA to redesign its implementation of GPRA to provide more information about the nation's overall progress toward meeting critical environmental goals.

7. Put aside partisanship because America wants Congress to solve serious problems

a. Members should use the environment to demonstrate that political parties can come together to set aggressive public-policy goals and provide the means to achieve them.

b. Share with EPA a willingness to try new approaches that hold promise of better performance, and must refrain from unfair criticism of EPA if some innovations fail.

c. Become an environmental leader. Members of Congress should join the administrator and the state commissioners in explaining to Americans why action on the big environmental problems is necessary and why innovation is essential in making progress.

Members should help business leaders, environmental advocates, and governors find common ground on approaches that will achieve the nation's environmental goals at the lowest possible social cost.

State regulators and legislatures should:

8. Challenge EPA, Congress, and one another to transform environmental governance

a. Continue to develop and deploy approaches to environmental protection that can deliver measurable results more effectively or efficiently, and be models for implementation across the nation. States should build evaluation into the design of innovative programs.

b. Commit to environmental improvement, reject a rollback of environmental standards, and increase the political pressure on one another to deliver environmental results as well as efficient programs. Accept the challenge of reporting on a meaningful set of core performance measures, and being judged in relation to comparable states.

c. Commit to build adequate environmental monitoring systems.

d. Make the next iteration of NEPPS work by investing in better self-assessments, expanding public participation in setting priorities, and vigorously negotiating roles and responsibilities with the regional offices, particularly on problems of interstate significance.

e. Equip communities and regions within the states with the tools and incentives to make land-use decisions that protect or enhance environmental values.

Business leaders, NGOs, and foundations should:

9. Embrace more effective and efficient policies for environmental protection

a. Reject calls for a rollback in environmental protection at the state or federal level.

b. Work with EPA and states on trading networks; building credible environmental management systems (EMSs) and International Organization for Standards (ISO) 14001 registration.

10. Help build a national system for gathering, disseminating, and using environmental information.

a. Provide better information about firms' environmental performance to the public: both local communities and regulatory agencies.

b. Nongovernmental organizations (NGOs) and foundations should support efforts to use environmental data and to evaluate environmental programs.

c. The leaders in the information-technology revolution should lend their support and resources to help EPA and the nation build a dynamic information system. Their

technical, financial, and political support could accelerate the transformation of EPA by a decade.

The next EPA administrator will have much good work to build on within the agency and among the states. Individuals, companies, communities, NGOs, and states have been testing new methods for making environmental progress. They are ready—even eager—for thoughtful, committed, consistent leadership to help them make even more progress.

CHAPTER 1

Innovate for the Environment

Those who take elected office in January 2001 have within their reach the tools to implement a new environmental agenda: one that will address serious problems now beyond the efforts of traditional regulatory programs; and one that will reduce the costs of the nation's continuing environmental progress.

Using innovative tools, and imaginative leadership, the United States could achieve three enormously important environmental goals within the decade:

freeing America's rivers, lakes, and estuaries from the oxygen-depleting nutrients that overwhelm them through runoff from farm fields, city streets, and suburban lawns

enabling America's cities to breathe easier and its mountains to stay greener by finally bringing under control many of the dispersed sources of ground-level ozone and smog

preparing America, and perhaps other nations of the world, to make choices about how best to increase energy efficiency and reduce production of carbon dioxide and other greenhouse gases

The nation can accomplish those aims if it commits to transforming its approach to pollution control and environmental management. This report tells how.

Key elements of such a new approach are already being used: a shift away from end-of-the-pipe technology requirements and toward whole-facility environmental management and permitting; cap-and-trade systems to drive down pollution-prevention costs; and performance requirements for facilities, whole watersheds, and even states. Their hallmark is the creation of incentives for technological innovation, for civic involvement and collaboration, and for place-specific solutions. As a result, the approaches tend to achieve environmental results at lower costs than traditional regulation.

But before the United States can complete the transformation of its environmental protection system, it will need better information about the environment, as well as more robust evaluation of environmental management efforts. The challenge is not merely technological: advanced monitoring systems and information technologies already maintain public accountability in many innovative approaches. It is, rather, organizational: EPA will have to change, as

will state environmental agencies, businesses, and the many other organizations that comprise the nation's system of environmental governance. Revolutionary information technology is already transforming the links among and between those organizations and the citizenry-and thus inspired the title of this report. *Environment.gov* is aimed at the entire network of public and private decisionmakers that determines the quality of the nation's environment.

The United States must continue to transform its environmental management system, not because innovation is good *per se*, but because the present system will *not* solve the most pressing of the nation's outstanding environmental problems. Neither will it fulfill the ultimate national agenda of providing future generations continuing economic prosperity, coupled with the quality of life that flows from clean air and water and healthy, sustainable ecosystems. Assuring those benefits to our children's children will require that all parts of society share the responsibility for innovating for more effective and efficient environmental protection.

Increasing the efficiency of the nation's approach to environmental protection is essential and should become part of EPA's core mission. This report focuses on two parts of that challenge: reducing "compliance costs," the amount firms or communities must pay to meet their individual or collective environmental responsibilities; and reducing public and private "transaction costs," the time, money, and labor consumed in negotiating an agreement. Reducing those costs will make it economically and politically easier for the nation to improve the environment, both in the short term nationally and in the long run globally. Neither the United States nor other nations of the world are likely to make much progress toward reducing the emission of greenhouse gases, for example, until everyone is convinced that they are doing so at the lowest possible price.

One of the virtues of America's environmental management system has been the consistency and stability derived from the series of sweeping environmental statutes the nation enacted three decades ago. But its strength has become, in many cases, its weakness. The statutes and the system they support are not keeping up with changing technology, changing public attitudes, or changing global relationships. Even the most ambitious and successful efforts in the United States to use innovative techniques to manage environmental problems seem cautious and inadequate when compared with the problems the system must confront over the next two decades. The next EPA administrator and the next Congress will have an opportunity—and the responsibility—to implement more significant reforms.

The Case for Change

Today's environmental regulatory system can fail the nation because it cannot address three pervasive types of problems that are outlined below:

Policy problems: Traditional regulatory approaches can keep most forms of industrial pollution in check, but they cannot reach many of the remaining sources of pollution and environmental degradation: the large and small users of fertilizers, the hundreds of millions of consumers of electricity and fossil fuels in the United States and the billions of consumers around the world, and the direct physical threats to ecosystems and endangered species. Even where traditional regulatory approaches succeed in reducing pollution, they often fail to achieve their gains at the lowest possible cost to society, and they provide too few incentives for entrepreneurs to develop more efficient technologies. The United States has relied heavily on one policy tool for controlling pollution: the enforceable—and vigorously enforced—federal or state permit. That tool cannot effectively reduce pollution from millions of small, dispersed sources, or even from thousands of large business-like farms.

Management problems: Congress and the executive branch have organized EPA, as well as other executive agencies, in ways that result in narrow—and sometimes ineffective—attacks on environmental and economic problems. EPA's division into offices and programs focusing exclusively on air pollution, water pollution, and hazardous wastes, for example, has produced a management structure that deals poorly with complex, multilayered environmental and economic problems. EPA is not organized well to foster or respond to increasingly complex arrangements among public and private institutions, or the changing capacities of states. That EPA cannot currently collaborate effectively with the Departments of Transportation, Energy, Agriculture, Interior, and State hobbles the nation's ability to manage the environmental aspects of large-scale issues such as global trade, production agriculture, or climate change. EPA cannot adequately address those problems by itself. As constituted, the agency cannot possibly be the protector of the nation's environment, despite the expansive responsibility implied by its name.

Political problems: The political status quo is deadlock. The divisions between the two major political parties, between Congress and the president, and between the federal government and the states, have impeded broad innovation and environmental progress. Because so many Americans agree on the basic goals of environmental protection, however, each of those institutions has an opportunity to be rewarded for ending the political stalemate, for joining a political consensus for change. The alternative, muddling through for several more years, would probably not be catastrophic, though it would certainly waste economic and human resources, and seriously erode the nation's capacity to protect its environment in the future. Moreover, failing to act would weaken the nation's potential leadership role in addressing global environmental crises.

This report, prepared by a panel of the National Academy of Public Administration, lays out a strategy for reform at the federal, state, and local levels of government, as well as in the private sector. The panel concludes that EPA and Congress should:

focus aggressively on reducing nutrients in surface waters, using cap-and-trade systems, targeted public spending, and collaborative watershed processes to achieve state, local, and national goals

focus aggressively on reducing ground-level ozone and smog, using a combination of market-based tools to reduce emissions of several of its chemical precursors: nitrogen oxides (NO_x), particulates, and, where adequate safeguards are in place, volatile organic compounds (VOCs)

enable states to experiment with bold new regulatory approaches designed to encourage companies to achieve higher levels of environmental performance and to develop innovative control technologies and techniques

establish a credible, authoritative source of environmental information that will support a performance-management system geared toward the most-effective use of techniques to reduce pollution, as well as harm to ecosystems

strengthen the management of EPA, focusing on speeding up decisionmaking and developing more effective structures at headquarters and the regions for managing problems in specific places

reframe EPA's critical relationships with states, other federal agencies, and nongovernmental institutions, to enhance their collective capacity to address complex environmental problems

The panel bases that strategy on its collective experience, on research completed by the Academy staff, on 17 retrospective evaluations of innovations in environmental management completed by a diverse group of academic researchers, practitioners, and consultants, and on a prospective look at the environmental problems and opportunities that may lie ahead.

The evaluations provide an extraordinary resource: detailed knowledge from the field. They focus not only on the application of new policy tools and the changing relationships among companies, individuals, and government agencies, but also on the challenge of innovating. Parts of the environmental management system in the United States are dynamic—the growing availability to consumers of "green electricity," for example—but much of it is ossified. The research demonstrates that government programs, because they are based in the legislative process and formal rulemaking, are among the most change-resistant parts of the system. The research also documents the extraordinary efforts of numerous elected, appointed, and career officials to reshape those programs, to enhance their effectiveness, and to improve the environment.

What the research does not show is the full extent of change under way in EPA, the states, business, and the broader environmental community. By necessity, the Academy focused on only a handful of initiatives, all of them chosen because they appeared to be constructive and successful. EPA managers are proud of many initiatives not covered in these pages: efforts to reduce diesel emissions, to implement performance measures for enforcement programs, to promote voluntary energy conservation, to expand public access to information about the hazards posed by high-production-volume chemicals. The panel did not set out to document every initiative, or to produce a scorecard for the effectiveness or commitment of particular institutions. Neither did it choose to evaluate reform efforts intended to weaken environmental protections. Rather, the panel sought to understand the potential of new approaches to environmental problem solving, as well as to identify barriers that frustrate progress.

Tomorrow's Problems and Opportunities

The environmental management system of the future can and should be more dynamic, effective, and efficient than today's. But what should it look like? What problems will it need to solve? Who or what will be its prime movers, its rulemakers? What role will government institutions play? Private companies? Nongovernmental organizations? Individual citizens? "Governance," after all, is not solely the domain of formal governmental institutions—legislatures, courts, and agencies—but arises from the actions of the rest of civil society. Which forms of governance will be most effective at managing the environmental problems of the next 20 years? Most importantly, given the range of possible answers to those questions, what should EPA, Congress, and the states do now?

The panel answers most of those questions in this report, though it approaches the question of the future's most pressing environmental problems with considerable humility. Forecasting environmental trends is beyond the scope of this project—and is notoriously difficult. Nevertheless, making thoughtful decisions today requires critical thinking about the future. In this section, the panel presents a few assumptions about environmental trends, and then a more extended discussion of changes in institutional roles that have occurred over the last decade. Within that context, the panel then offers three "scenarios," short, provocative narratives about the future intended not to predict events but to stimulate critical thinking about near-term decisions. The scenarios share some basic assumptions about the circumstances that will shape the environment, the economy, and society, but they diverge in several ways that illustrate that very different systems of governance—each with its own strengths and weaknesses—are possible.

Drivers of Change

The panel assumes that the following eight trends or drivers will continue for at least a decade and are likely to alter fundamentally the environment, what people know about the environment, and the institutional capacity to manage the environment:

increased demand for energy services, particularly as China and India become wealthier nations, which will probably increase the emissions of greenhouse gases

increased wealth and demand for resources in the United States and abroad, including a growing demand for access to relatively unspoiled natural areas for recreation and housing

increased pressures on ecosystems, particularly from land-use changes caused by development, and from the spread of non-native plant and animal species

increased costs for maintaining and replacing the nation's aging infrastructure for delivering drinking water and treating wastewater

increased access to information through ever faster, smaller, and cheaper computers, environmental monitors, cameras, and web devices

increased global trade, communication, and harmonization of environmental standards and norms

increased understanding of the human genome, how organisms—probably including individual humans—respond to environmental hazards, and the capacity to modify the genetic makeup of plants, animals, and microorganisms

increased improvements in technology, such as fuel cells, theoretically enabling the replacement of carbon-based fuels with hydrogen-based fuels

The Current Context

Absent from the list of drivers above are "toxic dumping" and most forms of industrial pollution because EPA's regulatory programs have kept those problems in check. Authorized by the Clean Air Act, the Clean Water Act, and other statutes, the agency has forced large-scale polluters to reduce their air and water emissions and manage their hazardous wastes.[1] Strong national programs have required firms to use particular pollution-control technologies, and required states to achieve specific levels of air quality. Those programs have matured: most are now implemented by state environmental agencies acting with varying degrees of oversight by EPA's 10 regional offices. States typically issue permits to firms or publicly owned wastewater treatment facilities; states—and occasionally EPA—enforce those permits in an effort to maintain a culture of compliance.

Chapter 2 of this report examines the strengths and weaknesses of that permit-based compliance system, focusing on innovations designed to reach activities that permitting cannot touch, or to encourage public and private actors to produce environmental benefits beyond mere compliance with regulatory standards. EPA is pushing some of those innovations, but most are coming from state agencies and from regulated businesses themselves as they struggle to find more effective and less costly ways to meet their state's environmental

and economic goals. Most businesses are not seeking a "rollback" of pollution-control requirements, but do want to avoid being required to install yet another level of control technology, particularly if they can point to greater environmental gains they might achieve more cheaply otherwise.

There is another pressure on the regulatory regime as well: a demand from the market for faster changes in production processes. Permitting systems simply cannot respond quickly enough to the needs of manufacturers of computer equipment, pharmaceuticals, and specialty chemicals, for example. The time-delay in securing permits is just one aspect of the transaction costs associated with various permitting systems. Other costs include labor and legal fees incurred by a business and its regulatory agency. Thus one of the challenges of any new system of environmental management is to develop ways to lower those costs. Another is keeping down the notoriously high transaction costs of trying something new.

The time to accept those challenges is now: the entire environmental regulatory system appears poised to exploit new technologies and related policy tools. Advances in on-site and remote monitoring technologies are enabling the replacement of traditional permit systems with tradable-allowance systems and facility-level emissions caps. As monitoring improves, the need for inspection and enforcement operations declines. The Internet is enabling more informative versions of EPA's Toxics Release Inventory, for example.[2] (Chapter 3 of this report examines several efforts to innovate using trading and better monitoring data.)

Of course, EPA has been more than a regulator or a source of compliance data. It has provided funds for large capital projects: the construction of sewage and wastewater treatment systems, drinking-water systems, and, through the Superfund program, the cleanup of contaminated sites. But analysts predict that municipalities will need to raise billions more dollars in the next decade to repair, replace, or expand their water treatment systems. States and communities may also seek cash from EPA or other federal sources for other place-based environmental projects, ranging from the restoration of large ecosystems (such as the Everglades) to paying farmers to install better manure-management systems to reduce phosphorus and nitrogen loadings in rivers, lakes, and estuaries.

Ecosystem restoration, production agriculture, international trade—those problems have never been part of the EPA regulatory sphere, yet environmental protection at the local and regional level is increasingly requiring the coordinated management of pollution, natural resource uses, economic development, and land-use decisions. Chapter 4 of this report focuses on watershed management and considers how EPA fits into that multiparty network of problem solvers.

Among the most potentially significant changes EPA has implemented over the last decade have been in its relationships with states, through NEPPS, described in Chapter 5, and in the organizational structure of the agency, described in Chapter 6. In 1994 Administrator Carol Browner consolidated all of the agency's enforcement staff under the new Office of Enforcement and Compliance Assurance (OECA). In 1995 and 1996 she moved the planning function from the Office of Policy, Planning, and Evaluation into the Office of the Chief Financial Officer, and let the vestigial evaluation function disappear. In 1999, she created the Office of Environmental Information, nominally on a par with OECA, and consolidated a number of the remaining pieces into the Office of Policy, Economics, and Innovation. Meanwhile, EPA's New England regional office reorganized along functional lines that went further than headquarters: it organized the permitting functions of the major media programs (air, water, solid waste) in a single office, and began to redefine its role *vis-à-vis* headquarters and the six states of Region 1. Given that about 40 percent of EPA's 18,375 employees work in regional offices, such changes may have a large impact on EPA as a whole.[3] They may already presage a step

toward the nation's adoption of an environmental protection system based more on achieving specific environmental goals than on meeting activity-based targets.

It is safe to say that most Americans do not care how EPA is organized, whether a local factory has one permit or 30, or what statutory basis or statistical model agencies use to gather consistent, reliable data. As Americans have demonstrated over the last three decades, however, they do care about the environment: about reducing health threats from pollution, about protecting endangered species and wild places, about leaving future generations of Americans a natural environment that is as rich, beautiful, and sustainable as possible. Many Americans also care about environmental governance: it makes a difference to farmers if new rules are coming from EPA or the Department of Agriculture, it makes a difference to businesspeople if they have a chance to review their corporate data before it is posted on the web, and it makes a great deal of difference to many Americans whether the nation's environmental laws apply to people, regions, and companies fairly.

The three scenarios that follow start with the broad range of governance issues described above and then combine them in different ways. For example, in the first scenario, the private sector and a host of environmental groups have exploited the potential of the web in disseminating environmental information, while EPA has missed out. In the second and third scenarios, EPA has established itself as the most credible provider of web-based information. In the second scenario, EPA drives a host of national environmental programs, while in the third, the agency focuses primarily on information, leaving most of the rest of the regulatory process to state and local governments. In all three scenarios, Americans support environmental protection, though they choose very different institutions and tools to achieve it, and the results vary somewhat based on those choices and the other details in the scenarios. The scenarios do not follow the dictates of "Goldilocks Effect:" that is, one is not too optimistic, one too pessimistic, and one "just right." Rather, the panel hopes that readers will use them as an inspiration for fresh thinking. Imagine:

Scenario 1: The Green Web

Frustrated by almost a decade of gridlock in Congress and inertia in federal and state environmental agencies, environmentalists all but stopped lobbying Congress at the turn of the century and went shopping instead. Nongovernmental organizations joined forces with a new generation of manufacturers, utilities, and Internet companies to establish dynamic markets for environmentally friendly products and services, ranging from organic foods to clean cars and electricity generated from renewable sources. North American and European consumers in large numbers chose to "buy green," even when costs were somewhat higher, and manufacturers responded. Americans deliberately invested their pensions in socially responsible stocks, and boards of directors responded. By 2002, most automakers could assure consumers that firms registered to the ISO 14001 standard for environmental management systems produced their cars. By 2012, consumers could set their e-shopping programs to purchase only completely recyclable products.

Activists with digital videocameras and inexpensive remote sensors played a critical role in establishing and policing the system. They called global attention, via the Internet, to environmental "predators." Originally, the term was reserved for companies using wood cut from old-growth forests, or routinely topping the web listings of toxic emitters, but it eventually came to be applied to ranchers with lax grazing practices and hotels with above-average water use. The green web could provide so much information to consumers committed to using that informa-

tion, that it corrected one of the classic market failures: the propensity of firms and individuals to externalize their environmental costs.

Most federal and state environmental regulatory programs atrophied. They stopped trying to innovate, their most creative talent went elsewhere, and they hunkered down into a routine role as a regulatory backstop: issuing perfunctory permits and enforcing actions against a relatively small number of firms and facilities that were either indifferent to the web's pressure, or were operating in areas where consumers and investors simply didn't care.

EPA missed its chance to become one of the premiere "content providers" on the green web, ceding that role to several large NGOs and for-profit companies. Thus consistency and objectivity have not been among the green web's strengths. Bad data can be flashed around the world-and have rapid impacts on the fortunes of individual companies or whole sectors. The green web tends to feed consumer fears and accelerate consumer fads. As a result, international markets punish genetically modified foods one day, a particular brand of cotton the next, and goods produced in Nation X the next, and then reverse their fortunes a year later. The very attributes that made the green web so powerful a force for environmental improvement—the speed with which it can spread information to households around the world, and the automatic connections it can provide between consumer preferences and purchases—has left many wondering what would happen if consumer demand for greener goods began to flag.

Scenario 2: Old Glory

Not since the dawn of the Great Society, some federal officials noted, had Americans held them in such high esteem as at the end of the first decade of the 21st Century. Americans had a renewed faith in Congress and the executive agencies, including EPA, because the institutions had successfully transformed themselves to better achieve the nation's priorities.

Americans wanted cleaner air, cleaner water, and some assurance that their grandchildren would be able to enjoy the outdoors and a stable global climate. They were willing to do their share to achieve those goals, but they really did not want to have to sign onto the Internet every night to check up on corporate emissions rates, the source of their strawberries, or the compliance record of the company trying to build an office park downtown. And they wanted to be sure that everyone played by the same rules: that if gas-guzzlers were bad for the atmosphere, *no one* could buy a gas-guzzler.

So, Americans turned to federal and state regulatory and natural-resource agencies to manage the environment for them. EPA now works as much as possible through market-based and information-based measures, providing sources of pollution with as much flexibility as possible in meeting national or regional ambient standards. Emissions-trading systems rely on web-based registries; companies report their environmental impacts through constantly updated websites managed by an office initiated jointly by EPA and the Securities and Exchange Commission. Although those new regulatory requirements are less prescriptive than in the old days, they are still hotly contested and often overturned. The agency's enforcement unit relies increasingly on remote sensing and other information technologies to automate compliance assurance. Compliance rates are very high. The degree of flexibility available to companies makes enforcement more difficult in some sectors, though scandals have been rare; companies are always mindful of the public relations damage NGOs can produce if they see fit.

Congress poured money into expanding and rebuilding public water and sewer systems; into the permanent acquisition of open space and environmentally sensitive land; into farm payments targeted to achieve environmental gains; into environmental monitoring and data

interpretation; and into basic research with the potential to improve energy efficiency over time. Congress eventually revised the federal tax code in ways that made environmental conservation less expensive and environmental harm (producing carbon dioxide, developing natural areas) more expensive. The myriad actors in the economy responded quickly to the change.

Ironically, as federal and state environmental agencies and programs became more effective, Americans stopped worrying about the environment, losing track of where government programs were heading. As the government became more environmentally sophisticated, citizens became less so. Some bureaucrats worry about what would happen in the event of a problem that would require public understanding and action, not just public support.

Scenario 3: Local Option

Just as simple organisms confronting varied habitat evolved into the dazzlingly complex array of specialized species that inhabit the earth today, so too has the management of environmental problems. States, acting singly or in coalitions, have assumed primary responsibility for managing most air and water pollution problems. People organized around specific places—watersheds, mountains, or economic resources—are the front-line of environmental action in most parts of the country.

By 2010, several states replaced traditional permitting systems with individual compacts negotiated between and among firms, communities, and state regulators, which achieves local environmental and economic goals at relatively low cost. Some sub-state areas have allocated substantial resources to buy development rights to valuable habitat. States sharing a large watershed created their own nutrient-trading system to protect the river and its estuaries. The people in a neighboring watershed decided to let their rivers become eutrophic, rather than impose any additional costs on their resident farms.

EPA plays a critical stabilizing role in this dynamic and varied system: it maintains a credible and up-to-date environmental information system. Data from reliable sources all over the country pour into the EPA network, enabling communities, states, and regions to see where environmental conditions are improving or worsening, where particularly harmful sources of pollution originate, where human exposures to various hazards are highest, and where different management approaches appear to be having the biggest impact. EPA also guides a forward-looking environmental research program that continues to shed light on environmental risks to human health, ecosystems, and economies. Armed with that risk information and local performance data, people ask their state and municipal governments and their local businesses for the environment that they want. The effectiveness of those state and local authorities, of course, varies across the country.

The federal government has essentially abandoned the notion of setting consistent regulatory standards for the whole nation and has delegated to the states all of its place-based permitting programs (retaining pesticide registrations, toxic release inventory, the acid-rain trading program, and a few other programs that are national in scope). EPA also concentrates on global environmental issues. The millions of Americans living in coastal areas have called on their representatives in Congress to take serious action on climate change. The agency offers little assistance, however, when conflicts arise among states. EPA's information systems might clearly identify a group of polluters in two states that are degrading air quality in four states to their east, but the downwind states have few levers to move their neighbors to act.

Lessons from the Scenarios

The three scenarios illustrate a number of points, chief among them that the United States will need a strong federal environmental regulatory agency for decades to come. New technologies—monitoring systems, the Internet, fuel-efficient cars—have the power to transform *how* the nation achieves its environmental goals, but they cannot miraculously eliminate the governance challenge of environmental protection. The nation is so broad and diverse that only a federal system actively engaged in resolving local, state, and national conflicts can reliably lead to enhanced environmental protection at the lowest possible cost. EPA must remain the backbone of the system, establishing national policies and standards, ensuring a degree of consistency across states, and engaging in global environmental issues.

Although the stability built into the status quo inhibits innovation, it also prevents many environmental problems from getting worse. The nation's basic system of environmental regulation is—and will continue to be—an essential component of environmental protection. It is largely through regulation that Americans have made companies, towns, and one another take responsibility for their potential impacts on their shared environment.

It appears unlikely that any individual player will be able to dominate the flow of environmental information over the Internet. As the "green web" scenario illustrates, a wide range of businesses and NGOs will use the web to promote various causes, and to provide information that may greatly enhance the efficiency of environmental protection. Freedom of information is a profoundly American tradition, and should be a part of the environmental governance system of the future. For the nation to reap the full benefits of the information age, however, the federal government must establish itself as the most credible source of consistent, reliable, and useful data about sources of pollution, environmental hazards, and place-specific environmental conditions. EPA has a critical role in building that system, though several other federal agencies and all of the states have essential roles as well.

The Leadership Challenge

The innovations described in this report demonstrate some of the approaches that the nation and states will need to use to make progress against significant outstanding environmental problems. In most cases, the innovations also demonstrate the value of a precious commodity in environmental management today: leadership.

At the national level, EPA was preoccupied for most of the 1990s by political struggles between the White House and Congress, and between the federal government and the states. Since 1995, it has seemed as if a stalemate between Congress and the administration on issues of funding and authority were the highest environmental goal achievable. As a result, many who believe statutory reform could make environmental protection more effective and more efficient have rejected legislation as a productive strategy. They simply have not trusted Congress to pass legislation that would help the nation address its environmental problems.

During the same time frame, the courts struck down a number of EPA initiatives—including an attempt to reduce human exposures to ozone and fine particles—finding that the initiatives exceeded the agency's authority.

The combination of those forces created challenges for EPA and its state counterparts. It was clear to many inside and outside EPA that the agency needed to innovate, to "reinvent" its programs, yet the distrust between EPA and Congress effectively prevented securing congressional authorization for significant reform. The administrator created an Office of Reinven-

tion, which made headway on a number of issues within the agency and tried to encourage innovations among the states. In 1997, an Academy panel concluded that those efforts were moving in the right direction, though ultimately of marginal impact because they were so tightly constrained by EPA's authorizing statutes, as well as by an agency culture that was averse to taking risks.[4]

Those constraints are evident in virtually all of the case studies the panel commissioned for this project. The innovations are encouraging, but they are not dramatic or unequivocal. Most of them make managers operate with one hand tied behind their backs. Often, the most forceful constraint has been EPA's Office of Enforcement and Compliance Assurance, which has resisted innovations proposed by EPA and the states when those innovations appeared to lack statutory legitimacy or might have weakened EPA's capacity to enforce the law.

Regardless of who wins the 2000 presidential and congressional elections, the next EPA administrator will have to deal with the aftermath of five years of stalemate on environmental policy in Washington. Continuing in the same path would leave the new administrator without a legacy, but, more importantly, it would leave the nation even more frustrated with its government.

To make progress on outstanding environmental problems, the administrator will need a good ear—to hear the public's mandate—and a gift for challenging Americans to do their part in accomplishing that mandate. The administrator will need to articulate a vision for the agency and its relationships with the states, and then engage the agency and the states in fulfilling that vision. And, of course, the administrator will need to find a way to work constructively with Congress—or around Congress, if it proves incapable of meeting its own leadership challenges.

This report focuses its recommendations on the steps the next EPA administrator should take to encourage innovation throughout the environmental management system. Viewing the next administrator as "the only hope," however, is a prescription for failure. There are thousands of other environmental leaders at work in America and abroad—people in business, NGOs, schools, state houses, and town halls; people within EPA itself and its state counterparts; people in numerous federal agencies with an impact on the environment—with whom the administrator must work, and from whom EPA must learn. This report includes information and advice for environmental leaders throughout the governance system.

Setting the Agenda for 2001

The next administrator, after consultation with Congress, should identify a manageable number—perhaps as few as two or three—of significant environmental problems to address first, and then marshal the support and develop the tools that will be needed to make progress. The Academy panel commends three problems in particular because they pose high risks to human health, the sustainability of ecosystems, and other social values, and because they are ripe for action: nonpoint runoff of nutrients, sediments, and other pollutants into surface waters; smog; and preparing for a reduction of greenhouse gas emissions.

Making progress on any of those problems will require new ways of thinking; new market-based tools to keep the costs of action as low as possible; new levels of coordination across federal agencies, state and local agencies, and numerous sectors of the economy; and new ways to share information and responsibilities with the American people. What is most important, strategically, is that the administrator innovates *for a purpose* that Americans agree is important. Innovation for its own sake is unsustainable, as well as pointless. As the studies described in this

report demonstrate, innovation is difficult, time consuming, and filled with risk. Innovators need to know that their efforts have a chance of making a significant improvement in a significant problem. Although smog, nonpoint runoff, and climate change are difficult issues to address, technically and politically, they are of such magnitude that Americans should find them worthy targets. Innovation, by necessity, will follow, and so too will progress on the other environmental problems which must remain part of EPA's agenda.

Report Structure

The rest of this report explains the Academy's research into innovative environmental management and develops recommendations for applying some of those techniques to outstanding environmental problems. Chapters 2 through 6 draw from the Academy's own research as well as from the 17 studies completed by independent research teams for this project. (The full research reports are available in separate volumes and on-line at the Academy's web site.)[5] Each of those chapters concludes with findings and detailed recommendations. Chapter 7 synthesizes the reports' findings and recommendations and presents them as a plan for action.

Appendix A lists the research teams that prepared papers for this project. Appendix B presents a summary of the major statutes that EPA administers. Appendix C is a glossary of the terms used in this report. The panel members and Academy staff responsible for the report are listed in Appendix D.

Research and Analytical Methods

This is the third major report about the Environmental Protection Agency prepared at the request of Congress by the National Academy of Public Administration's Center for the Economy and the Environment. In 1995, the Academy published *Setting Priorities, Getting Results: A New Direction for EPA*,[6] and in 1997, *Resolving the Paradox of Environmental Protection: An Agenda for Congress, EPA, and the States*.[7] The former analyzed the consequences of EPA's media-specific statutes, its stove-piped management, and its failure to integrate planning and budgeting in ways that would lead to more effective priority setting and use of analytical tools such as risk assessment and cost-benefit analysis. The 1997 volume tracked several of EPA's most important "reinvention" initiatives, and concluded they were having only marginal impact. The report stressed the need for performance-based approaches to regulation and state oversight in order to encourage the regulated entities to find the most cost-effective ways to meet their federal environmental obligations. In both of the projects, an Academy panel of fellows and others with relevant expertise supervised a research staff and prepared a final public report.

The U.S. Congress commissioned this report in EPA's FY 1998 appropriations act. The appropriations committees directed EPA to dedicate money to the project:

> $2,000,000 for the National Academy of Public Administration to design and manage a series of independent evaluations of recent EPA initiatives to improve the effectiveness and efficiency of EPA activities. These studies shall also assess how lessons learned can be built into ongoing agency programs. The conferees note that EPA has yet to develop a program evaluation capacity, a critical element of meeting the requirements of GPRA and ensuring the most effective allocation of resources. EPA is to enter into an agreement with the Academy within 90 days so that the reports may be made available to the Congress within two years.[8]

The Academy responded by forming a distinguished panel to oversee the work. That panel and the staff of the Academy's Center for the Economy and the Environment spent several months talking with senior EPA managers, EPA staff members, state environmental commissioners, environmental advocates, business leaders, and others in order to identify the most significant innovations in environmental management for evaluation. The Academy also issued a general call to researchers and others to propose innovations for study. To the Academy's delight, many program managers within EPA urged the Academy to evaluate their programs. The process produced a long list of innovations from which to choose. Eventually the panel settled on the topics presented here, and commissioned a set of highly respected independent researchers to undertake the analyses and write reports describing their findings.

Although EPA and other officials with direct knowledge of the innovations in question reviewed each of the research papers, which were also reviewed by the Academy panel and peer reviewers, the researchers had final control of their own reports including their findings and recommendations. Simultaneously, the Academy staff conducted its own research into innovative management approaches and organizational issues. In June 2000, the Academy convened some 40 environmental leaders from around the nation to discuss the findings, recommendations, and implications of the 17 research reports in a roundtable setting presided over by the panel. [9]

The staff and panel consolidated all of that analysis and commentary into this report. Senior EPA officials have reviewed and commented on the document, though the Academy panel exercised final say in the publication. The process has yielded a work of uncompromised independence and objectivity

CHAPTER 2

Transforming Regulation

Altering the way EPA and state regulatory agencies relate to individual sources of pollution and environmental damage from factories, power plants, dry cleaners, feed lots, and sewage treatment plants is an essential step to improving the nation's environment. Aspects of the current regulatory system are incompatible with the 21st Century economy: they either fail to maximize the environmental benefits that new technology and policies might provide, or they fail to minimize the private and public cost of meeting certain standards. Some of the old regulatory systems are simply too slow for firms trying to compete in an information-based economy. Reducing the ozone levels in cities, the eutrophication of lakes and streams, the emission and deposition of mercury and other persistent toxic chemicals, as well as the effects of climate change will depend on government's capacity to make its regulatory system more efficient and effective. Tinkering around the margins will not do the job.

The United States can continue to make progress against environmental problems—and can do so at the lowest possible cost—if it changes how it regulates. New information technologies, innovative policy tools, a strong and stable public commitment to environmental quality, and new institutional capacities throughout the economy make regulatory reform both feasible and imperative.

Numerous public and private institutions have been experimenting with alternatives to traditional regulation. This chapter examines several of the most promising efforts to change how government agencies—or society at large—coerce or entice sources of pollution to reduce their environmental impacts. The lessons from those efforts—and from the experiments with emissions trading described in the next chapter—should help the new EPA administrator plan the next steps. Nothing described in this chapter has dramatically improved the environment, or demonstrated simple fixes that make improvements quickly or easily. Indeed, most of the attempts to innovate have been severely constrained by tradition, politics, and EPA's cautious interpretation of its statutory authority. Making headway against the nation's most intractable environmental problems is going to require testing—and adopting—far more radical change.

EPA's regulatory apparatus focuses most of its attention on individual facilities and the permits they need to discharge pollutants to the air, to water, or to waste-management facilities. And the reformers who developed the programs in this report were trying to correct for a number of gaps and failures in that current system. Particularly, they were concerned about the following:

Unregulated sources: many of the most significant sources of pollution and environmental harm in America today are unregulated. Congress and the states have focused their environmental controls on larger point sources of pollution, and on a relatively small number of important products: cars, trucks, gasoline, pesticides, drinking water, and processed foods. Lawmakers have not required farmers, large or small, to take responsibility for runoff of nutrients, pesticides, and sediments from their fields and feedlots. Likewise, municipalities and homeowners have generally avoided regulation of runoff from their streets and yards. The numerous environmental and economic impacts of sprawl are largely unregulated as well. Traditional regulations would be ineffective against many of those dispersed sources of pollution in any case.

Under-regulated sources: many small business, including dry cleaners, printers, and photo-processors, are ignored by regulators because individually they contribute so little pollution that inspecting and taking enforcement actions against them can be a waste of time. Collectively, however, those business sectors are part of the pollution problem. So, too, are the cars and trucks that Americans drive. Older vehicles tend to contribute disproportionate shares of pollutants into the air; larger and less efficient vehicles contribute a disproportionate share of carbon dioxide. Again, traditional regulations are ineffective in many such areas.

Unduly expensive and static regulation: most federal and state pollution-control regulations require firms[10] of similar types to install pollution-control systems of similar types. Those "technology standards" are relatively easy to implement and enforce, but they provide no incentives for firms to go "beyond compliance," to reduce emissions further than the level that can be achieved by the technology; they provide few incentives for firms to create new technologies or processes that might achieve better results; they require some sources to over-control and other sources to under-control their emissions; and they thus cost society more than is necessary to achieve the result it wants. In addition, the uniformity of the requirements often precludes sources from finding or implementing the most cost-effective approaches to minimizing their combined environmental impacts.

The innovations described in this chapter contribute to the transformation of environmental protection because they reduce environmental problems *without* adding more layers of unduly expensive or static regulation.

It bears repeating that despite its weaknesses, the U.S. approach to regulation has achieved considerable environmental benefits.[11] Compliance appears to be the norm in America. The air and water are cleaner than they would be absent some sort of regulatory program. The problems listed above are widely understood, as well, and have inspired numerous reform efforts aimed at achieving what the Clinton administration has sought: "cleaner, cheaper, smarter" approaches to environmental protection.[12]

Six of the studies the Academy commissioned for this report evaluated significant innovations in pollution-source controls. The projects encompass large and small firms, regulated and unregulated activities, and private and public operations. Some of them exploit new monitoring and information technologies; others create new relationships among regulators, the regulated, and communities; some create market pressures that should foster continuous improvements; others are only tangentially related to government programs, flowing instead from individual businesses' conviction that reducing their environmental impacts will improve their

bottom line. The six studies by no means exhaust the list of potentially significant innovations being tested in America today. From "green accounting"[13] to Environmental Defense's on-line "Scorecard"[14] and the World Resources Institute's Forest Watch,[15] many public, private, and non-governmental organizations are responding to the weaknesses of the current regulatory system with creativity and commitment.

The innovations evaluated by the research teams demonstrate that firms—including very small businesses—using some form of "environmental management system" can improve their performance, and reduce the time and effort regulators need to spend inspecting their behavior.

> The Massachusetts Environmental Results Program engages business sectors in negotiating comprehensive environmental requirements and practices for firms, then uses self-certification, coupled with the threat of inspections, to achieve broad compliance.[16]

> New Jersey's facility-wide permitting pilot demonstrated that firms and regulators could improve environmental performance by treating a firm as a whole. In some cases, consolidating the participating facilities' air permits under a single performance cap achieved environmental and financial gains over stack-by-stack technology permits, particularly when the permits allowed facilities to change their manufacturing processes without prior approval.[17]

> Larger firms committed to maintaining a leadership position on environmental performance have demonstrated through participation in EPA New England's StarTrack program that third-party auditors can produce reliable critiques of facilities' environmental management systems. A strong audit report, or third-party certification, can signal to regulators that their inspection resources can be better deployed elsewhere.[18]

> States are now experimenting with whole-facility compacts in which the regulator and a company agree on a set of broad environmental performance goals (generally extending beyond mere compliance with standards). In return for that commitment, the regulator provides the firm with the freedom to achieve those goals through nontraditional means.[19]

Those innovations are leading regulation away from permit-by-permit controls of a facility's technology and toward a whole-facility standard for environmental performance. The firms benefit from the enhanced flexibility, and the public still has the assurance—backed up by a threat of inspection and regulatory action—of a defined cap on emissions.

Each of the innovations described in this chapter addresses a particular regulatory challenge, and has merit in its own right. Taken together, however, they lay a working foundation for a more dynamic and cost-effective approach to regulation: emissions and effluent trading. Trading systems, discussed at length in Chapter 3, can reduce the cost of meeting an environmental goal while stimulating the development of control technologies and better environmental information. Making trading systems work, however, depends on transforming the relationships among regulators and sources of pollution: finding ways to bring many new, smaller sources of pollution into "the system;" finding ways to hold firms accountable to the overall system without requiring static permits; and finding ways to ensure environmental well-being without requiring each facility to meet uniform technology standards that may be inappropriate to the facility and its community. Each of the following cases contributes to that transformation.

None of the innovations suggests that regulators can—or should—disappear, however. Whatever else changes, individuals, communities, and businesses will always have incentives to pass the cost of pollution or pollution-control on to others. That is why some form of regula-

tion—whether imposed by Congress and government agencies, or by a voluntary association of sources with a mutual interest in adhering to a standard—will always be necessary.

Self-Certification: Expanding the Universe

The Massachusetts Department of Environmental Protection (DEP) has achieved two remarkable breakthroughs with its implementation of its "Environmental Results Program:"

> it has greatly expanded the "universe" of small businesses in three sectors—printing, dry cleaning, and photo processing—on record with the state's regulatory system, and thus likely to be responsive to state requirements
>
> it has created a powerful incentive for the owners or managers of those businesses to take personal responsibility for complying with environmental regulations

Thus, the program has simultaneously expanded both DEP's reach and its effectiveness. The department makes a reasonable claim that in just three years the program has driven a measurable reduction in pollution from the participating sectors.

The Environmental Results Program (ERP) requires an individual in each firm to certify in writing each year that his or her business is in compliance with a comprehensive, facility-wide set of environmental regulations. To make that certification meaningful to small businesses without environmental staff, the department has provided each sector with straightforward workbooks to guide the managers through the steps they need to take to achieve compliance. To gain the widest possible participation, the state even published the guidebooks in Korean, to accommodate the large number of Korean drycleaners.

In their evaluation for the Academy, April and Tim write:

> ERP's affirmative statement of compliance shifts the onus for compliance to the regulated entity. Under the typical regulatory process, firms are supposed to comply with applicable regulations. However, many firms are ignorant of the multitude of regulations with which they are required to comply. Many programs, including ERP, have developed compliance assistance tools—workbooks, workshops, and ombudsmen—to help businesses determine rule applicability, as well as the means to comply.
>
> The ERP certification is several steps beyond these attempts to better communicate regulatory requirements.[20] It ranges in length from four pages (dry cleaners) to seven pages (printers). In filling out the certification, firms must determine the applicability of various requirements and certify their compliance. The last page of each certification contains a signature page where the proprietor or high-ranking official the firm must positively assert that:
>
> > The signatory has personally examined and is familiar with the information in the certification.
> >
> > The information contained in the submittal is true, accurate, and complete.
> >
> > Systems to maintain compliance are in place at the facility, and will be maintained for the coming year, even if processes or operating procedures are changed over the course of the year.

> The signatory is "aware that there are significant penalties including, but not limited to, possible fines and imprisonment for willfully submitting false, inaccurate, or incomplete information."[21]

Although the substance of the requirements remained unchanged, through self-certification the requirements became much harder to ignore. April and Greiner quote the environmental manager at a medium-sized electronics firm, which had participated in an early pilot of the ERP: "It meant that my boss [the president] gave me the 'keep me out of jail speech' every time that he signed it." And the person responsible for compliance at a small printing company said, "I'm glad they made it required. It's something they [DEP] should have been doing for years. In the position I'm in—I'm an employee—and if I say we have to spend $100, he [the owner] says go to hell. But with the certification requirement, now he recognizes he has to spend the money."[22]

Most of the facilities comprising the three business sectors involved in ERP had been virtually invisible to the department before it implemented the program. As part of the process of creating the workbooks and certification plans, however, DEP engaged the relevant trade associations and other stakeholders in an extensive process of technical collaboration and negotiations. The trade associations helped DEP build a registry of the state's dry cleaners, printers, and photo processors. The results, presented in Table 2-1 below, demonstrate the power of the approach. By expanding the number of small businesses inside the state's regulatory system, DEP not only increases the scope of compliance with regulatory standards, but also levels the economic playing field among hundreds of competitors and thus reduces the incentive to ignore environmental safeguards.

TABLE 2-1: NUMBER OF FIRMS KNOWN TO THE MASSACHUSETTS DEP

SECTOR	DEP-IDENTIFIED FIRMS PRE-ERP	DEP-IDENTIFIED FIRMS POST-ERP
Printers	~250	~1100
Dry cleaners	~30	~600
Photo processors	~100	~500
Total	~380	~2200

The Environmental Results Program has produced some beneficial environmental results, though actual measurements are few. Two quantitative studies documented improvements in the printing sector (such as switching the chemicals used to wash printing presses) that DEP predicts will reduce the release of approximately 168 tons of volatile organic compounds (VOCs) statewide each year. (VOCs contribute to the formation of ground-level ozone and may be toxic.) DEP estimated that the program would cause the state's dry cleaners to reduce their aggregate emissions of perchloroethylene, a hazardous air pollutant, by some 500 tons per year. In addition, photo processors were expected to reduce their discharges of silver-contaminated wastewater.[23]

The Environmental Results Program is not voluntary. All companies in the three sectors are required to participate, and by inspecting a percentage of the participating firms, the enforcement staff at the DEP has made sure that participants take the self-certification seriously. Indeed, some of the participating businesses complain that their involvement makes it more likely that they will be inspected than will competitors who have not self-certified and made themselves part of the visible universe as the regulations require.

The department was sufficiently pleased with the success of ERP in the three initial sectors and among the 18 pilot-phase participants, that it was moving ahead in 2000 with the development of a certification program for some 8,000 dischargers of industrial wastewater, for thousands of gas stations responsible for operating pumps with vapor-recovery systems, and for thousands of other firms installing or modifying boilers. The department expects ERP eventually to cover some 25,000 facilities. Massachusetts and neighboring Rhode Island are jointly developing regulations and workbooks to apply to auto-body shops in both states.[24] And other states have shown interest in replicating the program.

No other innovation described in this report has covered such a large number of pollution sources. Most of the other initiatives have involved a small number of firms where regulators and facility managers have negotiated customized permits or special arrangements. ERP, however, demonstrates how a state can expand its regulatory program to include thousands of otherwise un- or under-regulated firms, while producing potentially significant reductions in their aggregate pollution loads. The approach helps reduce compliance costs for participating firms and, once the rules and workbooks are written, greatly reduces transaction costs for regulators.

ERP could be adopted on a broad scale in many states to bring tens of thousands of firms into compliance with state standards. The approach could even be modified to reduce agricultural sources of nutrient runoff, where part of the regulatory challenge is finding a way to bring many relatively small operations into a management program or trading system without creating huge new transaction costs. (Those issues are discussed in Chapter 3.) EPA's approach to enforcement of federal standards, however, may limit the potential impact of ERP and programs like it.

EPA Constrains ERP

The Massachusetts Environmental Results Program is more than just evidence that self-certification is a useful policy tool for bringing small businesses into compliance with environmental standards. It is also a perfect example of the challenges that confront—and often confound—efforts to change the structure of environmental regulation.

ERP's original goals were to consolidate all the environmental requirements facing various business sectors into a single *performance-based* document, and then eliminate all of the corresponding permits. The result would give businesses a clear emissions cap and provide maximum flexibility in how they might meet it. ERP has only partially achieved that goal. It has eliminated several air- and water-related permits that printers had to have before doing business or making significant equipment changes. Now, in exchange for switching to several practices that reduce VOC emissions, printers may change their processes freely without first getting a permit, provided they certify annually that they are operating under the cap. ERP eliminated fewer permits in the other sectors, however, partly because fewer permits applied to such small enterprises. (The program's early advocates envisioned it as an approach for working with medium and large businesses as well as small operations.)[25]

ERP made many people nervous from the start. Environmental advocates and many DEP employees were fearful that the department would lose control of both standard setting and enforcement over the regulated entities.[26] Staff was particularly worried that any ERP standards would eventually become less protective than traditional permits. DEP requires all new sources of pollution over a certain amount, as well as all sources with proposed increases in pollution over a certain amount, to go through a Best Achievable Control Technology (BACT) review. That requirement allows permit writers to push firms to adopt newer and cleaner technologies. Some DEP staff feared that once in place, ERP's performance-based requirements would remain fixed, and thus produce less improvement over time. Other DEP staff countered that many large sources of pollution were—and would remain—exempt from BACT requirements because of exemptions made at the time the regulations were adopted. [27]

To reduce that internal conflict, and to avoid potential conflicts with EPA, DEP decided to roll out ERP with relatively small businesses, those which neither had nor needed many federal permits: hence dry cleaners and photo processors in 1997 and printers in 1998. To the extent that it would consolidate or eliminate permits, ERP would be working with sources operating below the federal radar. Dry cleaners, however, posed a challenge because their use of perchloroethylene is subject to a National Emission Standard for Hazardous Air Pollutants (NESHAP). Even relatively small dry cleaners are covered by a federal Maximum Achievable Control Technology (MACT) rule. April and Greiner explain:

> Massachusetts had an existing dry cleaner Reasonably Achievable Control Technology (RACT) standard for dry cleaners, but it was not highly enforced. In developing the ERP regulations for dry cleaners, the ERP workgroup looked to the federal MACT as a model. DEP wanted a simple, unified set of requirements. It was interested in increasing sector environmental performance even beyond the MACT level, so DEP actually increased the stringency of requirements . . . DEP did not consider it necessary to apply for MACT program delegation. Based on its good relationship with Region 1, managers expected that EPA would retain the principal authority for enforcing the MACT standard and DEP would enforce the ERP requirements for dry cleaning. Such cooperation had been quite common in the environmental arena.[28]

But the federal-state relationship did become a problem. As noted above, the requirements DEP negotiated with the workgroup were considerably more stringent than the old ones it had applied—and more likely to be enforced:

> The federal MACT has a lower applicability cut-off, so very small sources are not covered; DEP has no cut-off, so the state's requirements would apply to all dry cleaners.
>
> DEP is more stringent in requiring leak-detection equipment instead of the "sniff test" for perchloroethylene; the federal standards classify the sniff test as a "MACT" technology.
>
> DEP's standard requires dry cleaners to test for leaks twice as frequently, and to maintain more logs of those tests.

In order to persuade the dry cleaners to accept those stricter requirements, DEP agreed to continue the state's practice of requiring dry cleaners to retain their environmental records for three years, rather than adopting EPA's requirement of five years. Because the federal MACT

standards in all sectors require five years, however, DEP could fulfill its ERP agreement only if it could persuade EPA to accept the change. DEP could have petitioned EPA to delegate to it on a sector-specific basis the controlling federal air toxics program. (California had done just that and reduced record-retention requirements.) DEP rejected advice from EPA to seek that delegation and accept the program's record-keeping requirements. Instead, DEP sought the flexibility from EPA through the agency's flagship reinvention program, Project XL.

EPA established Project XL—a loose acronym for "excellence and leadership"—in 1995. It was presented as a vehicle in which leading companies, communities, business sectors, and even states could use to obtain regulatory flexibility by committing to superior environmental performance. Since its creation, Project XL has produced several strong agreements with companies, though as a vehicle for encouraging systemic innovation, the program has been a disappointment.[29] The Massachusetts dry cleaners illustrate some of Project XL's weaknesses.

DEP started its XL proposal in March 1997. After roughly a year-and-a-half of extensive negotiations and public involvement, Massachusetts became the first state to sign a final XL project agreement with EPA. The agreement, however, did not authorize DEP to reduce the record-retention requirements for small dry cleaners. Rather, it set out a process for approving specific requests for flexibility as *addenda* to the agreement. DEP agreed to submit addenda to EPA Region 1, which would then forward them to EPA headquarters and to an interagency review committee. In accord with that process, in March 1999, DEP submitted to EPA the dry cleaner package with its request to change the record-retention requirements. Region 1's staff has worked hard to make the agreement work, but EPA's Office of Enforcement and Compliance Assurance resisted the proposal.

April and Greiner juxtaposed the arguments for and against allowing the change in record retention in Table 2-2 below.

In July 1999, EPA sent DEP draft comments on the proposal informing the department that the only way EPA could extend that flexibility to DEP would be if DEP applied for formal EPA delegation of the MACT program for the dry cleaning sector, the very route that DEP had rejected two years earlier as too long, uncertain, and potentially incompatible with ERP's approach to self-certification and enforcement. EPA recommended that Massachusetts follow California's approach to the MACT delegation, and emphasized that the package should contain a strong enforcement protocol and compliance strategy. California had to commit to EPA to inspect 100 percent of its dry cleaners each year in order to gain its delegation: a commitment made possible only because California relies on local fire departments and health officials for inspections. Massachusetts created its ERP to move in the opposite direction: to improve compliance through self-certification and spot inspections.[30] As of July 2000, DEP had not decided whether to pursue delegation.

Thus, EPA's statutes, and the agency's tradition of enforcing them, frustrated a reasonable approach to innovation. Prior to the start of ERP self-certification in September 1997, no one had been regularly inspecting Massachusetts' small dry cleaners. When the state attempted to honor a negotiated agreement that increased the stringency of the requirements in ways that could produce environmental benefits while simultaneously strengthening the connection between the regulator and the sector, EPA could not say yes. The state may have signed a Project XL agreement with EPA, but EPA still insisted that the Clean Air Act's MACT delegation requirements had to be enforced. The agency could not set a precedent that other sectors or other states might seek.

The Massachusetts Environmental Results Program has demonstrated how a state regulatory agency can improve environmental performance by shifting enforcement strategies and

TABLE 2-2: ARGUMENTS FOR AND AGAINST ERP DRY CLEANERS RECORD-RETENTION FLEXIBILITY

	PRO	CON
CONSISTENCY	Important for small sources to get consistent message and not manage records differently for different programs. A common record retention requirement is three years (e.g., RCRA manifests).	All federal MACTs have five-year record retention. Maximum time frame allowed by law (42USC2463: federal government cannot bring enforcement actions seeking penalties for actions more than five years old).
SMALL SOURCES	Inspector experience says small sources either have no records or all their records from startup. Enforcement experience says the last six months to one year' s worth of records is sufficient to derive penalty.	Want fullest time frame available because inspectors don' t get out to small sources very often. Three vs. five years would remove 40 percent of the available time frame for punishment.
PRECEDENT SETTING	Since flexibility is granted within context of the XL program, it should be clear flexibility is not open to everyone.	MACTs have never deviated from the five-year time frame. XL has mostly been about single-facility flexibility, site-specific experiments that don' t set sector- or program-wide precedents.
SUPERIOR ENVIRONMENTAL PERFORMANCE	Derives from sector participation in the entire ERP. Does not judge element by element. ERP standards for dry cleaners are more stringent; the program brings more sources into the system, promotes higher compliance via certifications and workbook process, and has potential for sector-wide superior environmental results.	No direct link between record retention and environmental performance. Not clear what benefit dry cleaners derive from reduced record retention, or what superior environmental results accrue.
PAPERWORK REDUCTION	Important to offer small facilities something in exchange for higher regulatory burden. Average dry cleaner has 2500 square feet of floor space, and needs every inch. Would have liked real regulatory relief but believed they got as much as they could.	The real burden is in record keeping, e.g., logs, purchase records, not in holding them an additional two years. It would take more effort to go in and purge records than to keep them.

developing effective compliance-assistance tools. Self-certification of compliance appears to be an effective strategy for regulators seeking to expand their reach to under-regulated or under-inspected enterprises, provided the state maintains a credible system of oversight to detect fraud or abuse. As the state expands ERP to cover thousands more wastewater dischargers, combustion sources, gas stations, and auto-body shops, the experiment will provide valuable information, and possibly significant environmental benefits. As part of ERP, the state and EPA have worked collaboratively on developing what Massachusetts calls Environmental Business Practice Indicators, which may prove useful in coming years. ERP has also demonstrated how little running room EPA is inclined to give a state when the agency perceives a threat to its own enforcement capacity. Until EPA finds a more effective way to encourage experimentation, programs like ERP will have a hard time demonstrating that they might also be productive approaches to improving the performance of larger sources of pollution requiring federally delegated permits.

A Private Transformation: Firms Adopt EMSs and Third-Party Certification

Regulatory agencies and the public have sent a clear message to companies over the last three decades: pollution and other environmental impacts are problems the companies must *manage*. In the last 10 years, parts of the private sector have transformed their response to that challenge by developing formal "environmental management systems" or EMSs. Regulatory agencies are slowly realizing that the rise of EMSs will enable them to operate more efficiently as well.

One of the reasons the Massachusetts Environmental Results Program succeeds in improving the performance of small businesses is because its workbooks and self-certification forms help firms create and maintain a simple and systematic approach to environmental management and compliance. Dry cleaners, for example, are guided to check for leaks periodically, to fix any problems promptly, and to document their actions. The EMSs employed by larger firms are correspondingly more complex, of course, but they achieve the same goals: to help firms identify and manage their environmental impacts and obligations, and thus improve the overall efficiency of their operations, and avoid legal problems.

Any U.S. business or municipality that has made an effort to comply with environmental regulations over the years probably has an "environmental management system,"[31] though it may simply be a set of steps one or two employees know they must take to stay in compliance with regulations. In such cases, loss of those employees may mean loss of the "system." To prevent that, firms and trade associations have developed more formal approaches to environmental management. Jennifer Nash and John Ehrenfeld define EMSs as "formal structures of rules and resources that managers adopt in order to routinize behavior that helps satisfy corporate environmental goals. They are a subset of management systems in general."[32] The authors point to the American Chemistry Council's (formerly the Chemical Manufacturers Association) "Responsible Care" program as a code of behavior that fits that definition, because it directs "managers to establish environmental objectives, assign responsibility, allocate resources, and regularly measure and report progress."[33]

The private sector has created the EMS innovation, and now the public sector is trying to figure out what to make of it. Should government agencies be encouraging firms to adopt EMSs? Should agencies treat firms with EMSs differently? Will firms with EMSs begin to ask regulators to take the same integrated, systematic approach to environmental protection? And can a third-party certification of a firm's performance in any way augment or replace the role of a regulatory inspector?[34]

The next several sections of this chapter begin to answer those questions, documenting the strengths and weaknesses of each approach, and also suggesting how those approaches might contribute to the emergence of cap-and-trade systems and performance-based management of the environment. The first section examines ISO 14001, the predominant international standard for environmental management systems. The next section considers "StarTrack," a program initiated by EPA Region 1 to create a special regulatory status for leading firms implementing EMSs verified by a variety of third-party auditors. The third section analyzes efforts in Oregon, Wisconsin, and EPA headquarters to encourage firms to achieve better environmental performance by establishing "performance-track" programs somewhat similar to StarTrack. The chapter concludes with an examination of New Jersey's long-standing programmatic attempt to accomplish some of the same goals through integrated facility-wide permits.

ISO 14001

The International Organization for Standardization (ISO), based in Geneva, develops standards to promote international commerce. In addition to product standards (e.g., for screw threads), it has developed two highly visible management systems: the ISO 9000 series of standards, which defines the essential elements of a "quality management system" (QMS); and the ISO 14000 series, which defines the essential elements of an environmental management system. The EMS standard is defined in "ISO 14001"; other documents in the ISO 14000 series offer guidance on lifecycle assessment, environmental labeling, auditor training, and related topics.

ISO 14001 was formally adopted in September 1996, and rapidly became the dominant global EMS standard. More than 10,000 firms and facilities around the world—particularly in Asia and Europe—have "registered" to the standard. In the United States, only 463 organizations had done the same as of December 1, 1999,[35] though that number is likely to grow significantly in the next few years.

ISO 14001 is a voluntary standard, developed largely *by* businesses *for* businesses. (EPA officials and representatives from other national governments also participated in the drafting of the standard.[36]) Firms use ISO 14001 to help them identify and manage their environmental obligations. Some firms, including major auto manufacturers, also require their suppliers to be registered to the ISO 14001standard, presumably because they believe that the management system will encourage their suppliers to maintain a good environmental reputation and operate more efficiently, thus protecting the reputation of the finished product and keeping its price down.

The standard does not impose or suggest any particular environmental performance targets. It does, however, require that firms identify their significant "environmental aspects," those impacts the firm's operations or products may have on environmental quality. Firms must demonstrate a commitment to compliance, to the prevention of pollution, and to the continuous improvement of their environmental management system. An EMS must include provisions for training workers, for record keeping, for establishing an environmental policy, and for periodically refining goals for environmental performance. Firms must document every aspect of their implementation of an EMS, and must make those documents available to auditors.

Firms do not have to develop formal EMSs, of course. They can ignore ISO 14001 and compliance issues altogether; they can develop their own unique system for managing their environmental responsibilities; they can use a system that conforms to any of several European EMS standards;[37] or they can implement an EMS that conforms to ISO 14001. Even if they choose ISO 14001, they have a choice of self-auditing and self-declaring their conformity with the standard, or hiring an independent third-party firm or "registrar" to audit them. A registrar checks to ensure that each element of a firm's EMS is in place, conforms to the standard, and is linked to the achievement of an organization's environmental goals. If all is in order, the registrar adds the organization or facility to the list of "ISO 14001-registered" entities. To maintain their registrations, firms must demonstrate annually to their auditors that they are maintaining their commitment to compliance, and are making progress in achieving whatever environmental goals and objectives they specified in their plans. If a registrar finds "significant nonconformances," it must notify the firm immediately; if the firm fails to correct the problem, the registrar is obligated to suspend or terminate the firm's registration.

Nash and Ehrenfeld used case studies and statistical analysis to determine what motivated some of the first U.S. firms to seek registration to the ISO 14001 standard. They found a variety

of reasons, depending of the type of business, the corporate culture, and the firm's position in regard to environmental performance. Among those motivators:

> a desire to add rigor to an internal process by letting employees know that they would have to pass muster with an independent auditor
>
> a desire on the part of facilities within a corporation to demonstrate their competence and leadership to their parent firm
>
> a desire to demonstrate to the public or to regulators that they were taking environmental responsibilities seriously, and thus should be considered national leaders in the field, worthy of recognition and closer relationships with regulators
>
> a desire to compensate for-or even obscure-compliance problems or higher-than-average emissions rates

Many analysts have sought to explain why relatively few U.S. firms have registered to the standard. One answer is that the registration audits may cost from $50,000 to $100,000.[38] Nash and Ehrenfeld concluded that early adopters in the United States tended to be large firms with well-established environmental programs and ample financial and staff resources. Those attributes will change as powerful companies such as Ford and General Motors implement their 1999 edicts that all of their parts suppliers implement EMSs consistent with or registered to ISO 14001 by 2003.[39]

Evidence to date suggests that EMSs and ISO 14001 EMSs can help firms improve their environmental performance, particularly when the firms set out to do so in corporate policies or ambitious goals. There is nothing in the standard, however, to ensure that firms will go beyond compliance requirements or achieve excellent results. Nash and Ehrenfeld conclude that implementing and maintaining an EMS registered to ISO 14001 can have a positive impact on firms' behavior:

> We found that adoption of ISO 14001 led to two types of changes in the case study facilities. First, adoption has formalized and reinforced existing environmental practices. Second, ISO 14001 has led to increased integration of environmental objectives into business practices. By this we mean that regulatory compliance has been institutionalized as a priority for business managers and, in several facilities, pollution prevention activities have been incorporated into responsibilities of many workers.[40]

It remains to be seen if smaller firms, and those that implement formal EMSs merely to satisfy their business customers, will respond so aggressively. It also remains to be seen how vigorously independent auditors "enforce" or uphold the standard. Nash and Ehrenfeld conclude that despite the lack of a requirement in the standard for compliance, ISO 14001-registered firms will tend toward better environmental performance.

> In written comments in response to this report, EPA's Office of Enforcement and Compliance Assurance argues that ISO 14001 fails to provide regulators with such assurance [of a firm's compliance with regulations]. We agree that a firm's adoption of the standard does not *guarantee* continuous improvement toward compliance. Managers may adopt the standard, but fail to devote the

> resources necessary for implementation; registrars may overlook managers' failure to address compliance issues. These examples are not what drafters intended, however. Continual improvement toward regulatory compliance is the clear intention of ISO 14001. For example, the introduction to ISO 14001 states: "this standard does not establish absolute requirements for environmental performance beyond commitment, in the policy, to compliance with applicable legislation and regulations and to continual improvement." ISO 14001 drafters viewed compliance as a performance requirement, not an empty commitment.[41]

The Multi-State Working Group (MSWG), an unusual affiliation of public and private practitioners and academics, is undertaking a long-term study to monitor the impact of ISO 14001, as well as the impact of less-formal EMSs on the environmental performance of firms. It has, with EPA's financial support, established a database at the University of North Carolina at Chapel Hill, which will help track the performance of hundreds of firms with various types of EMSs.[42] The MSWG participants have adopted a consensus document that reaches essentially the same conclusion as Nash and Ehrenfeld, while cautioning that regulators must remain vigilant, even if firms are registered to ISO 14001:

> Evidence suggests that a comprehensive approach to compliance through use of environmental management systems have merit. No EMS is a guarantee of compliance. Consequently, governments must continue to maintain some degree of regulatory oversight over all regulated entities, regardless of whether an entity has an EMS in place. However, governments should not unduly scrutinize entities that have voluntarily implemented an EMS. Entities that systematically discover potential compliance violations through an EMS may be eligible to take advantage of federal and state incentive policies for self-disclosures, and governments should not unduly scrutinize entities for making such voluntary disclosures.[43]

ISO 14001 is still new, and it has attracted many critics. Some argue that the standard itself is too weak: that it should demand compliance, public participation in a firm's identification of its significant aspects and goals for improvement, as well as public access to audit reports. Some critics point to faults in the registration process. Others argue that the worst thing that could happen to the standard would be to load it down with public policy objectives—or any requirements that would make adoption less appealing to firms. Most would agree, however, that the emergence of formalized EMSs as a respected part of business management is a step forward, and an innovation of potentially large impact.

StarTrack: EPA's EMS experiment

EPA Region 1 initiated its "StarTrack" pilot project in 1996 to test several hypotheses. Regional Administrator John DeVillars was particularly interested in seeing if third-party compliance audits similar to financial audits done by independent certified public accountants and relied upon by the federal Securities and Exchange Commission could begin to privatize EPA's enforcement operations. If those firms committed to compliance could identify themselves through a credible system of compliance audits, then EPA would be able to focus its inspectors and

enforcement resources on firms more likely to be in violation.

Project designers also wanted to see if EPA could encourage firms to become environmental leaders by offering various rewards to those firms that volunteered to participate in the project. By recognizing and rewarding environmental "stars," EPA hoped to entice more firms to become stars, and to move to a performance level beyond mere compliance.

Finally, the pilot team envisioned EMSs and third-party audits as a means of improving the flow of information between firms and the public. If participating companies made environmental-performance reports available to the public, they would have an incentive to maintain a high level of performance. And their neighbors would have a better understanding of the companies' environmental challenges.

The pilot has demonstrated success in several of those areas, and has shed light on some of the challenges states will face as they try to establish equally ambitious "performance-track" systems.

In early 2000, 15 firms, six of which had been involved since the start of the pilot, were participating in StarTrack. To join the project, firms had to demonstrate:

an established compliance-audit program

an acceptable compliance history

a cooperative relationship with regulators

a top-management commitment to EMS implementation and continuous environmental improvement

significant pollution-prevention efforts with quantified results[44]

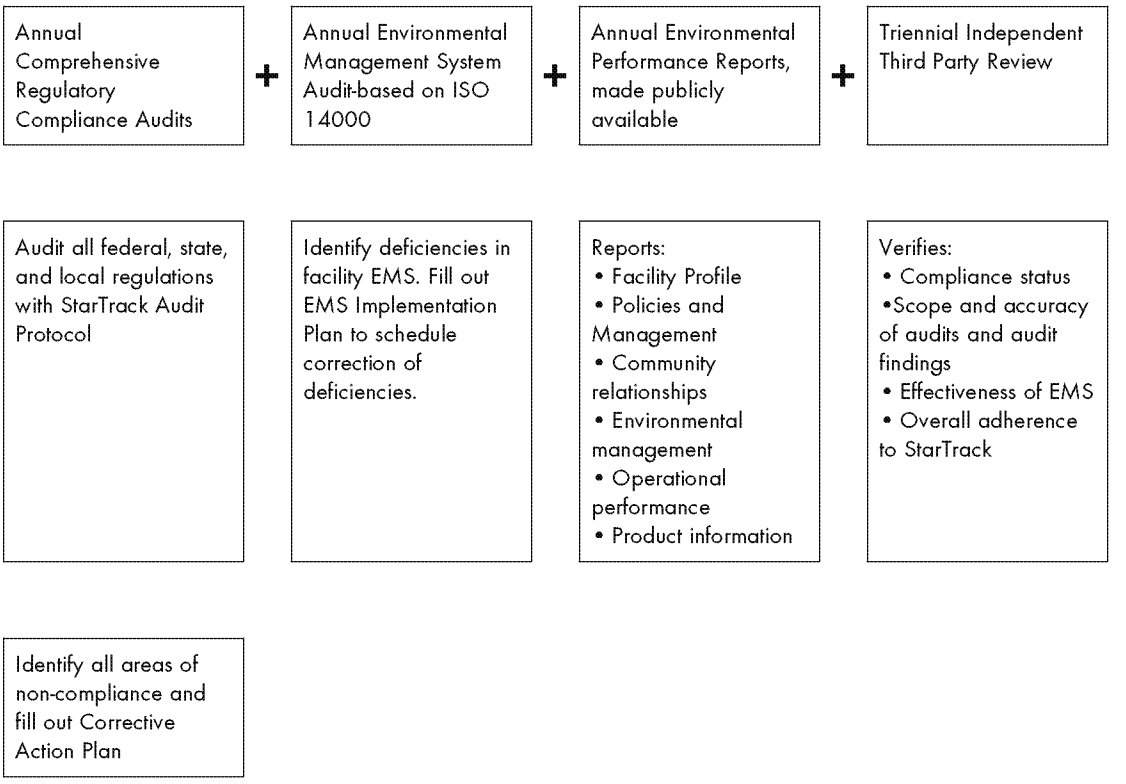
Nash and Ehrenfeld report that EPA used considerable discretion in deciding which firms met those criteria. The staff deliberately left ambiguous the definition of an "acceptable" compliance history to provide enough room to allow in the program firms that were starting low but were committed to improvement. Participating firms had to: conduct an annual compliance audit (with regulatory staff in attendance as observers); perform an annual EMS audit (again with observers); publish an annual environmental performance report; and commit to conduct a third-party audit every three years.[45] Those requirements are summarized in Figure 2-3.

In return, EPA gave public recognition to StarTrack participants by listing them on its web page and applauding them in other venues. Nash and Ehrenfeld report that:

> EPA also offers what it calls "partnerships" to firms participating in StarTrack. By this the agency means "constructive feedback to help improve auditing programs, environmental management systems, and measures for improving overall environmental performance." StarTrack promotional materials list additional benefits to managers of firms. These additional benefits-which are not listed in the formal agreements signed by the parties-include modified inspection priority and "express lane service for permits and other regulatory actions."[46]

After conducting extensive interviews and four case studies, Nash and Ehrenfeld concluded that the pilot firms and participating EPA and state regulators had formed constructive relationships that strengthened their mutual understanding and trust. Those emerged because

FIGURE 2-3: SUMMARY OF STARTRACK REQUIREMENTS



regulators spent considerable time in plants observing audits and learning about individual EMSs, and the firms put a high value on that engagement.[47] Perversely, however, the pilot facilities consumed more, not fewer, EPA resources. The StarTrack staff had made a deliberate effort to engage state regulators and representatives of EPA's Office of Enforcement and Compliance Assurance (OECA) in the pilot in order to overcome OECA's natural suspicion of privatizing compliance assurance:

> A chief concern for OECA at the outset was that participating companies might reduce attention to compliance once admitted into the program. This has not happened, according to the OECA and state enforcement personnel with whom we spoke. There is no evidence to suggest that environmental performance at StarTrack companies is declining, or that companies are taking advantage of the penalty mitigation provisions offered by the program. "In most cases, companies follow through on their commitments in a serious way," explained one manager at OECA familiar with StarTrack.
>
> Yet OECA has not accepted the idea that companies admitted into StarTrack do not need to be inspected by EPA. [The] acting director of the Office of Planning and Policy Analysis at OECA, believes that Region 1 has yet to prove that the program provides compliance assurance. "The fact that these

companies are less likely to violate environmental laws has not yet been established," he said. More experience is needed to test the reliability of the audits and the third-party system. Others at OECA also urged that the program needs more time. "The only way to build legitimacy in the program is to observe the audits," explained an OECA staff person. "If no substantial problems are discovered over the course of 50 or so audits, headquarters will have to see the program as legitimate."

Representatives of both OECA and state environmental agencies expressed concern about the costs of StarTrack. Often between five and 10 people from agencies observe compliance and EMS audits. Inspectors from air, water, and waste departments take part. Preparing for audits, participating in them, and assessing results require substantial amounts of time. [A manager from] New Hampshire's Department of Environmental Services explained that participating in StarTrack requires one full-time equivalent for his agency. Four New Hampshire companies belong to StarTrack.[48]

Nash and Ehrenfeld conclude that the pilot has demonstrated that the first of StarTrack's assumptions was correct: regulators can reasonably expect firms with a good compliance history and a commitment to periodic third-party audits to be more likely than others to be in compliance, and hence that EPA can reasonably change *its own* behavior toward participating firms. Specifically, the researchers recommend that EPA reduce its direct oversight of participating firms, and have inspectors focus on poor performers.[49] They also find that StarTrack is *not* an effective vehicle for encouraging firms to go beyond compliance because the incentives EPA has available to offer firms—recognition and fewer inspections—are too weak. EPA could not or did not put participating firms on an "express lane" for permits or provide any unusual regulatory flexibility.

Is StarTrack improving the performance of firms that participate in the program? The answer, based on our case studies of participating facilities, appears to be no. While environmental performance at StarTrack firms is improving, improvements should not be attributed to the program. To be admitted, a facility must have a history of pollution prevention and an EMS that includes environmental performance improvement as a goal. Firms that meet these criteria are managed by people who have already invested in environmental performance improvement, and are committed to continuing to do so.

Neither is StarTrack likely to improve the performance of facilities that might aspire to participate in StarTrack. The reason is important. Our cases show that the factors that push managers to develop beyond-compliance programs have little to do with agencies. Our research suggests that managers adopt ambitious environmental programs because they are both *capable* and *motivated.* In our statistical analysis we saw that facilities that have already instituted advanced management systems such as ISO 9000, and that are owned by large organizations, are the ones that adopt ISO 14001. These facilities have the capability-in terms of knowledge and resources-to embrace the EMS standard. In the case study facilities, managers were motivated to invest in

> environmental performance improvement by the need to improve efficiency and reduce costs, and, in some cases, to gain stature with corporate management. Managers told us that they also wanted to improve their reputations with agencies. But this desire, on its own, was not a sufficient incentive.
>
> Our cases suggest, therefore, that even if EPA could deliver the benefits it has promised in StarTrack, these benefits would still be inadequate, on their own, to shift the curve of environmental performance in the direction of excellence. Larger forces shape the environmental practices of firms. Fortunately, these forces have in recent years propelled many companies in the direction of compliance and beyond compliance. Agencies have stood at the sidelines.[50]

EPA does not plan to remain on the sidelines, however. In the agency's July 1999 publication, *Aiming for Excellence: Actions to Encourage Stewardship and Accelerate Environmental Progress*,[51] the agency committed to develop a "performance track" that would encourage firms to go beyond compliance. On June 26, 2000, the agency formally launched its Performance Track program, and invited firms with strong compliance records, an EMS of some form (not necessarily ISO 14001 or one audited by a third party), appropriate public reporting and outreach, and a commitment to pollution reduction and compliance to apply for acceptance to the "national environmental achievement track." EPA regional-office staff will review each application. Applicants meeting EPA's standards will: receive public recognition; "will be a low priority for inspection targeting purposes"; and will be eligible to attend various meetings with EPA officials. In announcing the program, EPA committed to amend various guidance documents and to seek rule changes that would create more significant rewards for participation. The agency also committed to unveil a "national environmental stewardship track" in 2001, one that will reward firms with exemplary programs with various as-yet-undefined benefits.[52] The implementation of the performance track includes a commitment to improved environmental performance and pollution reduction, as well as to continued compliance.

EPA's performance track programs will succeed only if the agency finds a way to live up to its promises of inspecting participating firms less often, and rewarding high achievers with new regulatory flexibility. The former will require a cultural change within the agency, and the latter may require statutory change, as EPA's experience with Project XL suggests. The initiatives and their forerunners—ISO 14001, StarTrack, and others—signal the growing sophistication of private environmental management systems, the potential of third-party certification to augment or replace government inspections, and the maturation of the private sector's response to environmental regulation.

That maturation opens up new possibilities for more cost-effective regulation. Third-party certification, for example, can help reduce transaction costs and enhance the dynamism in a cap-and-trade pollution-reduction system involving many traders.

As the following section demonstrates, several states have been working for years to implement performance-based regulatory programs within their jurisdictions. They are struggling to find incentives with sufficient power to make their systems work.

Oregon and Wisconsin: Building a Performance Track

The promise of "regulatory heaven" floats in front of Wisconsin business people who listen to a state employee describe the Wisconsin Department of Natural Resource's (WDNR) new "Environmental Cooperation Agreements" program. Volunteering firms would have to com-

mit to a new way of managing both their environmental impacts and their relationships with the department, but in exchange, they could escape "regulatory hell,"[53] the world of ordinary permits. Oregon calls its performance-track experiment "Green Permits," and its goals for the program are at least as lofty Wisconsin's: to provide incentives for companies to deliver increasingly strong environmental performance in exchange for admittance into one of three increasingly flexible regulatory "tiers." According to Speir, by early 2000, both state programs had been maturing for several years, were authorized in state legislation, and were building innovative relationships with several firms. As of July 2000, both programs were also still working with EPA to determine exactly how much flexibility they could deliver to participating companies. Researcher Jerry Speir's analysis of the two programs concludes that it is still not clear whether EPA will give the states enough latitude to test the limits of the approaches.

Wisconsin and Oregon's work to date illustrates not only a new way of thinking about how states might better regulate facilities, but also the challenge states and EPA face in sorting out their roles and authorities. Speir identified five other states that are developing programs with some resemblance to EPA's performance track (see Table 2-3).

TABLE 2-3: STATES DEVELOPING A "PERFORMANCE TRACK"

OREGON	Green Environmental Management System (GEMS) Permits 1997, legislation passed; 1999, rules adopted Three tiers: Participant, Achiever, and Leader.
WISCONSIN	Cooperative Environmental Agreements 1997, legislation passed.
NEW JERSEY	Silver and Gold Track Program for Environmental Performance September, 1999 (announced) Three tracks: Silver, Silver II, Gold.
MICHIGAN	Clean Corporate Citizen (C3) Program 15 designees as of November 1999 Benefit to participants include: "faster reviews of air emission source and storage tank permit applications, and expanded waivers for construction and operation of air emission sources during permit review, and plant-wide applicability limits (PALs) for air emissions."[54]
MINNESOTA	Regulatory innovations legislation designed to test state "XL permits."[55]
LOUISIANA	Legislation providing for an innovations program, adopted in 1997.[56]
ILLINOIS	A non-statute-based pilot project offering participating firms with EMSs: "assistance from Illinois EPA staff in completing data collection protocols, technical assistance in pollution prevention and public involvement, access to independent research on ISO 14001, and Illinois EPA recognition and publicity."[57]

Speir describes the essential elements of the Wisconsin and Oregon programs, their history, and the would-be participants' preliminary proposals for cooperative agreements or green permits. As of late July 2000, none of those proposals had been finalized.

Wisconsin designed its program to engage not just corporate environmental leaders, but firms with average records seeking to make big gains. (Oregon's program, in contrast, requires a history of strong performance as a prerequisite for participation.) The Wisconsin statute authorizes the state Department of Natural Resources to sign agreements with up to 10 firms. Each agreement has to meet a long list of requirements, including the following:

> "Provide at least the same level of protection of public health and the environment" as current law
>
> "Encourage facility owners and operators to systematically assess the pollution that they cause, directly and indirectly, to the air, water and land"
>
> "Encourage facility owners and operators to implement efficient and cost-effective pollution reduction strategies . . . while complying with verifiable and enforceable pollution limits"
>
> "Encourage facility owners and operators to achieve superior environmental performance" as to both regulated and unregulated effects of their facilities, "while achieving a balance among the economic, social and environmental impacts of these efforts that is acceptable to the community in which the facility is located"
>
> Consolidate environmental requirements into a single cooperative agreement "to the extent that consolidation is practical and efficient"
>
> "Grant . . . greater flexibility than would otherwise be allowed" under present law
>
> "Seek to reduce the time and money spent by government and . . . facilities on paperwork and other administrative tasks that do not result in benefits to the environment"
>
> "Encourage public participation and consensus . . . in the development of innovative environmental regulatory methods and in monitoring . . . performance"
>
> "Seek to improve the provision of useful information to the public"
>
> "Provide public access to information about performance evaluations"
>
> "Encourage facility owners and operators and communities to work together to reduce pollution below the levels" required by current law.[58]

The statute requires that each agreement "specify waste reduction goals in measurable and verifiable terms" and "contain pollution limits that are verifiable, enforceable and at least as stringent" as current law. Participating companies must commit to implement an environmental management system based on ISO 14001 and allow an "interested persons group"[59] to comment on its EMS and be involved in measuring the system's performance. The requirements for public involvement exceed anything in ISO 14001, traditional permit systems, or even StarTrack. Speir reports that firms are apprehensive about those requirements.

The emphasis on public involvement reflects the program's roots. Wisconsin conceived its "cooperative agreements" as analogues to the Dutch "covenants" between businesses and the

communities in which they operate. One aspect of a covenant is the presumption that community representatives can make sound judgments about a company's overall program, balancing environmental, economic, and social concerns. The Wisconsin program calls on communities to help in that process, but does not give community representatives a decisionmaking role.

The final agreements would be formalized in contracts and thus subject to contract law, rather than administrative laws. That notion worried EPA, however.

> EPA has had concerns about the legal implications of calling the agreements "contracts," especially as to their enforceability. The concern centers on whether the contract language might suggest a remedy *only* within the confines of contract law, taking the agreement out of the context of the traditional administrative and enforcement remedies associated with permits. The compromise presently in development would allow the agreements to be called contracts but would also require that they be treated *as permits*, including the full administrative process (notice, comment, and enforcement) associated with permits. Whether these "contracts" will also generate an additional legal remedy in contract law is presently unclear: that will depend on the language of the final agreements.[60]

Because the agreements would involve requirements framed by federal programs delegated to Wisconsin, EPA insisted that it had to approve the overall program. Negotiations lasted 18 months, and resulted in a memorandum of agreement between the state and EPA, the first "innovations agreement" reached under the umbrella "Joint EPA/ State Agreement to Pursue Regulatory Innovation" (the so-called "ECOS Agreement" signed by the Environmental Council of the States and EPA). The final memorandum does what the Massachusetts' XL agreement does: creates a process whereby most thorny issues are resolved as they arise by an interagency group. Speir explains:

> A key issue, and one that appears to surface anywhere these kinds of programs are discussed, is what exactly constitutes a "federal requirement" triggering a necessity for EPA approval. This is still an open question under the memorandum of agreement reached between WDNR and EPA, and has resurfaced in the negotiations between Oregon and Region 10 that are presently on-going. The issue has been generally resolved by WDNR's agreement to submit all applications under the Cooperative Agreement Pilot Program to EPA Region 5 for its review, and to work out any concerns that may arise through an Inter-Agency Implementation Team process.[61]

Despite the ambiguity that remained about who would determine exactly what is acceptable, four firms submitted proposals to WDNR seeking various kinds of regulatory flexibility in exchange for past or future performance beyond compliance.[62] Most of the applicants sought permission to combine permits, reduce or consolidate reporting requirements, or replace process-specific permits with a whole-facility emissions cap enabling firms to change processes without waiting for new permits. One firm sought a cross-media change: it wanted to develop a new process for treating its waste that might result in the need for a water discharge permit; the change, however, would enable the company to shut down its incinerator. As might be expected in a process involving negotiation, the firms' initial requests for flexibility were more specific than their promises for improved performance. After preliminary discussions, one of

the four firms withdrew its application. The others are moving through the review process. Neither the firms nor WDNR—or even local environmental groups—has yet sought to clarify how to meet the statute's public involvement requirements.

Three firms are at roughly the same point in Oregon's new "Green Environmental Management System Permit" program (GEMS), and the state is at roughly the same point in working out the fine points of the program. (Oregon adopted rules in August 1999 to implement a 1997 statute.) On June 1, 2000, EPA and Oregon signed a memorandum of agreement to implement the GEMS program. All parties are wondering how far the new system will be able to go in transforming relationships between regulators and firms.

The system requires firms to have an implemented EMS, a history of strong environmental performance, and an active stakeholder involvement process before they can apply for entry into even the lowest of the three tiers. The system also requires applicants to pay $5,000 as a first installment to cover the state's costs for reviewing an application.

In exchange, participants would receive a "single point of contact" within the regulatory agency, and other benefits commensurate with the firm's performance. The rule sets up what has become known as a "performance ladder": increasing levels of performance would receive increasing regulatory benefits.[63] Speir summarizes the distinctions among the green permit tiers:

> For all GEMS permits, the agency may apply its enforcement discretion to address appropriate compliance issues through improvements to the environmental management system. For Achiever and Leader Permits, the agency "may provide expeditious reviews of proposed modifications to existing permits, modify existing permits for maximum flexibility for process changes which do not negatively impact the environment, extend the duration of permits . . . modify record keeping or reporting requirements, coordinate reporting cycles . . . or provide other benefits that streamline regulatory interactions or benefit the facility." In addition, "the agency may provide waivers of environmental laws, if needed, to make these incentives possible."
>
> For Leader Permits, the agency may facilitate innovative approaches that involve more than one facility (e.g., multiple applications for the same project), such as facilitating a supplier-customer relationship.[64]

One particular negotiation in Oregon serves as a good example of the value of a performance track—and of the dilemma it poses for EPA. LSI Logic, a semiconductor manufacturer, is working with Oregon DEQ in an attempt to expand its flexibility. The LSI plant already has a facility-wide air permit, as does an Intel plant in the state.[65] Speir reports that LSI would *like*, ultimately, to have one umbrella permit for all media, with one report for the entire set, though it does not expect that to happen in the short term [66] (Intel tried to achieve a similar result through EPA's Project XL at its Chandler, Arizona, plant, only to end up with separate federal, state, and local permits.)

> More significantly for its day-to-day operations, LSI is seeking expedited permits; as with many others in high-tech manufacturing, its officers complain that the present system of permitting impedes their market flexibility.
>
> As part of a proposal to conserve water and to test a "mass balance" approach to waste management, LSI also requests approval to increase the *concentration*

of a particular contaminant in its wastewater, without increasing the actual "loading" to the treatment system.

And LSI offers another proposal that highlights a particular problem with the current regulatory scheme. The federal regulations, in their extensive detail, at 40 CFR 265 Subparts BB and CC, set out required control devices, monitoring, inspection, and labeling requirements for tanks storing hazardous materials, under the Resource Conservation and Recovery Act (RCRA). LSI's equipment is more advanced than the regulations envisioned (its system operates under "negative pressure," for example, and is vented to a "thermal oxidizer"—a control device that burns air emissions—and not released directly to the atmosphere). Still, the regulations, which were designed with large hazardous waste treatment and storage facilities in mind, cause the firm to inspect, monitor, and maintain records specific to the regulatory requirements, records that are subject to inspection, even though they don't really apply to LSI's system. LSI seeks an exemption, based on a finding that its system is equivalent—or superior—to the system envisioned by the regulations. RCRA is quite prescriptive in its requirements. The question will be whether meeting the *intent* of the regulation (i.e., control of emissions) is acceptably equivalent to employing the technology required by the regulation.

There are questions, of course, about exactly how that determination of equivalence would be made. Assuming it could be made, however, it would appear to be the sort of change that would fall into the second category of the MOA discussed under the Wisconsin program, those "approvable without any change in the federal program," though a federal notice approving the change would likely still be required.

Interestingly, observers note that *if* LSI had sufficient air emissions to require a Title V permit, its present practices would likely fall within an exception within Title V. But emissions are below the threshold at which Title V applies.

Also of interest: LSI reports that its "new relationship" with ODEQ , which is already evident, is one of the most beneficial aspects of participating in the pilot program. The new relationship is largely a function of a "single point of contact" with a DEQ staffer who is able to devote enough time to the company to understand its issues and arguments, and who doesn't show up only for inspections.[67]

As the LSI example suggests, the value of a performance-track approach is its treatment of a facility as a whole, as a dynamic enterprise constantly changing its exact relationship to the environment, but willing and able to maintain practices that meet or exceed the public's general requirements as defined in environmental statutes and regulations. EPA's dilemma is that those requirements—the RCRA regulations, in this instance, as well as the underlying statutory requirements that EPA is required by law to implement and enforce—do not fit LSI very well. EPA's insistence on the "enforceability" of permits requires compliance with the letter of the law, not the spirit. The specificity of EPA's regulations is intended to paint bright lines between compliance and non-compliance, eliminating the need for plant managers, permit-writers, or

enforcement officers to make judgments about the effectiveness of the overall system as it applies to an individual facility. Under a performance-track system, it is not clear what activities would—or should—trigger intervention from EPA.

The Wisconsin and Oregon programs start with the implicit assumptions that each facility is unique, and that imposing the most effective and efficient set of environmental conditions on each firm requires judgments on the tradeoffs between established regulatory requirements and new opportunities for environmental gain. The two programs further assume that state employees, in consultation with public stakeholders, are capable of making those judgments on the public's behalf. If Oregon approves the LSI request, it will be because its environmental regulators decide that the facility's controls are at least equivalent to those specified in RCRA. If Wisconsin approves the wastewater/ incinerator proposal, it will be because regulators decide that the facility's net impact on the environment will be reduced. Those decisions are not purely technical; they involve judgments about the relative efficacy of different technologies, the relative hazards posed by different chemicals and exposure pathways, and the relative importance of different types of environmental harm or restoration.

At least since the creation of Project XL, the environmental establishment has fretted about the need for an *objective* definition of "superior environmental performance." The innovative, challenging notion the legislatures in Oregon and Wisconsin embraced in their performance track statutes is that their state agencies *should* exercise their judgment, that permit writers *should*—on a pilot basis, at least—test the limits of transforming their relationships with firms.

It remains to be seen how far EPA will let the two states and participating firms go with their experiments. If the agency responds as it did in the Massachusetts Environmental Results Program, and even in StarTrack, the two pilots will demonstrate very little except that attempting to negotiate a facility-wide permit is time consuming. If, for example, EPA retains the threat of prosecuting LSI for violating the RCRA standards, LSI could be expected to take a more conservative—and less effective—approach to environmental management. Other firms would follow suit. It is harder to predict what would happen if EPA lets the two states exercise their discretion. And that, of course, is the point of conducting pilots.

New Jersey's Facility-Wide Permitting Project

To see what might occur if states continue to develop integrated, multimedia permits, one needs only look at New Jersey's Facility-Wide Permitting Project. Initiated by the state legislature in 1991 as part of the innovative Pollution Prevention Act, the project has engaged 18 companies in the development of facility-wide permits (FWPs).[68] Their experiences suggest that consolidating permits can eliminate some barriers to pollution-prevention, and that significant gains can be assured if facility-wide permits explicitly require firms to reduce emissions.

Pollution prevention—P2—was a relatively new term in 1991 when the New Jersey legislature passed a law requiring all firms in the state reporting toxic release inventory emissions to prepare P2 plans, and to file a brief summary of them with the New Jersey Department of Environmental Protection (DEP). The statute also created the pilot program for facility-wide permits. The permits were to be based on the details of a facility's P2 plan: the descriptions of each manufacturing process, and an accounting of the specific uses and fate of all hazardous materials in those processes. DEP assigned a high-profile group of staff members to work intensively with facility staff on developing those plans and translating them into binding permits. That intensive use of staff produced several remarkable results, according to Helms, *et al.*:

Each of the 12 signed FWPs consolidated between 12 and 100 permits into a single facility-wide permit. Some of the factories had had a separate permit for each of dozens of air-pollution sources or "stacks." The facility-wide permit first aggregated those sources into separate industrial processes within the facility, and then generally set an air-emissions cap on each process. Those caps allow firms to "trade" reductions within their facilities.[69]

Ten of the 12 FWP facilities reported that the biggest benefit for them from the program has been operational flexibility: they no longer need authorization to change their permit prior to installing new equipment or changing their processes, provided the change doesn't increase their "nonproduct output" or exceed their permitted emission levels.[70]

The intensive review that accompanied the FWP assurance improved the regulators' and plant managers' understanding of the plants and their systems. Together with DEP staff, facility managers in virtually every firm discovered at least one air-pollution source that lacked a required permit; one facility had roughly 40 unpermitted sources.[71] The resulting facility-wide permits were thus more accurate simply because the process was more resource-intensive, not because the process was integrated across media.

Firms reduced the emissions from facilities, not necessarily because of the integrated permit, but because of what they learned in the process of developing the permit: "Environmental managers saw their facilities, often for the first time, as a series of connections and materials flows, rather than as a checklist of point sources."[72]

FWP permit writers, working in cross-media teams, discovered and eliminated a cross-media shift of VOCs. In one plant, the existing permits had required the operation of "strippers" to remove VOCs from an air stack. The process left the VOCs dissolved in water, which eventually was discharged to a local treatment plant. There, the wastewater was processed in such a way that most of the VOCs evaporated back into the air anyway. The single-medium permit writers had never followed the process far enough to see that their efforts—and the facility's resources—were being wasted.[73]

One company credits the program with saving the firm's operation in New Jersey. The facility needed to upgrade many of its systems, and the FWP process enabled the company and the DEP to work out the permitting expeditiously. Were it not for that cooperation, the firm might have left the area.[74]

The ebb and flow of the FWP program illustrates some of the classic challenges of innovation. Created by one administration with high hopes and a high profile, the subsequent administration all but wiped out the staffing and special status of the program before it could make good on its promise. The status of the FWP permitting teams aroused the jealousy of other DEP employees, leading to behavior within the department that slowed the FWP and constrained its gains. Some of the participating companies were slow delivering data to DEP, or otherwise lost interest, adding to delays and the overall expense of the project. Everyone within DEP, as well as in the participating companies, discovered that the program was more complex to administer than they had expected: the demands on staff time were much higher; and the environmental benefits specifically attributable to the multimedia aspects of the final permits were much harder to distinguish from improvements resulting from other forces.

None of the permits includes a true multimedia cap (on the total emission of a particular chemical, for example). Rather, the DEP staff essentially "stapled" fairly traditional water and waste permits onto the consolidated air permits.[75] (Helms, *et al.*, note that water-discharge permits have traditionally been aggregated to a single point of discharge for a whole facility, so the content and nature of the water permits did not change under the FWP.) None of the permits extends to resource conservation, habitat restoration, or other environmental problems that regulators in Oregon or Wisconsin might include in their performance-track permits as they negotiate a facility's overall environmental impact. Managers of several of the participating FWP firms said that they believed the integrated permits would be more effective if they included more permits and activities, including water conservation, stormwater management, and spill prevention.[76]

The New Jersey permits are more conservative than those envisioned by Wisconsin and Oregon not only in the scope of environmental impacts they encompass, but also in the degree of flexibility they presume to offer participants. According to Helms, *et al.*, the project's staff concluded that more flexibility would have yielded better results:

> P2 Office staff felt the FWP writers are constrained because they have to follow every existing DEP rule. Allowing exemption from prescriptive permitting rules if the permit could be at least as protective of the environment without following them would provide more leeway for innovation. For example, it would be easier for FWP writers to create facility-wide air caps, change reporting requirements, set realistic permit limits, and develop permits that require P2 commitments if the FWPs did not have to meet the specific requirements of the DEP regulations on those issues.[77]

Because the process was working within the general parameters of traditional regulations, both the state and EPA regard the new permits as equivalent to the old. DEP and EPA worked together smoothly on the project. EPA generally reviewed each of the permits but did not need to provide any of the special approvals it anticipates in Oregon and Wisconsin.[78] During the development of the FWP process, however, EPA developed its Title V program for permitting major sources of air pollution, and the agency has not yet decided whether to accept the FWPs as equivalent to Title V permits.

> The root of this concern is the fact that EPA's implementing regulations for Title V require seven-day advance notice to the state regulatory agency of any change at a facility that does not require permit modification. While seven-day notice is an improvement compared to the six months a permit modification can take, it is not as good for facility managers as the FWP requirement of notifying DEP within 120 days after a change has been made. With the 120-days-after requirement, not only is paperwork cut back, but the facility managers can also try changes and abandon them if they do not work out, without ever notifying the agency. If facilities currently operating under FWPs were required to meet the seven-day advance notice requirement under Title V, they would lose significant operational flexibility.
>
> At this juncture, it is uncertain whether notification will continue to be an issue, because there are changes underway at both EPA and DEP that may address the problem. EPA is currently revising Part 70 (the rule implementing

> Title V), partly based on comments about the difficulty of making changes under the original rule. One of the recommendations being considered is changing the notice requirement from seven days before to 120 days after a change, which the Schering Corporation [one of the New Jersey FWP participants] advocates. Meanwhile, DEP also is considering taking a different approach by including the 120-day notice as part of a "Gold Track" program for companies demonstrating environmental leadership. DEP is attempting to make that program, which is currently under development, a state Project XL project, which could exempt participating facilities from certain EPA regulations, such as the seven-day advance notice requirement. If the FWP facilities enter the "Gold Track," the agency may be able to allow them to continue the 120-day notice practice through the flexibility provided by XL. In that case, EPA's decision about accepting FWPs as Title V equivalent would have less effect on the facilities.[79]

Thus, New Jersey, like Massachusetts, Oregon, and Wisconsin, is contemplating a special arrangement with EPA to allow a degree of flexibility and innovation that, in New Jersey's case, has demonstrated some environmental benefits and few risks.

Helms, *et al.*, conclude that the FWP *process* has been more significant than the facility-wide nature of the permits themselves. The process led regulators and facility managers to discover unpermitted sources and cross-media transfers; the single-point-of contact in DEP improved communication and trust between regulators and facilities; the efforts to link water and waste permits to air permits, however, achieved very little. "This is not to diminish the importance of maintaining a multimedia perspective, but to suggest the best vehicle for achieving multimedia environmental protection may not be a permit."[80]

As implemented in New Jersey, facility-wide permitting turned out to have very high transaction costs. Some of those were associated with start-up; some relate to the problem of fitting an innovative permit into the existing regulatory framework; and some are the result of the intensive relationship that developed between DEP and company staff. Once in place, the transaction costs for facilities changing their processes dropped dramatically, however, as they were able to avoid lengthy permit reviews. Among its lessons for transforming regulation, the New Jersey pilot program demonstrates the value of process-level emissions caps, an idea essential to the development of emission-trading systems.

The Proliferation of "Caps"

One of the common features of many of the innovative approaches described in this chapter is an emissions "cap." Generally, a regulatory agency sets a limit for one or more pollutants, above which a firm may not emit. In most cases, regulators then allow the firm to determine how best to stay under the cap, allowing it to make process changes without the traditional pre-approval through the permitting process. The degree of flexibility varies, as do associated reporting requirements.

EPA has been experimenting with flexible, facility-wide caps and permits through Project XL, and through so-called "P4" permits (Pollution Prevention in Permitting Project). Helms and her colleagues examined several of those experiments, EPA's January 1997 XL agreement with Merck Pharmaceuticals plant in Stonewall, Virginia, among them. The agreement set permanent facility-level caps on several air pollutants, and requires increasingly detailed and

frequent environmental reports as emissions approach those caps. As long as emissions are low, reporting requirements are minimal. In exchange, Merck spent $10 million to convert its boiler at the facility from coal to natural gas, achieving a 94 percent reduction in SO_2 emissions, an 87 percent reduction in NO_x emissions, and a 65 percent decrease in hazardous air pollutant emissions, compared to baseline levels. The researchers describe how the cap corrects one of the fundamental flaws of the traditional permitting system:

In addition to providing direct incentives to P2, the Merck XL permit also removes perverse incentives that discouraged the facility from pursuing the best possible environmental practices. For example, a significant disincentive for P2, as articulated by Merck, by the FWP companies, and by other companies in a variety of circumstances, is that facility managers must go through the tedious permit application process even if a new piece of equipment lowers emissions. One of the reasons Merck had not previously converted its boilers to gas was that the company would have had to obtain permits for the new boilers, while the old boilers remained grandfathered out of the permit requirement.

Similarly, an EPA representative pointed out that prior to the XL project, Merck would ship a product back and forth from one state to another to avoid having to get a new permit at any one site, thus "gaming the system" to avoid the permitting process (which could take up to a year), and potentially damaging the environment with unpermitted releases. The people who provided both these examples pointed out that such behavior is not Merck-specific but typical of regulated companies.

A third systemic disincentive is that most companies usually choose a new piece of equipment that emits right at their permitted limit in order to avoid having EPA lower the emissions limit based on the new piece of equipment. However, the features in Merck's permit—a set cap and a tiered reporting system—changed that perverse incentive into a beneficial one. Because Merck had an incentive to keep emissions as low as possible, and because of the assurance that EPA would not lower the emissions cap, Merck managers specifically asked the procurement staff to buy the lowest-emitting gas boilers possible with reasonable reliability. The presence of such perverse incentives is a clear call for change in the current permitting system.[81]

As noted above, Intel has been instrumental in developing facility-level caps, using the P4 process in Oregon and Project XL in Chandler, Arizona, to negotiate agreements with regulators. Although the former involved a major source of air pollutants and the latter a minor source (and thus not subject to the federal Title V requirements), the Chandler negotiations caught the attention of national environmental groups and became a symbolic battleground. Environmentalists argued that the cap on hazardous air pollutants was too loose because it would allow Intel to substitute more-toxic substances for less-toxic ones. A community advisory group and the regulators involved felt that the cap provided sufficient levels of safety and transparency, even if the relative toxicity of the emissions should change over time. Intel agreed to publish on the web quarterly reports of the Chandler facility's environmental performance: notably, the reports on hazardous air pollution emissions are estimates based on measurements of the raw materials used in each process, not the product of continuous emissions monitors.[82]

In the last three years, Intel has replicated that agreement in four other states: Massachusetts, Texas, New Mexico, and Oregon (where the Aloha site has reduced its air emissions to the point where it is now officially a minor source). In early 2000, Intel was negotiating a sixth such permit with Colorado's environmental agency. All of the permits rely on mass-balance estimates of emissions; all require Intel to publish more information about actual emissions and environmental performance than most statutes require; none of the permits subsequent to Chandler has invoked Project XL or required much federal involvement.[83]

The proliferation of emissions caps represents a fundamental change in how regulatory agencies relate to pollution sources. Caps invite businesses to apply the same kind of ingenuity to environmental protection as they do to the rest of their business, provided they are in fact free to innovate and are not limited by the constraints of typical BACT and MACT requirements. The result is likely to be a more efficient approach to environmental protection.

Findings

The innovations described in this chapter have the power to transform the relationship between businesses and environmental regulators in the United States—a necessity if the nation is to achieve its environmental goals at the lowest possible cost.

EPA has been both a force for innovation and a counter-force: a financier and promoter of numerous pilot projects and an enforcer preventing those pilots from getting off the ground. That internal contradiction should come as no surprise: EPA has never been a monolith. Rather it is a collection of regions, programs, offices, and individuals loosely bound by shared goals, leaving ample room for entrepreneurs in one corner of the organization to promote ideas that good soldiers in other parts of the organization feel compelled to frustrate. So it is with record-retention rules in Massachusetts, Title V permits in New Jersey, and permits and performance "contracts" in Wisconsin. Subsequent chapters will demonstrate that EPA is both promoting market-based pollution-trading systems, and making them unmarketable.

The states, as a group, are prone to the same contradictions. This chapter has featured initiatives championed by states with strong commitments to environmental protection. But EPA officials say they also have to deal with state initiatives that would undermine environmental protection, or even reverse environmental progress. Because the Academy panel chose to evaluate only those federal, state, or local initiatives that appear to be *improvements* in environmental management, this report includes no case studies praising EPA for *preventing* a state or firm from implementing a destructive new idea.

Among the most interesting innovations in this chapter are those that enable or encourage firms to go beyond compliance. The pilot projects—and their critics—illuminate several common misunderstandings of corporate behavior. The first misconception is that manufacturers have already made all the environmental gains they reasonably can. Another is that that pollution prevention is always a "win-win" proposition: that reducing emissions and waste is always profitable and desirable from a firm's point of view.

In fact, within today's regulatory system, responsible firms acting responsibly may not find it in their economic interest to reduce waste—because the returns on investment may not match other returns available to the companies. Consider the case of collaboration between officials at the Dow Chemical Company and the National Resources Defense Council to identify and implement pollution-prevention strategies at Dow's plant in Midland, Michigan. Teams of engineers and scientists succeeded in that goal: they found P2 strategies to reduce nearly seven million pounds of emissions and wastes per year at an annual savings of some five million dollars. The actions required no new permitting systems or special regulatory flexibility. But the Dow employees were initially very reluctant to tinker with some of the plant's manufacturing systems, afraid of causing far worse problems than they might solve. The effort succeeded only because the NRDC and local activists pushed Dow hard to achieve the targeted results. The financial returns on the P2 investments would have been too low to attract company capital but for the firm's commitment to NRDC to follow through with implementation.[84]

Another misconception is that all firms oppose regulation, and would prefer deregulation.

That belief leads to the cynical view that companies engaged in pilot projects such as XL or the performance-track systems must be trying to *avoid* doing something that would benefit the environment. Some firms have behaved that way, of course, but more often, firms trying to use innovative approaches to achieve positive results have been unfairly criticized, as were Intel and some of the other Project XL pioneers.

Even the reasonable assumption that government agencies can provide economic incentives to coax otherwise reluctant businesses to make improvements beyond mere compliance can lead to murky thinking. Regulators like to believe that they are leading the companies forward, while in some cases, companies are leading the regulators—as well as their competitors—toward greener practices. Indeed, Forest Reinhardt says that a firm's strategic use of government regulation may raise the bar for competitors. Some firm activities:

> . . . make it easier for government regulators to adopt policies that benefit the firm that initiated the changes. By demonstrating the feasibility of a particular technology, for example, firms can sometimes induce regulators to require it of competitors, who are unlikely to be able to match the cost of the first mover . . . The technology in question could be a tangible mechanism for reducing pollution, like a device that removes sulfur dioxide from the gas leaving a boiler. The same logic would apply, however, if the technology were less tangible than machinery or equipment; it might for example, be a practice of information disclosure, or a process for public participation in resource allocation decisions . . . What raises the costs for followers is not a technical limitation but the cost of changing established ways of doing business . . . What matters is that the technology is less expensive for the original firm than for its competitors, and that it fosters meaningful pressure for industry-wide adoption.[85]

One of the negative consequences of EPA's conservative approach to innovation is that it reduces the opportunities for competition among firms to drive business sectors toward more environmentally protective practices. Regulators and policymakers should guard against that error, just as they must guard against lowering the environmental bar. Recognizing the diversity of interests among regulated entities is a first step toward better regulation, and a prerequisite for effective negotiation of beyond-compliance agreements.

In the chapters that follow, this report illustrates how some of the innovations described above can fit into a larger transformation of the nation's environmental protection program. Facility-level caps, for example, may become a foundation for regional NO_x-reduction trading systems that could help improve urban air quality. Some combination of caps, self-certifications and third-party certifications could make possible a cost-effective strategy to reduce nutrients and other nonpoint sources of pollution in surface waters. The complex facility-level planning and goal-setting that drives state performance-track initiatives and ISO 14001 may gradually merge with place-based watershed management efforts to foster more sensitive land-use decisions and more coherent civic action to protect resources that are beyond the scope of EPA regulations.

Finding 1: Many individuals within EPA have struggled over the years to innovate, to improve the efficiency and effectiveness of core EPA programs and those delegated to the states. The studies completed for this report illustrate numerous cases where those efforts have

been stifled by EPA's conservative interpretation of its mandate. In addition, specific statutory requirements sharply limit EPA's authority to experiment with some new approaches. EPA has invested so much effort in establishing and protecting the legal precedents for regulations that it is now unable or unwilling to authorize significant experiments with alternative approaches. That the innovations the Academy studied could not produce significant environmental gains, is due in large part to those federal constraints.

Finding 2: EPA's commitment to compliance assurance—to systems in which requirements can be precisely defined and in which violations can be clearly detected and prosecuted—has succeeded in establishing "compliance" as the norm. But because so many of the causes of environmental harm are outside EPA's regulatory authority, even universal compliance with existing standards will not deliver the environmental improvements Americans profess to want. Neither can the rigid compliance model, with its emphasis on the uniform application of technology standards, achieve most environmental goals at the lowest possible costs.

Finding 3: At the heart of many innovations designed to improve both the effectiveness and efficiency of regulatory systems is a degree of flexibility not present in many regulations today. Such flexibility allows individual firms to find their own best ways to meet an environmental requirement, and thus encourages technological innovation and experimentation. There is inescapable tension between providing flexibility to firms and preserving tight accountability over firms. Flexible approaches, including the performance-track systems described above, may appear—or actually prove to be—less certain to produce their desired results than the status quo approach. The New Jersey facility-wide permitting project demonstrated, however, that even the most prescriptive aspects of the current regulatory system can be counterproductive, misunderstood, or ignored, even by "good" firms. Regulators must insist on accountability and enforceability in all programs, because both are essential to continued environmental progress. Regulators and policymakers must also recognize, however, that no system is perfect, and that the gains from flexibility may outweigh the risks of less control.

Finding 4: In the past few years, EPA and the states have made concerted efforts to involve the public and so-called stakeholders more fully in environmental decisionmaking. Those efforts have been motivated by several goals, each of them laudable: to ensure that decisions reflect public values; to build public understanding of environmental challenges and management options; to attain public "buy-in" on otherwise controversial decisions; and to mobilize public support for actions not strictly part of the regulatory process. Administering some of the more flexible approaches to environmental management will require regulators to make more complex judgments, and regulators will increasingly turn to stakeholder groups for guidance. There is the danger, of course, that regulators will abrogate their authority to make decisions, yielding that responsibility to volunteer members of advisory committees. Programs that rely heavily on such volunteers are probably unsustainable—and may actually diffuse regulatory accountability.

Finding 5: The Massachusetts Environmental Results Program extended the reach of state regulatory programs into the domain of small business. The program encouraged small firms to create appropriate environmental management systems by linking carefully framed technical assistance with the threat of enforcement. ERP is an effective model for dealing with smaller firms subject to state permits. The experiment is silent, however, on the potential utility

of the approach for managing problems permitted by EPA-delegated programs. EPA's inability or unwillingness to sign off on the state's request for shorter record-retention requirements for dry cleaners underscores the tenacity with which EPA clings to the enforcement model, even when engaged in a formal Project XL agreement.

Finding 6: The emergence of ISO 14001 and other voluntary, private efforts by firms to identify and manage their environmental responsibilities is likely to raise the level of compliance and create some opportunities for pollution prevention. A well-designed EMS should provide the same kinds of insights into a firm's operation as the New Jersey materials accounting reports. Although third-party certification to ISO 14001 is not a guarantee of a firm's compliance, state and federal regulators are justified in presuming that certified firms are less likely to pose compliance problems than uncertified firms, and thus less desirable as targets for inspection. That conclusion could change if the integrity of the third-party registration process were to be compromised.

Finding 7: EPA Region 1's "StarTrack" program added a degree of public accountability to ISO 14001 by requiring participating firms to publish environmental reports, and by opening the audit process to some external observation. It is not clear that those requirements strengthened the environmental performance of the participants, however. Indeed, StarTrack does not appear to provide sufficient incentives to firms to change their environmental performance. In order to make its new performance-track program work, EPA will need to extend more flexibility to high-performing companies.

Finding 8: State efforts to create performance-track regulatory programs will demonstrate the potential value of rewarding higher-performing firms with greater permit flexibility, such as facility-level or process-level emissions caps, faster service, or fewer inspections, but only to the extent that EPA allows such experiments. If EPA permits states such as Wisconsin and Oregon as little flexibility in changing their regulatory programs as it did the ERP program in Massachusetts, the experiments are not likely to demonstrate much of value. Absent a clear signal from EPA that it will let the two states experiment with bold—and risky—new arrangements with firms, the pilots will have little to test.

Finding 9: Process-level and facility-level emissions caps work; and, if set at appropriate levels, they offer a desirable alternative to stack-by-stack regulation, especially if the caps permit process changes without prior approval or lengthy permitting processes. Caps encourage firms to find their own best ways to control emissions, and thus may remove disincentives to pollution prevention or provide opportunities for firms to "raise the bar" for their competitors. Used in conjunction with other performance-track tools (e.g. enhanced public accountability, third-party certification of EMSs, the incorporation of unregulated environmental aspects), caps may be a regulator's most valuable negotiating chip: a reward regulators can offer in exchange for beyond-compliance performance.

Finding 10: Today's proliferation of facility-level emissions caps lays the groundwork for building cap-and-trade regulatory systems in the near future. Instead of negotiating customized caps with individual firms, regulators will be able to apply a performance-enhancing cap on a whole group of facilities and let those firms determine—through the market—how best to achieve the net emissions reductions. Today's facility-wide and process-level caps generally

rely on emissions estimation techniques rather than on the more precise continuous-emissions monitors available for only a few chemicals. The enforceability of those caps demonstrates that trading systems do not need to be based on continuous-emissions monitors.

Recommendations

1. Transform regulation.

The next EPA administrator should pursue innovations that hold promise for solving particular environmental problems, such as nonpoint pollution, and for increasing the overall efficiency and effectiveness of the regulatory process. The administrator should make it EPA's explicit policy to find the least costly ways to meet environmental goals.

a. The administrator should make full use of her or his discretionary authority to promote innovation within the agency, to reduce internal institutional barriers to innovative approaches, and to encourage the states and private businesses to lead the way.

b. The administrator should make it clear to the agency, states, regulated entities, and the general public that he or she is willing to take risks to develop better systems. EPA should end its practice of permitting only those experiments that pose no possibility of increasing some pollution or decreasing some measure of enforceability.

c. Congress should authorize EPA and the states to take bold new steps to transform regulation, providing the administrator with the discretion to authorize site-specific performance agreements and a wide range of new approaches to environmental protection, provided the approaches remain reasonably transparent to the public, verifiable, and facilitate accountability.

2. Use the "new tools."

Recent pilot projects have demonstrated the value of several new approaches to environmental management. EPA and the states should build many of those approaches into their programs. Specifically:

a. States should adopt and adapt the Massachusetts Environmental Results Program to their own small-business problems. Wherever possible, EPA and the states should standardize the compliance-assistance/ facility-level requirements to reduce the cost of program design, and to speed the rapid introduction of the self-certification approach. EPA should signal its support for the program by yielding on the record-retention issue.

b. EPA and the states should regard ISO 14001-certification as an indicator of a firm's commitment to improved environmental performance and, all else being equal, target enforcement resources at firms that have not certified.

c. EPA and the states should expand their use of facility-wide emission caps, enabling firms to make rapid process changes without pre-approval, provided their net emissions stay below a fixed cap.

d. EPA and the states should continue to exploit the capacity of new monitoring and information technologies to strengthen or replace traditional accountability systems.

3: Make the "performance-track" work.

EPA and the states should collaborate on creating a system that will encourage firms to keep raising the bar on environmental performance.

a. EPA should give Oregon and Wisconsin the greatest possible freedom to implement their green permits and cooperative environmental agreement pilots. In addition to clarifying the extent of the states' inherent flexibility to implement the programs, EPA should ask Congress for authorization to protect firms that volunteer to experiment with new approaches to environmental management.

b. EPA and several states should make it clear that participants in performance-track systems should be eligible for facility-level emissions caps requiring no prior notification of process changes, including under Title V air permits.

c. EPA and several states should allow firms to use means other than BACT or MACT to achieve their emissions caps or overall environmental performance goals.

d. EPA and the states should develop front-line permit writers with the capacity to make and explain judgments about facility-level environmental management strategies.

CHAPTER 3

Using the Market

Among the most important public-sector innovations in environmental management in the United States today are those that apply market forces to environmental protection. They are significant for two reasons:

They are reducing the cost of improving air and water quality in many parts of the country: the less expensive it is to protect the environment, the better off society will be.

They are demonstrating the effectiveness of the most plausible tools the nation might apply to outstanding environmental problems such as nonpoint runoff of nutrients into surface water and the emission of greenhouse gases.

This chapter explains how EPA, some states, and some other federal programs are successfully using market forces to extend the reach or increase the efficiency of their regulatory programs. It focuses on the potential and the limitations of market tools to address two of the nation's most serious and intractable environmental problems: nutrients in surface waters; and urban smog, the combination of ground-level ozone and fine particles. The chapter draws on new analysis of trading systems designed to reduce nutrients in surface waters, as well as various pollutants in air.

The Academy panel commissioned two research teams to analyze the results of several ongoing trading systems.[86] Michael Hix, Eric Ruder, and David Sugarman, of Environmental Economics, Inc., evaluated so-called "offset" and "open-market" trading systems in four of the 12 states that have adopted such programs to control VOCs:

offset programs in Louisiana, New York, and Texas

open-market programs in Texas and Michigan

Robert Kerr and Steve Anderson, of Kerr, Greiner, Anderson and April, and John Jaksch, of Batelle, analyzed three programs to attack smog precursors:

New Jersey's offset program for VOCs

New Jersey's open-market program for VOCs

Southern California's RECLAIM program, a cap-and-trade system to control emissions of sulfur oxides (SO_x) and nitrogen oxides (NO_x)

They also studied two other cap-and-trade systems, both of which were designed to reduce effluents in surface waters:

the San Joaquin River (California) Grasslands trading system for selenium, a contaminant associated with irrigation in the west

the Tar-Pamlico River (North Carolina) trading system for phosphorus

In addition, they examined an open-market trading system related to water quality:

Michigan's draft statewide program for nutrient trading, and its parent, the Kalamazoo River pilot project

Finally, they considered three other cases sometimes described as "trades": one involving wetland mitigation banking, and two involving "trades" between point and nonpoint sources of nutrients in surface waters:

Ohio's experience with wetlands mitigation banks

the Rahr Malting permit in Minnesota

a trade involving an office building and private septic systems discharging into the Sudbury River in Wayland, Massachusetts

Together, those case studies and the work of other scholars offer valuable insights into the relative effectiveness of various models for trading pollution credits or allowances—cap-and-trade, offsets, and open markets—in both air and water.

(The project did not commission research into a wide array of other policy tools that may be described as market mechanisms: pollution taxes or fees, for example, or deposit-refund systems, labeling requirements, or requirements for the public reporting of emissions. Those tools help internalize the costs of environmental harm in a firm's products or services, or they enhance the capacity of consumers to choose among products on the basis of their environmental impact. There is a rich literature describing the effectiveness of those tools, hence this study's focus elsewhere.)

Among the trading approaches the Academy examined, the one offering the greatest potential in both air and water is the cap-and-trade system. EPA has applied the tool with considerable success to phase lead out of gasoline and to reduce SO_2 emissions, one of the precursors of acid rain.[87] EPA, the states, and Congress are poised to expand trading programs to airsheds, and to implement some fairly large-scale pilots in river systems and estuaries. Those pilots should demonstrate that in many situations, trading systems can deliver relatively certain and equitable results.

Allowance trading remains extremely controversial, however, and it is possible that EPA, Congress, and the states will decide that the political challenges of implementing trading systems outweigh their potential economic and environmental benefits. EPA appears ambivalent on the issue: endorsing the concept of trading in various policy statements, while simulta-

neously developing rules that would make illegal some of the trading systems that are already achieving environmental and social goals.

Cap-and-Trade Systems

Cap-and-trade systems similar to the familiar SO_2-trading system Congress created in 1990[88] could be used to reduce nutrient loads in watersheds or NO_x and VOCs in airsheds. Experience with effluent trading in water and ozone precursors in air demonstrate the potential for cap-and-trade systems to achieve specified social goals for the environment at a relatively low cost.

The essential rationale for creating trading systems to reduce pollution is that one size does not fit all. Firms—and farms, for that matter—vary in size, location, age, technical sophistication, production processes, and attitude. Those differences make it relatively less expensive for some operations to reduce their environmental impacts, and relatively more expensive for others. Trading systems exploit the variances by allowing firms that can reduce their impacts cheaply to generate "emission reduction credits" which they can sell to firms at the other end of the cost spectrum. The high-cost firms buy the credits because it is cheaper than reducing their impacts directly. In short, some firms pay others to meet their environmental responsibilities for them. Their transactions reduce the total amount of pollution released by the participating firms at lower overall costs than would have been possible if regulators had simply asked each firm to install the same piece of control technology or reduce emissions by the same amount.

None of the trading systems described in this report works in a "free market"; rather, they all start with government intervention in the market to achieve a broader social goal. The most important key to make a cap-and-trade system work is, of course, the cap itself. A legislature or regulatory agency must impose a pollution-reducing cap on participants, a regulatory driver that creates incentives among participants to reduce their emissions and generate emissions credits to trade. In 1990, for example, Congress required coal-burning utilities to reduce their aggregate emissions of SO_2 by 10 million tons. Another important element is the government decision as to which dischargers fall under the cap; that is, the designers must "close" the system. And finally, program designers must decide how to make the initial allocation of pollution credits among the participants, so that each firm knows its baseline, and can thus buy or sell credits in relation to it.

Numerous technical and policy challenges complicate the task of establishing a robust cap-and-trade system, just as they complicate the task of establishing any effective regulatory regime. For example, trading systems need reliable tools to verify that firms are actually generating the credits they attempt to sell, and selling them to only one user. The systems need to ensure that no user buys so many credits that its emissions then create unacceptably poor local conditions—a "hot spot" that might pose excessive health risks or environmental damage. And the system needs to keep transaction costs low enough to avoid discouraging trades. The pilot projects analyzed by the Academy's researchers illustrated how some systems have overcome—or been overcome by—those challenges. (Readers interested in a full treatment of the technical issues should see the two research reports and their case studies published with this volume.)

Reducing Water Pollution Through Allowance Trading

It has become apparent that the United States will be able to end the eutrophication of lakes and estuaries only if it reduces the amount of nutrients pouring into surface waters from agri-

cultural operations: both fields and feedlots. Those operations have not been effectively regulated, and trading systems offer one approach to bring agriculture into the environmental era with the least amount of government intrusion and expense.

Excess nutrients flowing into surface water are a huge problem in the United States. Nitrogen and phosphorus promote the growth of algae in rivers, lakes, and estuaries. Waters become turbid, warmer, and less pleasant for swimming or recreation. When the algae die they decompose in the water, but that process consumes dissolved oxygen. Fish and other aquatic organisms suffer and the ecosystem is disrupted. For example, nutrients pouring into the Gulf of Mexico from the Mississippi River have created a vast "dead zone" in what had been a highly productive fishery. Nutrients may also promote the growth of harmful organisms, such as *pfisteria*, which created environmental and economic havoc in the Mid-Atlantic states in 1998.

Paul Faeth, director of the economics program at the World Resources Institute, has published a study that demonstrates how a trading system could work to reduce nutrient loadings in several areas of the upper Midwest.[89] The key requirements of a trading system are present: an identifiable set of actors responsible for nutrient discharges (both point sources and nonpoint sources); reasonably effective techniques to define and verify the generation of credits (including those generated by nonpoint sources); and enormous variations in the price per ton that different actors would have to pay to reduce their contributions of nutrients.

Because nonpoint sources of nutrients have done so little to control their contributions, they can now make enormous gains relatively cheaply. Faeth cites a 1998 study that concluded that 82 percent of total nitrogen discharges and 84 percent of total phosphorus discharges into American waterways are from nonpoint sources.[90] Another study estimated that effective trading among point- and nonpoint sources of nutrients could be arranged within 900 watersheds in the United States.[91] Most impressively, a 1994 EPA study estimated that nutrient trading could reduce the costs of implementing President Clinton's proposed Clean Water Initiative by $658 million to $7.5 billion on total incremental costs estimated to range from $5 billion to $9.6 billion. Most of those savings (75 to 92 percent) would be derived from trading among point and nonpoint sources.[92]

Faeth developed detailed analyses of the sources of nutrients in three areas: the Minnesota River Valley; the Saginaw Bay watershed in Michigan; and the Rock River watershed in Wisconsin. He considered not only point-source discharges but also nonpoint waterborne and wind-borne nutrients from fields under different types of tillage systems. Faeth estimated that 51 to 69 percent of the phosphorous in the three water bodies was coming from agriculture.[93] He then estimated the costs of four approaches to reduce nutrients in those rivers:

imposing tighter performance standards on the point sources

providing farmers with conventional subsidies to adopt "best management practices" (BMPs) to promote conservation

imposing performance standards on the point sources, but allowing them to trade with nonpoint sources (the point source would pay the nonpoint sources to make most of the reductions, and, in his example, the point sources would need to buy three "estimated" pounds of phosphorus reduction for each pound they avoided reducing on-site)

imposing 50 percent of the net reduction on the point sources and 50 percent on farmers. To achieve the former, the point sources would be allowed to trade with one another and with nonpoint sources; to achieve the latter, public funds would subsidize

farmers to implement conservation measures. Unlike traditional BMP programs, however, the programs would be performance-based, and targeted at achieving the highest reductions possible per dollar.

The fourth option appears to be the most cost-effective way to reduce nutrients in each of the three areas. In the Minnesota River case, Faeth estimates that the price per pound of phosphorus removed would be $19.57 for the traditional regulations; $16.29 for the traditional BMP subsidies; $6.84 for point/ nonpoint trading; and only $4.36 for a program combining trading and targeted subsides.[94]

Faeth's estimates are the results of a sophisticated modeling exercise based on real conditions in three real places. For the time being, however, they are still just estimates. Faith and the World Resources Institute are working closely with the Great Lakes Trading Network, a consortium of states in the upper Midwest committed to implementing trading programs to reduce environmental problems.[95] Actual effluent trading systems are operating at several places in the United States, however, validating the assumptions economists make in their discussions of trading. Experience illustrates not only what works, but also what does not.

The state of North Carolina has almost a decade of experience with a nutrient allowance cap-and-trade system. The Tar-Pamlico River drains some 5,440 square miles and suffers from excess nutrients. Computer modeling in the early 1990s estimated that 92 percent of the nitrogen in the river was coming from nonpoint sources, and most of the rest from 12 municipal sewage treatment facilities and one industrial plant. In 1990, the state's Department of Environment and Natural Resources signed a permit with those point sources, directing them *as a group* to reduce their total nitrogen discharges by 12 percent below their 1991 actual levels. The facilities could work out the details of how to achieve that result in any way they wished. If they failed to keep their aggregate emissions below the cap, the association of point sources would have to pay a fee based on the magnitude of their exceedence, essentially a pollution tax of $56 per kilogram of nitrogen per year. The state would then use those payments to pay the agricultural sources of nonpoint pollution to install BMPs: a system similar to the one proposed by Faeth for rivers in the Midwest.

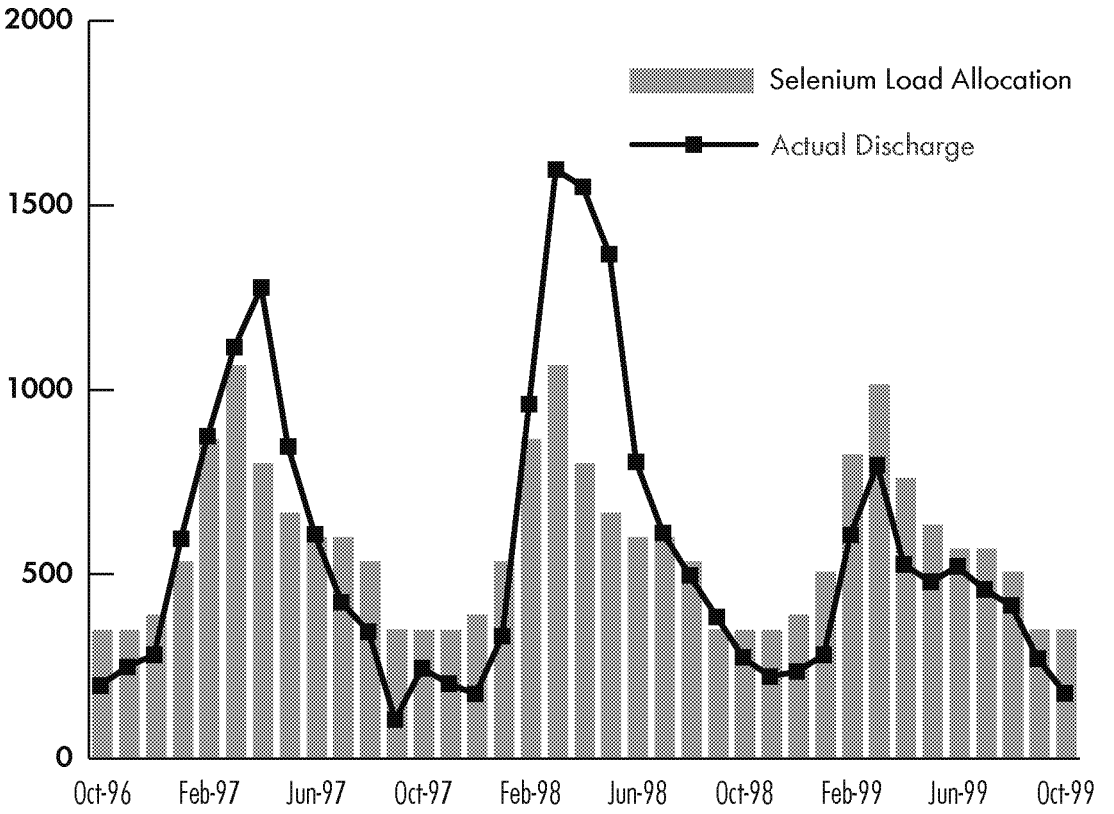
The terms of the Tar-Pamlico agreement have changed somewhat over the past 10 years, but it is still in place. The point sources have stayed under their cap throughout the period, despite a 35-percent increase in flow. Observers believe that the flexibility in the group permit enabled the participating plants to improve their technology when it was most opportune for each plant, thus saving their customers money.[96] The drafters of the agreement did not expect the point sources to achieve 100 percent compliance, and thus avoid paying fees to finance BMPs. The lack of progress in reducing nonpoint nutrient loadings in the Tar-Pamlico has made some observers question the effectiveness of the overall approach, however. Those who expected the system to lead to trades between the point sources and farmers—and thus compensate for a lack of regulatory controls over farm runoff—have been disappointed and critical of the system.[97] Of course, if the state had set the point sources' group-cap low enough, the members would eventually have found it more economical to pay farmers to reduce their nutrient loads rather than install ever-more expensive nutrient-removal technologies.

It bears repeating that North Carolina was able to develop and implement its innovative nutrient-reduction program because the federal NPDES program, which requires all major dischargers of conventional water pollutants to comply with permit requirements, does not impose technology-based limits on nitrogen or phosphorus.[98]

In California's Central Valley, a group of farmers has joined with several regulatory authorities to address the problem of selenium in surface waters. Irrigation has leached selenium from soil and lead to concentrations in surface waters that harm migratory birds and other wildlife. The Grasslands Bypass Project, a cap-and-trade-system proposed by Environmental Defense in 1994, aims to reduce the amount of selenium reaching the San Joaquin River by 15 percent over five years. The California Regional Water Quality Control Board and a host of other local, state, and federal agencies, set a selenium limit in an irrigation system that reaches some 100,000 acres. The farmers in the region have organized into seven districts, which can buy and sell selenium allowances as needed to meet their own needs. If the districts exceed their allowances, they have to pay fees; if all the districts exceed their allowances by more than 20 percent, the regulatory authority will close their access to the irrigation system entirely.[99]

Since the inception of the trading system, districts have made four trades: two exchanges of load allocations for specific months, and two exchanges of load allocations for the duration of the project. Eight or nine new trades were being negotiated during the preparation of this report.[100] Participants generally view the system as a success; transaction costs are relatively low—certainly lower than if regulators had attempted to permit each individual discharge—and selenium loads are dropping. (See Figure 3-1.) One reason the system is effective is its state-

FIGURE 3-1: SUMMARY OF SELENIUM DISCHARGES



of-the-art monitoring network, including a remote site that automatically collects and analyzes water samples every six hours, and relays information about water quality and flow rates by phone to administrative offices.[101]

Generally, in market-based systems, larger is better. The more potential buyers and sellers, the more efficient the market will be at delivering products or services at the lowest possible price. With only seven and 13 market participants, respectively, the Grasslands Bypass Project and the Tar-Pamlico Association are probably as small as systems can be and still offer much value.

Reducing Air Pollution Through Allowance Trading

The Southern California airshed provides a vastly more complex and dynamic market, and suffers from a different problem: smog, the combination of ground-level ozone and fine particles. Ozone impairs breathing and forces the elderly and the very young indoors in many parts of the country. Fine particles, including sulfates, cause even more serious health effects.

The Regional Clean Air Incentives Market (RECLAIM) for sulfur- and nitrogen-oxide emissions (SO_x and NO_x) includes all of the major stationary sources of air pollution in the Los Angeles area. The South Coast Air Quality Management District (SCAQMD) has managed the market since 1994, setting a declining cap on allowances for SO_x and NO_x, and then allocating "RECLAIM trading credits" among major sources. Those sources must still install BACT and MACT technologies, but they also may buy or sell credits to meet their specific emissions targets.[102] Although facilities operating at the creation of the market got their allowances free—a property right bestowed by the public to private enterprises—new facilities have to buy credits from operating sources to cover their SO_x and NO_x emissions. Brokers and a computer-based listing of credits for sale facilitate trades.

Table 3-1 summarizes the volume and value of trades in the RECLAIM system from 1995 through 1997.

TABLE 3-1: SUMMARY OF RECLAIM TRADING, 1994-1997

POLLUTANT	NUMBER OF TRADES	TONS TRADED	$ VALUE OF TRADES
SO_x	64	15,085	$20,008,000
NO_x	549	54,665	$59,422,000

Source: SCAQMD, *Annual RECLAIM Audit Report for the 1997 Compliance Year*, SCAQMD, *RECLAIM Program Three-Year Audit and Progress Report*, 1998.

The numbers in the table understate the magnitude of trades by showing only those that happened between facilities. Each facility also has the option, under RECLAIM, of trading among individual pollution sources within that facility, provided the facility stays below its total allocation, its facility-level cap, but the table does not show those trades. And it is that flexibility that firms participating in the New Jersey Facility-Wide Permitting Program found so valuable. Through 1997, the RECLAIM program produced net reductions of almost 14 percent for SO_x emissions and 10.6 percent for NO_x emissions. The declining cap should force substantially more reductions over the next three years. And the trading system should help regional

businesses find and implement the least-costly ways to achieve those air-quality goals.

The South Coast Air Quality Management District originally intended to include VOCs in the RECLAIM trading program. By 1995, however, regulators dropped the idea because of political and technical problems. VOCs are harder to monitor than SO_x and NO_x emissions (which, in RECLAIM, are monitored continuously by reliable stack instruments). VOCs are also more diverse: there are hundreds of different chemicals, each with its own properties. Some VOCs are highly toxic to humans and other organisms, raising equity concerns about trading's potential to concentrate emissions—and possibly human exposure and health risk—in localized hot spots. (Even the geographic distribution of SO_x and NO_x trades poses some equity issues. Thus RECLAIM has two distinct trading zones: a coastal zone and an inland zone. Trading rules attempt to ensure that air in the downwind inland zone does not deteriorate because of activity along the coast.[103])

The success of RECLAIM's programs suggests that statewide or regional cap-and-trade systems could be an effective way for states in the eastern United States to meet the NO_x reductions EPA ordered in 1998, under its responsibility to prevent cross-state pollution.[104] That order, the "NO_x SIP call,"[105] required 22 states and the District of Columbia to reduce emissions of nitrogen oxides by fixed amounts by 2003 and 2007. EPA set the reduction quotas at levels intended to help reduce the long-range transport of NO_x and ground-level ozone, which is partially responsible for dangerously high levels of ozone in the eastern United States. Midwestern and Southern states, which generate much of that ozone, had resisted imposing additional NO_x controls on their businesses. Although EPA was using authority granted it by the Clean Air Act, several midwestern states sued the agency in an attempt to block the action, which held up implementation until June 2000, when EPA prevailed in court.[106] Now that the regulations must be implemented, many states are considering using cap-and-trade systems to achieve the specified reductions as efficiently as possible.

The existing system of NO_x controls generally requires specific types of large emitters—power plants, industrial boilers, and cement kilns—to meet specific rate-based standards (measured as units of nitrogen oxides per-million units of exhaust volume). The evolution of those specific standards has resulted in a system that fails to achieve effective and efficient NO_x reduction. Byron Swift, of the Environmental Law Institute, identifies some of the problems with today's regulations:

> A major problem with rate standards under the Clean Air Act is that they differentiate between old and new plants, creating a significant bias towards old sources that only need to meet a relatively weak standard, while new sources face a very stringent one. Thus, older largely coal-fired plants emit NO_x at levels of 100-630 parts per million (ppm) of exhaust volume, even though some could reduce NO_x at prices as low as $300 a ton. However, the stringent New Source Review (NSR) standards applied to new and cleaner gas-fired plants require them to reduce their already low NO_x emissions to 9 ppm, or in some states 3 ppm, requiring investments that cost from $2,500 to $20,000 per ton of NO_x reduction. These new source standards are so stringent that they impose significant costs on new sources, and discourage investment in clean technologies.[107]

A cap-and-trade system for NO_x reductions would create incentives to invest in the least-costly reduction strategies first (adding controls to coal-burning plants) while eliminating some of the disincentives for installing gas-fired turbines and industrial cogenerating facilities to the

grid. Allowance trading would also tend to favor reductions in mercury and SO_2 from coal-burning plants and carbon monoxide from gas-fired plants.[108]

Eight states in the Northeast, all members of a broader Ozone Transport Commission, have adopted compatible rules establishing the "NO_x Budget Program," an allowance trading system that went into operation in 1999.[109]

> In 1999, these states instituted a stringent emissions cap and allowance trading system requiring 912 units to reduce emissions by 55 to 65 percent from the 1990 baseline. Despite initial expectations that many sources would need to use expensive end-of-pipe controls such as selective catalytic reduction (SCR) to achieve these deep reductions, the flexibility afforded by the cap-and-trade approach led to unexpected results. Chief among these were that most (126) of the 142 coal-fired units achieved 20 to 30 percent NO_x reductions through operational changes alone, without post-combustion controls. This allowed compliance through a number of technologies . . . and not only SCR. As a consequence, compliance costs, after initial volatility at the program's start in which prices ranged from $3,000 to $7,000 per ton, have settled down to less than $1,000, significantly lower than estimated. This may foreshadow low compliance costs for the EPA NO_x SIP call that would impose a NO_x emission cap for a broader group of 19 states.[110]

States interested in using a cap-and-trade system, however, will face an unfortunate challenge: EPA lacks specific authorization to implement such a system on a regional basis. A regional cap-and-trade approach could include 392 coal-burning power plants, as well as other large emissions sources that are the primary targets of EPA's rule. Trading at the regional scale would be appropriate because the pollutant mixes in the atmosphere across regions, and toxic hot spots are not of particular concern with NO_x emissions. In the absence of a federally coordinated regional market, individual states could implement their own trading systems. They could also collaborate to build multistate markets, as is happening in the Northeast, though doing so requires a substantial commitment of state resources. States could, of course, forego the advantages of trading, and use traditional regulatory approaches to meet their emission limits.

When EPA and the states decide to tackle the even-more-daunting health risks posed by sulfates and other fine particles, they will probably find cap-and-trade systems among the best solutions. Sulfates, like NO_x, are generated by many large combustion sources and transported across broad airsheds. EPA has established a monitoring network to gather more information on their transport and fate. Data from that system, coupled with the lessons from the NO_x trading efforts, should provide EPA with a foundation for establishing regional cap-and-trade systems for sulfates in the near future.

All of those cap-and-trade systems for controlling air and water emissions have several features in common:

- They are a different form of "command-and-control" regulation. Public authorities set the caps and then command a group of participants to meet them. As such, the systems transform traditional regulation, while continuing to use the public's authority to protect the public good.

- The more flexibility participants have in how they generate or use credits, and the lower the transaction costs for finding a trading partner, the more efficient the market. The

more efficient the system, the lower the overall cost society will have to pay to achieve its environmental goals.

The systems are not perfect. Regulators may set the caps too high to achieve the results the public wants. Sources may make false claims about the credits they are generating or using, and monitoring systems may fail to catch such fraud. On the other hand, the systems need not be perfect to be highly effective.

The systems shift the respective roles of regulator and regulatee in ways that improve the effectiveness of both. Stephenson and his colleagues observe: "Allowance trading recognizes that a centralized agency has limited ability to know all the pollution control alternatives available to each individual discharger. Rather, the individual discharger, with first-hand knowledge of its own unique circumstances, is in the best position to determine how to manage its waste stream. In an effective effluent allowance trading system, the role of the government regulators shifts from identifying who must control effluents and how they should do so, to establishing water quality goals and monitoring and enforcing discharge limitations."[111]

America's experience with cap-and-trade systems demonstrates that they are highly effective approaches for implementing publicly driven pollution-reduction goals, provided that the sources of pollution can be identified, monitored, and "regulated," that the sources face varying prices for making environmental improvements, and that the pollutants being traded are unlikely to create toxic hot spots.

Open-Market Systems and Offsets

A dozen states have adopted open-market systems or a close relative, an "offset" program, to allow firms some flexibility in controlling their emissions of VOCs. Michigan, for example, is attempting to implement an open-market system to encourage reduction of nutrients and other water pollutants. As implemented, the systems are generally productive, though unlikely by themselves to help America achieve its goals for cleaner water or air. Their weakness stems from the lack of a cap, the regulatory driver that would motivate firms to participate.

In an open-market system, a firm might install a new piece of equipment or shut down a process: in either case generating fewer VOCs and the opportunity to sell an emissions-reduction credit. Depending on the program, that credit might be good for a particular year, or considered "permanent." In some states, regulators verify a credit before listing it on a state register of available credits. A firm elsewhere in the state might want to buy that credit if it is facing a relatively unusual circumstance: an unusually big production year, for example, and a corresponding increase in VOC emissions beyond its permitted level. Buying the credit could keep the firm "in compliance." Or a firm might be subject to a new technology requirement, and find it cheaper to meet its emissions level by buying someone else's reduction than installing the new technology.

After a firm buys a credit, some states perform on-site inspections to verify that the purchase will not result in unacceptable health risks for people in the area surrounding the facility, thus combining some of the safeguards assured by traditional permits with some of the efficiencies of a market. A state may formally modify the seller's and purchaser's operating permits to lock in the implications of the transaction, as well.

Hix, Ruder, and Sugarman offer an example from Michigan's open-market VOC program:

> We interviewed an environmental manager at a firm that needed credits to comply with a new regulation governing emissions associated with startup and shutdown of manufacturing lines as a stopgap measure until it could obtain a permit modification. The company's existing permit did not cover startup and shutdown emissions, and the company would have faced non-compliance had it not purchased credits. The company purchased two tons of emissions for less than $10,000 (including a broker's fee). Time spent on the transaction included two days to learn about the program, two to three days working with the credit broker, two days completing the necessary paperwork, and a day or two obtaining final approval from the company's lawyer and corporate office. In total, the company spent less than 10 person-days on the transaction. It took the state between two and three weeks to approve the transaction. The environmental manager found the MDEQ extremely helpful, knowledgeable, and willing to work constructively to facilitate the transaction. Now that he has gained familiarity with the program, he hopes to generate and sell credits in the future.[112]

The Clean Air Act requires major sources of air pollution to install BACT or MACT. That statutory requirement prevents EPA from allowing firms to purchase credits to meet the same performance goals that the technology achieves. For most firms, installing those more-or-less standard devices eliminates any further legal need to reduce emissions. Thus, few firms need to buy credits and few trades occur, as shown in Table 3-2. It is likely that trading would be heavier, overall costs lower, and environmental results at least as good if firms could buy credits rather than installing BACT or MACT.

TABLE 3-2: VOC TRADING ACTIVITY UNDER OPEN-MARKET AND OFFSET SYSTEMS

PROGRAM TYPE	PROGRAM	INCEPTION DATE	AVAILABLE CREDITS	NUMBER OF GENERATORS	CREDITS USED	NUMBER OF USERS
OPEN-MARKET	Michigan	1996	5,042	25	161	13
	Texas	1997	38	4	10	1
	New Jersey	1995	615	15	10.2	5
OFFSET	Louisiana	1994	6,032	29	Not available	Not available
	New York	1994	2,646	43	476	6
	Texas	1993	4,945	59	2,693	18
	New Jersey	1977	14,440	157	1,540	12

Note: Credit units are in tons per year for offset programs and tons for open-market programs.

States generally design their open-market systems to produce an environmental benefit by requiring a purchaser to buy more credits than it actually needs. The purchaser is then compelled to "retire" those extra credits, resulting in a net reduction in air emissions after the trade. States also "retire" credits permanently if they have gone unsold for more than five or 10 years.[113]

Offset programs work in similar ways. In those areas of the country failing to meet EPA's ambient air-quality standards, no large new source of air emissions can be constructed or extensively modified unless it first offsets its new emissions by eliminating emissions elsewhere in the non-attainment area. Most offset programs require firms to eliminate more emissions than they will add to an airshed, thereby producing a net reduction in emissions. The size of that reduction is determined by the program's "trading ratio," the ratio of emissions retired to emissions added.

Trading ratios ensure that in each transaction the total emissions drops very slightly,[114] and states may apply different trading ratios to achieve various policy goals or to make some trades more desirable than others. In New Jersey's offset program, for example, the trading ratio increases as the distance between the generator and user of the credit increases, which encourages trades within smaller geographical areas. Such a policy keeps the public benefits of the trade "close to home," and reduces the chance that a transaction would create a new toxic hot spot.[115] The imposition of trading ratios is another way in which government agencies manipulate market forces to produce results a "free" market would not. The primary benefits of offset programs, however, are their allowance for economic growth and some technological innovation, along with their prevention of pollution increases.

Since early 1998, the Michigan Department of Environmental Quality has been attempting to establish an open-market system for effluents in surface waters. The department wanted to allow voluntary trades among point and nonpoint sources of all types of effluents except those which bioaccumulate. The state also wanted to allow firms to use credits to meet technology requirements. The department hoped that the system would encourage voluntary emission reductions in waters currently meeting water-quality standards, and in those impaired waters where the state is developing place-specific regulatory programs known as "total maximum daily loads" or TMDLs.[116]

The department has been revising a draft rule in collaboration with EPA's Region 5 office, and published a version for public comment at the end of 1999. Citing prohibitions in the Clean Water Act, EPA insisted that the state drop the potential for firms to meet their technology requirements through the purchase of credits, and that the state narrow the scope of trading. According to Kerr, *et al.*:

> The agency suggested to Michigan that it permit only nutrient trading. The provisions that were dropped would have provided more opportunities for trading to take place, might have substantially reduced the transaction costs of trading, and could have afforded increased opportunities to affect improvements in water quality at lesser costs than traditional EPA-sanctioned approaches.
>
> A fundamental, unresolved issue between MDEQ and EPA is the extent to which trading is permissible prior to the establishment of a TMDL. While the department regards EPA's proposal [the agency's since-withdrawn August 1999 proposed "Revisions to the NPDES Program . . . "] to require offsets for new or expanded sources discharging into an impaired water body as a major

> step forward in recognizing the potential environmental benefits of trading, the restriction of pre-TMDL trading to offsets is clearly a far narrower vision of the potential of trading to achieve early reductions in pollution than the approach embodied in the Michigan statewide trading proposal. A related issue is EPA's view that, once a TMDL is developed, any changes in allocations within it require a formal modification. MDEQ believes such a requirement would create a cumbersome disincentive to trading.[117]

Michigan's negotiations may prefigure conflicts that could arise in other states interested in developing nutrient trading systems. As explained fully in the next chapter, the process of developing and implementing a TMDL for one or more pollutants in a watershed is technically and politically complex. Even under the best of circumstances, it will be years before TMDLs will be in place in many impaired waterways, so EPA policies or regulations that restrict the implementation of trading systems in the meantime may become bones of contention. On the other hand, once in place, a TMDL could establish the cap for a nutrient-trading system in a watershed-and the kind of environmental and economic benefits Paul Faeth described could ensue. In a sufficiently flexible market with few constraints and low transaction costs, trading under the TMDL cap would constantly—and efficiently—reallocate the scarce resource of the watershed's assimilative capacity. The TMDL rules, however, do not explicitly authorize that kind of flexible system and may even, as Michigan's experience suggests, actively discourage it.

Federal regulations require that point-source effluent load limits be written into NPDES permit. EPA has interpreted that to mean that each source must receive an individual NPDES permit, and that any exchanges of control responsibility would need to be approved on a case-by-case basis and included in each NPDES permit. EPA's rationale for requiring each effluent trade to be formalized within an NPDES permit is that doing so would maintain the federal government's authority to take enforcement actions against each permit holder. Such a requirement for pre-approval of trades through individual NPDES permits would eliminate the potential for flexible, timely trading and would reduce incentives for undertaking pollution-prevention activities. Such a regime would also eliminate the kind of group (watershed) permit that North Carolina issued to the sources on the Tar-Pamlico.[118] Group permitting would create one NPDES-type permit for a number of point source dischargers. Members of the group would determine among themselves how the load reduction responsibilities would be shared. While that concept would add decisionmaking flexibility to dischargers, EPA headquarters has not made clear its position on group permits. Region 4 of EPA has authorized such a permit for the Neuse River, but the proponents of a nutrient-allowance trading system for Long Island Sound felt they needed separate statutory authorization for a more flexible, market-like system.[119]

Michigan had proposed an alternative approach to enforcement in its open-market rule. Trades between point and nonpoint sources of pollution would be both registered and enforced by the state. Point sources would have their permits modified "by rule," to acknowledge the impact of trades they made: they would not need formal NPDES permit modifications for every trade. The state would have the responsibility of ensuring that credits were legitimately generated and used. Enforcing such a system is within the capacity of most state governments. Indeed, the challenges would be similar to those Massachusetts faces in keeping its Environmental Results Program honest and credible. Even if Michigan were allowed to sever EPA's direct enforcement authority over each point-source permit, the federal agency could still audit Michigan's management of the program as a whole. And if Michigan proved to be lax in its

management of the trading system and water quality declined as a result, EPA could exert pressure on the state to strengthen its program.[120] States adopting the approach might thus find it advantageous to develop some public-accountability mechanism to replace the Clean Water Act's provisions enabling individuals to bring enforcement suits directly against dischargers covered by the NPDES program.

It remains to be seen whether EPA will approve the Michigan plan. Indeed, it remains to be seen whether EPA will approve any of the open-market systems. At the time most of the research for this project took place, EPA was involved in several large policymaking and rulemaking exercises that are immediately relevant to the trading programs described in this chapter. The Office of Air and Radiation had issued its Draft Economic Incentive Program Guidance in September 1999,[121] which superceded the 1994 Economic Incentive Program Rules, Final Rule and Guidance.[122] The Office of Water was seeking public comment on proposed rules relating to the implementation of TMDLs and NPDES permits, as noted above in the discussion of Michigan's program. On July 13, 2000, EPA published a final revised TMDL rule, which is to become effective on October 21, 2001.

States and their businesses have responded differently to EPA's lack of clarity or conflicting signals. Hix, Ruder, and Sugarman explain:

> States seek to submit their programs to EPA as revisions to their Statewide Implementation Plans (SIP) for achieving or maintaining attainment status. In so doing, the states need clear guidance on the program design, implementation, and review elements necessary for federal approval. None of the programs we evaluated has received approval from EPA as SIP revisions. Sticking points between EPA and states in program approval relate primarily to ensuring the certainty of emissions reductions, public involvement, and program transparency to the public. While states have worked with EPA to resolve these issues, EPA has yet to approve programs, primarily due to its lack of a final Economic Incentive Program (EIP) guidance document.
>
> . . . Debate over emission quantification protocols could also take some time to resolve. The discussion of quantification protocols for open-market programs contained in the draft guidance is intended merely as a starting point for developing a policy on protocols. Due to the contentious nature of the debate over protocols between states and EPA, as well as a lack of consensus within EPA's Office of Air and Radiation, the agency may not adopt a final policy in the near future.
>
> Uncertainty also exists regarding whether EPA will base approval decisions on the provisions of the new EIP guidance in cases where states developed programs in response to the 1994 guidance and the 1995 open-market trading rule. States argue that they encounter difficulty in developing programs according to guidance that does not yet exist. EPA has yet to determine how it will treat programs that were developed prior to issuance of the new guidance. Indeed, the draft EIP guidance leaves blank the section titled "How does this guidance apply to existing EIPs?" Staff within OAR's Office of Policy Analysis and Review suggests that state programs will likely be held to the "spirit" of the new EIP and that consideration will be given to those programs that were designed to follow past guidance. It is unclear exactly what this will entail.

> The extent to which lack of program approval by EPA's Office of Air Quality Planning and Standards (OAQPS) hinders trading varies among programs. According to EPA's draft EIP guidance, firms participating in programs that lack federal approval may be in violation of SIP requirements and subject to EPA enforcement actions and citizen lawsuits. In Michigan, DEQ staff believes that lack of federal program approval has had a chilling effect on credit use, but not on generation. This assertion is supported by the fact that credit use increased after 1997 when EPA issued a notice of proposed approval. Following this announcement, credit use—which had been virtually nonexistent previously (only 10 tons used in the four preceding years)—has increased markedly (150.64 tons used in the two years since). In contrast, trading program staff at agencies in Louisiana, New York, and Texas suggests that lack of formal EPA approval does not impede trading. While the New York program lacks federal approval, EPA has noted that the program has no significant shortcomings. This favorable review, however, appears to have done little to encourage trading. In Texas, TNRCC staff suggests that the regulated community does not care that the program lacks federal approval. The business community and TNRCC have established mutual trust through ongoing negotiations with EPA on TNRCC's operating permits program, and firms feel comfortable participating in non-approved trading programs.[123]

Firms that participate in any of the new permitting or trading systems described in this report take a number of risks that would discourage most firms—and regulators—from innovating. When the economic stakes are high enough, however, firms and regulators come forward. Kerr, *et al.* describe two examples of "trades" in watersheds that helped expand the range of the possible, though at considerable cost. In Minnesota, Rahr Malting, a local firm, and the state regulatory agency agreed to an offset arrangement in which Rahr agreed to finance—and, through its NPDES permit, remain legally liable for—nonpoint nutrient reductions upstream as compensation for its own discharge of oxygen-depleting matter into the Minnesota River. In Wayland, Massachusetts, EPA Region 1 helped negotiate a similar permit for an office park, which agreed to finance the connection of residential wastewater systems to the park's expanding treatment system in exchange for a permit to discharge into the Sudbury River. In both cases, the net impact on the health of the rivers is clearly positive, and the firms saved large sums of money, even though the permitting required extended periods of study and negotiation.[124] The two permits suggest what might be achieved if point sources and nonpoint sources were encouraged through markets to trade effluent allowances, but the two agreements are still essentially negotiated permits, not market-driven trades. Both agreements created extremely high public and private transaction costs. Although productive, then, the agreements are not viable models for addressing the nation's nonpoint water pollution problem.

Exploiting Competition

Paul Faeth's proposals for nonpoint source reductions raised the possibility of maximizing the environmental impact of public payments to farms by targeting the payments to projects that would deliver the biggest gains per dollar. He contrasted that with traditional agricultural subsidies—including those intended to reduce erosion and nonpoint pollution—which the federal government and states have generally handed out equally to all farmers meetings certain

TABLE 3-3: THE BUREAU OF RECLAMATION'S SALINITY CONTROL PROJECTS

UNIT/ STUDY	RFP DATE	IMPLEMEN-TATION	CONTROLS (TONS/ YR.)	USDA CAPITAL COST	RECLAMATION CONTRACT COST (AWARDED)	RECLAMATION OBLIGATIONS THRU 5/99	ANNUAL O&M COSTS ($M)	COST PER TON
Hammond	1996	1996-2001	48,130	$0	$13,486,000	$5,001,000	$0	$22
Navajo Well Plugging	1996	1998-1999	500	$0	$71,000	$0	$0	$11
Cottonwood	1996	1998-1999	8,506	$0	$2,100,000	$1,955,680	$0	$20
Wellington	1996	1998-2000	14,532	$0	$3,935,400	$3,935,000	$0	$22
Ashley	1997	1999-2000	9,000	$0	$3,269,000	$3,269,000	$0	$29
Duchesne County	1997	1999-2004	20,417	$0	$9,127,000	$175,000	$0	$36
Ferron	1998	1998-2002	47,407	$4,109,028	$10,802,744	$3,408,707	$0	$25
Paradox Nanofiltration	1998	1999-2002	81,500	$0	$10,264,236	$1,799,723	$1.17	$24
Allen Lateral	1998	1999-2000	8,125	$601,000	$2,412,000	$400,000	$0	$30
Uncompahgre Demo	1998	1998-1999	2,295	$0	$889,600	$889,600	$0	$31
Price (addition)	1998	1999-2001	16,153	$1,009,400	$5,182,650	$0	$0	$31
L. Brush Cr. (Sunshine)	1998	1999	2,764	$185,000	$858,000	$858,000	$0	$30
North Carbon	1998	1999-2000	10,245	$416,270	$3,499,908	$500,000	$0	$31
Moffat	1998	2000-2001	5,112	$750,000	$1,066,440	$0	$0	$28
Highline	1998	2000-2001	8,870	$1,700,000	$2,100,000	$0	$0	$34
BIA – Ute Tribe	1998	1999-2005	53,344	$0	$19,788,373	$0	$0	$30
Price R. Improvement	1998	Pending	48,003	$0	$0	$0	$1.30	$27

UNIT/ STUDY	RFP DATE	IMPLEMEN-TATION	CONTROLS (TONS/ YR.)	USDA CAPITAL COST	RECLAMATION CONTRACT COST (AWARDED)	RECLAMATION OBLIGATIONS THRU 5/99	ANNUAL O&M COSTS ($M)	COST PER TON
Burns Bench	1999	2000-2001	21,468	$1,206,000	$4,465,514	$0	$0	$21
Farnsworth	1999	2000-2001	9,557	$0	$3,250,000	$0	$0	$27
UT DWR - Instream Flow	1999	1999-2000	1,900	$0	$506,931	$0	$0	$21
Moore Group	1999	1999-2000	17,587	$1,174,930	$4,733,160	$0	$0	$27
Ouray Park	1999	NEPA	4,637	$0	$944,905	$0	$0	$16
Seeley-Collard	1999	1999-2000	905	$102,667	$185,690	$0	$0	$25
Western Uintah	1999	NEPA/ CS	25,780	$1,821,141	$6,875,000	$0	$0	$27
TOTALS			**466,737**	**$13,075,436**	**$109,813,551**	**$22,191,710**	**$2**	**$26**

Note: Cost effectiveness computed using no federal replacement cost and 8 percent interest.)

Source: U.S. Bureau of Reclamation, 1999

criteria. The U.S. Department of the Interior's Bureau of Reclamation, however, has developed a strong case for using the market to target conservation funds. In a research report for this project, Robert Adler, Michele Straub, and Heather Green describe the bureau's successful innovations in the Colorado River Basin.[125]

Since 1973, the Colorado River Basin Salinity Control Program has spent some $700 million to reduce the salinity of the river to levels meeting requirements set by a United States treaty with Mexico. Much of that money has gone to large public works projects, including a desalinization plant near the Mexican border, as well as large capital-intensive irrigation projects. The bureau planned, built, and owned those projects; and Congress had to approve each one. In 1995, Congress authorized a change, and the bureau started an annual competition for funds for salinity reduction. Public and private entities can apply, proposing to implement specific changes to reduce point- or nonpoint runoff. A team from the bureau and affected states ranks the proposals each year for estimated cost-effectiveness and risk—a function of the certainty that the projects would achieve the promised results. (The results are summarized in Table 3-3.)Under the old system, the bureau's projects cost an average of $70 per ton of salinity removed from the Colorado. Under the new competitive system, costs have ranged from $11 to $36 per ton, and have averaged $26 per ton.[126]

The results in the Colorado River Basin simply underscore the power of competition and markets. Entrepreneurs could reduce salinity at a lower cost than government officials using traditional management tools. When the bureau introduced market forces into its program, the cost of achieving specific environmental goals went down, just as it did with the SO_2, SO_x, and NO_x trading systems described earlier in this chapter.

Greenhouse Gas Emissions

The United States is many years away from deciding whether or how to regulate greenhouse gas emissions: carbon dioxide and other gasses that contribute to long-term climate change. The panel recognizes that there is no political consensus for action, though most atmospheric scientists conclude that reducing the growth of greenhouse gas emissions is desirable. Emissions trading could be part of a plan to achieve that result.

Carbon dioxide is amenable to cap-and-trade systems because it is transported globally throughout the atmosphere, creating no problems of local or regional hot spots; and because there are millions of sources of carbon dioxide worldwide, with great variations in the costs they would face to reduce emissions. At the national or global level, the best way to find and implement the least costly reductions would be through some form of dynamic market-based system, possibly a cap-and-trade system, possibly a tax or fee system. Any cumbersome permit process would create unnecessary and wasteful transaction costs.

One of the advantages of developing trading systems to reduce SO_2, SO_x, NO_x, nutrients, and other pollutants is that the experience helps the nation learn more about the strengths and weaknesses of various approaches to credit generation, verification, trading, and enforcement. Such knowledge will lead to better choices about greenhouse gas emissions in the decades to come.

Delivering Results

The innovative trading systems described in this chapter demonstrate that governments can exploit market mechanisms within a regulatory context to achieve the public's environmental goals. Indeed, the examples suggest that trading systems are one of the best approaches the nation could use to reduce nonpoint sources of nutrients in surface waters and nitrogen oxides in the air. Yet trading—particularly in water systems—remains controversial. EPA offers rhetorical support, but neither EPA nor Congress has taken the steps necessary to test the potential of trading to reduce the nation's intractable problems with nonpoint pollution.

Trading systems do pose new technical, legal, and political challenges that must be addressed. Some of the technical issues are probably immutable, and *should* prevent certain kinds of trading. But many of the so-called "problems" with trading are either overstated or solvable. This section distinguishes among those issues.

Technical Issues

The technical challenges to establishing trading systems to reduce environmental pollution relate to the laws of nature, and to the scientific capacity to understand and manage chemical, biological, and physical interactions. Three types of challenges are particularly relevant: spatial constraints and hot spots; monitoring; and managing a system that allows trades among different types of pollutants or environmental impacts.

Spatial Constraints

There is great variation in how pollutants behave in air and water, and those variations determine the spatial constraints society might reasonably impose on a trading system. Sulfur dioxide, nitrogen oxides, and sulfates tend to disperse once released to the atmosphere, and are carried far beyond their points of origin by winds. That is why Congress created the acid-rain trading system as a national market, and why states are interested in regional markets for NO_x and, possibly, for sulfates and other fine particles. Nitrogen or phosphorus in a river moves with the river, and concentrates in its lakes or backwaters. Hence, proponents of nutrient trading systems generally see them operating *within* particular watersheds. Most volatile organic compounds break down fairly quickly in the atmosphere, so their immediate toxic impact is likely to be highly localized. A trading system that allowed for a significant new concentration of VOCs could thus create a local hot spot: a place where a few people could be exposed to elevated and potentially hazardous levels of the pollutant. Because of the risks they pose, as well as how they behave in the environment, some chemicals may be entirely unsuited for trading. For such toxics, society may prefer to use stricter controls or outright bans.

Monitoring

For trading systems to work, each credit or allowance must be clearly defined and verifiable. When a power plant says that it has reduced its emissions of SO_2 by five tons, and thus has five tons of allowances to sell, the plant can use its continuous-emissions monitor to verify that it has made the reduction, and that it will continue to operate in accordance with its post-transaction allocation. Such monitors do not exist for VOCs, however, or for nutrient runoff from farm fields. Thus the challenge of defining exactly how much of a credit a given improvement in performance "generates" has stalled implementation of trading programs in those arenas.

As Chapter 2 demonstrated, however, the difficulty of measuring or estimating a firm's emissions is not unique to trading systems. In the world of conventional air permitting, for example, regulators are comfortable estimating emissions based on what they know about chemical inputs, measurable outputs, and the workings of various machines. Facility-wide caps on air toxics for Intel and other firms have been based on estimates, not actual measurement. Although they introduce a degree of uncertainty, there is no particular reason why careful estimates—backed up with appropriate documentation—should not suffice as the basis for generating and using credits or allowances.

Paul Faeth's modeling of the Upper Midwest was based on estimates of erosion and runoff from different types of fields under different conditions. Those estimates appear to be precise enough to use in defining credits. It is relatively simple to verify that a farm has converted acreage from moldboard cultivation to no-till cultivation or to conservation. Therefore, managing the enforcement of such a system may be better placed in the hands of state agriculture officials than EPA inspectors. Faeth recommends using U.S. Department of Agriculture-certified farm planners to determine how many credits a farm might generate from a particular change, and then making public a list of where and how credits are generated and used. The approach would use third-party certification, similar to StarTrack's, in its reliance on public access to information about the audits. Publishing the list of credits would enable the public *and competitors* to keep tabs on each other's commitments, providing an additional incentive for participants to honor their agreements.

More sophisticated verification technologies are possible: some are available now. Instruments flown over rivers in small airplanes can detect changes in water temperature, an indica-

tor of some habitat changes and nonpoint problems. As noted above, water quality in the Grasslands trading system is monitored in part by an automated device that reports its sampling results by phone. Remote sensing devices, including some in satellites, can detect the presence of certain algae blooms related to excess nutrients,[127] and could help EPA or a state monitor the impact of a nutrient management system.

Currently, the only market demand for advancements in water monitoring technology is coming from firms interested in better point-source monitors to check their compliance with NDPES permits. Regulatory agencies have not invested much in technologies to detect nonpoint problems or measure the quality of surface water because those data have been only marginally relevant to the regulation of point sources. Where there is a demand for better monitoring, however, industry responds. The food industry, for example, needs to know how its products smell and taste, and so has been developing "artificial noses" and "artificial tongues," small sophisticated sensors capable of detecting low levels of a variety of complex chemicals. Similar technologies might have useful applications in the verification of environmental performance.[128]

Government agencies could design trading programs to encourage the development and use of better monitoring technology simply by establishing lower (cheaper) trading ratios for credits that can be verified directly than for credits that are only estimated. Conversely, trading ratios can be set to increase as the certainty of compliance decreases. Both tactics should stimulate the market for better ambient water-quality data.

Cross-pollutant trading

Trading systems are simplest when credits are all in the same units: "pounds of SO_2 discharged to the air," for example. The systems are more complex or problematic when the types of credits vary. The VOC trading systems in place in several states allow trading of allowances for hundreds of very different chemicals as if they all had the same characteristics and environmental impact. The Rahr Malting offset agreement worked because the Minnesota Pollution Control Agency established a set of conversion factors that allows Rahr to offset units of BOD (biochemical oxygen demand) with units of erosion control, livestock management, revegetation, and other activities that should help reduce the flow of nutrients into the Minnesota River. Those trading ratios are not technically exact, but they work: they produce a reasonably predictable environmental result because they are based on years of observation of the river, and on reasonably good science.

In short, trading systems often have to rely on approximation, and for that reason, they have tended to build in trading ratios and other conservative measures to compensate for technical ambiguities.

Legal Issues

The Clean Air Act and the Clean Water Act treat trading in different ways. Title IV of the Clean Air Act Amendments of 1990 established the SO_2 trading system, an earlier version of the statute specifically authorized bubbling, offsets, and other components of a trading system. The Clean Water Act, in contrast, is silent on trading, neither authorizing nor rejecting it. Both statutes emphasize the use of technology to reduce pollutants, however, and that emphasis discourages certain applications of trading.

The Clean Air Act requires major sources of pollutants to install BACT or MACT. That technology standard ensures that every plant installs a minimum level of control, and eliminates some of the difficulty EPA and the states had regulating air toxics on a performance basis. As noted in the discussion above on NO_x controls, however, such standards do not provide incentives for firms to reduce their emissions below those that can be achieved with standard technologies. The statute precludes some possible forms of trading: a firm cannot meet what might be considered its emissions baseline (the level that would be achieved by operating the BACT or MACT standard) simply by buying emissions reductions elsewhere. The SO_2 trading system differs in that regard: rather than requiring each utility to install a uniform technology—electrostatic scrubbers, for example—the Clean Air Act allowed them to choose among an undefined set of options. To reduce their emissions, utilities could install scrubbers or burn low-sulfur coal or generate less electricity; they could even *increase* their emissions, provided they purchased allowances from others. The relative simplicity of measuring SO_2 emissions compared to other air toxics is one reason Congress could break from the technology standard for utilities. Indeed, the program has achieved measurable reductions in SO_2, and few environmentalists today accuse utilities of "backsliding" if they purchase allowances rather than install scrubbers.

The Clean Water Act does not require point sources to adopt any particular technology, but the technology-based performance standards required in the act tend to be used that way. Firms have a propensity to install the same technologies that regulators used to set the standard.[129] Those practices inhibit technological innovation, as well as the kind of flexibility that trading systems reward.

Stephenson *et al* write of the potential for provisions of the Clean Water Act to discourage both the generation and use of credits by sources with NPDES permits. The act requires entities with NPDES permits to seek renewals every five years. Regulated entities may fear that if they aggressively control their discharges and sell or bank their allowances, they will signal to regulators that they should impose tighter controls at renewal time.

> If this occurs, the surplus allowances created for sale or banking would be lost and superior performance would be penalized, rather than rewarded . . . The CWA thus creates an incentive for dischargers to do no more than meet their permitted effluent limits, which would truncate the supply of allowances and ultimately undermine any allowance trading system carried out under the act.[130]

Moreover, the act's anti-backsliding provisions "prohibit permitted dischargers from purchasing allowances that will enable them to discharge more effluent than the technology-based performance standards will allow."[131] "The current anti-backsliding language of the CWA reflects the statute's focus on the use of technology-based control requirements by an individual source, rather than on the achievement of watershed water quality goals."[132]

EPA has been sending mixed signals on trading in watersheds for some years. In its 1996 "Draft Framework for Watershed-Based Trading," the agency announced: "EPA will actively support and promote effluent trading within watersheds to achieve water quality objectives, including water quality standards, to the extent authorized by the Clean Water Act and implementing regulations."[133] And, as noted above, EPA has indeed supported several permits based on a creative use of offsets. But the agency's draft framework goes on to assert: "Trades that depend on fundamental change in EPA's enforcement and compliance responsibilities will not be allowed."[134]

The final TMDL rule does not include allowance trading as an implementation option. The final rule makes reference to the draft framework, but that framework only authorizes offsets among permitted sources, provided that each NPDES permit is modified to reflect the exchange of responsibilities. Offsets of that type tend to carry high transaction costs. The continued emphasis on individual NPDES permits provides little incentive for individual states to implement more cost-effective control strategies such as group permits. Stephenson and his colleagues conclude that the emphasis on the individual NPDES permit could call into question the legality of the kind of flexible group permit that North Carolina issued to the sources on the Tar-Pamlico.[135]

Political and Policy Issues

Trading and the use of other market-based incentives raise a host of familiar—and largely unresolved—policy questions. That lack of resolution has probably kept trading on the margins of most environmental management efforts.

EPA's regulatory rationale has always been that a polluter should pay to clean up its pollution. America made progress against industrial polluters largely by vilifying them: by framing pollution as a moral wrong, not merely a rational business decision. Trading systems, however, focus on making rational business decisions yield environmental benefits. They help create a system that embeds the costs of pollution in the price of goods and services, and thus tends to discourage the most destructive of those goods and services. The nutrient-reduction trading system advocated by Faeth does not vilify farmers for polluting. To the contrary, it proposes to subsidize farms for cleaning up. The salinity-reduction system managed by the Bureau of Reclamation in the Colorado River does not force landowners to deliver on the reductions they claim to be able to make; it provides cash for necessary capital improvements. The overall goals of the systems are to minimize the total costs of achieving an environmental goal. Just who pays those costs depends on how the system is organized. EPA has tended to put the financial onus on the point sources it regulates—on Rahr Malting, on the point sources covered by the Tar-Pamlico group permit—and then let them pass the costs on to their customers. RECLAIM and other air-pollution offset programs tend to put the cost of cleanup on new and expanding firms, thus subsidizing the gradual adoption of cleaner technology by established enterprises. Market systems could be designed and implemented to distribute costs more broadly, or to keep them focused on the firm or farm actually causing the pollution in question.

Most of EPA's regulatory programs start with the principle that if a point source *can* control its pollution with a known technology, it should. EPA and its statutes require all major polluters to install such technologies, to do their fair shares, even if some firm's share is disproportionately expensive or produces little environmental benefit. Most of the trading systems described here—including the open-market systems deemed acceptable by EPA—require firms to install mandatory technology before they can begin trading, even though the trading systems might achieve more efficient results if some firms bought pollution allowances or offsets instead of installing cleanup technology.

Some people oppose trading because they consider a government "sale" of pollution rights as a moral affront. Supporters counter that in most permitting programs, governments are already simply giving firms permission to pollute.

The overarching policy dispute about trading, however, is about environmental justice. Because trading systems are intended to provide more flexibility to firms in how they manage their emissions, many Americans oppose trading because they fear what firms might do with

that flexibility. The principal objection is that trading would allow firms to concentrate pollution geographically, particularly in poor communities and communities of color, thereby creating ever-higher exposures to hazardous pollutants and ever-higher health risks to the disadvantaged. Ruder documents the objections raised by the National Environmental Justice Advisory Council to an EPA-proposed framework for trading VOCs and hazardous air pollutants.[136] Environmental justice advocates have been able to make a case significantly strong to slow the development and adoption of VOC-trading systems.

Hix, Ruder, and Sugarman's analysis of several VOC trading programs showed that some states have taken serious precautions to prevent trades from creating hot spots. The on-site inspections some states require before purchasers can use their VOC-emissions credits may be even more protective than typical permitting programs. The inspections raise the transaction costs for VOC trades, but are justified if the credits could add significant health risks to surrounding neighborhoods. EPA and states understand that in order to make trading systems politically viable, they need to involve a broad range of stakeholders in designing the systems and establishing essential safeguards. Despite the favorable results of trading programs as diverse as acid rain and Tar-Pamlico, vocal opponents still have considerable fear of the policy tool, and EPA has not yet found a way to allay that fear. The political anxiety about hot spots and trading seems to be partly responsible for the slow adoption of nutrient trading in watersheds, as well, even though toxic exposures are not part of the program.

Designing and implementing a trading system, such as one to reduce nutrients in watersheds, involves making scores of large and small policy decisions, ranging from those discussed above to setting the most productive and socially acceptable trading ratios or enforcement arrangements. Those choices are largely political in nature, and will thus likely vary from state to state, or watershed to watershed. The most fundamental choices may require state or federal statutory reform.

To date, EPA has had a difficult time with various state proposals for open market or cap-and-trade systems in air and water. The agency has tended to keep them under review for months or years, sometimes issuing letters of support, but not publicly accepting them as official parts of delegated federal programs. One EPA reviewer of a draft of the Ruder paper on VOC trading programs explained that the agency's regional offices were of split opinions as to whether they could or should approve those programs as part of individual SIPS before the agency issued a final version of its EIP guidance:

> I actually think that one or more programs will be approved prior to finalization of the revised EIP. Most regions take the position that SIPs received prior to proposal of the revised EIP should be grandfathered; a couple of regions take the position that we shouldn't consider programs until the guidance is finalized.[137]

That kind of confusion within EPA about how the regional offices and national programs are supposed to be making decisions frustrates those throughout the state and federal system who would like more timely and definitive answers about proposals to test innovative approaches to environmental management.

Findings

The market-based mechanisms for reducing pollution described in this chapter are likely to be among the most effective and efficient the United States will deploy in this decade. The

potential for allowance-trading systems within watersheds to spur significant reductions in nonpoint runoff of nutrients is clear and imminently practical. If EPA and Congress provide only some assurances to states with programs in the works, tests will soon get under way. EPA is currently sending a contradictory message, however, by both encouraging and frustrating innovation.

A Regional Market for NO_x Allowances

Finding 1: Nitrogen oxides, particularly from older coal-burning power plants, are a major cause of smog throughout the eastern half of the United States, and are overdue for reduction. A cap-and-trade system encompassing most of the Midwest and East could create market incentives for efficient NO_x reductions, as well as a better alignment of national environmental and energy policies. Creating and managing such a market is an appropriate job for EPA, which could devise and implement uniform trading rules across the region more effectively than could individual states or partnerships of states. Now that the courts have upheld EPA's NO_x SIP call, EPA should expedite the development of such a system. Explicit authorization from Congress would help that process.

The framework adopted for the regional NO_x trading system may be applicable to fine particles such as sulfates, as well. The agency should continue to learn from ongoing monitoring of fine-particle transport and health effects over the next few years, looking for the most cost-effective tools available to reduce major sources. One approach that bears study would be for EPA to create several regional caps on sulfate emissions, and allocate allowances among larger emitters.

Trading in Watersheds Has Great Potential

Finding 2: There is ample evidence to conclude that trading of allowances for nutrients could be used to reduce point and nonpoint pollution in many of the nation's watersheds at costs far lower than could be attained through traditional point-source controls alone.

Although there is no technology to monitor precisely either base loads or reductions from nonpoint sources, approximation techniques coupled with periodic on-site inspections should be sufficient to verify the generation and use of credits for nutrients. Trading under those conditions is appropriate because of the relatively low risk of nutrients creating hot spots. With more toxic or persistent hazards, much more precise measurement systems would be necessary to support a trading regime.

Finding 3: Allowance trading in watersheds can improve water quality *because* it is a form of regulatory action. A cap-and-trade system is traditional in that it starts with a legal authority establishing rules to force changes in how firms manage their environmental impacts. The system is untraditional—and generally superior to many forms of regulation—in that it then puts the responsibility of deciding how best to respond on those individuals who are best able to find the most efficient solution. Making the transition from facility-by-facility permitting to the more dynamic market-based controls requires new ways of thinking and acting by both regulators and the entities they regulate. Managing that transformation in attitudes and practices is an important challenge for EPA, state agencies, and the private sector.

Finding 4: Experience from Rahr Malting, the Tar-Pamlico and San Joaquin River trading systems, and the Colorado River salinity-reduction program, illustrates the range of ap-

proaches to trading within watersheds. Offsets and open-market systems can deliver some value; cap-and-trade systems are more certain to produce a desired environmental result, however. The latter is likely to work particularly well as a tool to allocate reductions under a TMDL. Because trading systems invite credit generators and users to make choices based on their individual costs and benefits, other tools that directly influence costs can be blended in with allowance trading systems. The Tar-Pamlico system linked emissions fees with a trading system; targeted subsidies or even pollution taxes could work just as well.

Finding 5: Trading among point and nonpoint sources of nutrients in a watershed will be productive only if transaction costs are low and the system is dynamic. States, EPA, and Congress will need to establish new systems to enforce agreements among trading parties. Requiring NPDES permit modifications for each trade is unworkable and unnecessary. State enforcement should suffice on nutrient trades, particularly if EPA audits the performance of the overall state program rather than the individual permits. EPA can use its grant-making authorities and its negotiations for performance partnership agreements to press states to tighten their management of trading programs, if necessary.

EPA's Ambivalence

Finding 6: EPA's indecision on state plans for allowance-trading systems is unfortunate and counterproductive. That regional offices have divergent opinions about which innovations to encourage, or even interpret EPA policy differently in different parts of the country, is both reasonable and acceptable. It is unacceptable, however, for disagreements among the regions and programs to go unresolved. Headquarters has the responsibility of resolving internal debates and making decisions accordingly.

State officials trying to establish market-based programs complain that they do not know what EPA wants-or will accept. They make the same point about numerous other proposed innovations. The authors of several of the Academy's research reports conclude that EPA should be more specific in its guidance, setting clearer national specifications for state-led innovations. The Academy panel, however, disagrees. In many areas, including the design of trading systems, increased specificity would lock in a narrow set of solutions, precluding good ideas and the possibility of productive variation among the states. The panel believes that faster, crisper decisions from EPA—not more specifications or more predictable pronouncements—would encourage innovation.

Finding 7: VOC trading programs, because of the potential of some air toxics to create localized health risks, create particular technical and political challenges. Several states have shown considerable ingenuity in addressing those challenges. They have imposed higher trading ratios to discourage trades across long distances, and required on-site review of credit uses to protect against hot spots. The states, with EPA's encouragement and careful oversight, could continue to develop effective and responsible approaches for reducing VOC emissions through trading.

EPA is justified in being cautious with VOC trading. The agency has the responsibility to guard against environmental injustice. And it has a secondary interest in preventing the tool of allowance trading from becoming even more politicized than it is today. Poorly conceived or implemented VOC trading systems could heighten public and agency apprehension about trading systems in general, and thus make it more difficult and expensive to address those environmental problems for which trading is an especially appropriate tool.

Trading and Technology

Finding 8: EPA is quick to remind critics that most of its "technology standards" are really "performance standards"—requirements that firms reduce emissions to certain levels. Yet the Clean Water Act and air-pollution trading policies prevent firms from buying credits to attain the same net-performance levels. In cases where control technology prevents harmful local exposures or undue risks to employees, then insisting on such technology is sound public policy. When such risks are not likely, however, allowing trades may accomplish more environmental good than a rigid application of technology standards.

Finding 9: Market-based strategies that allow firms to sell emissions credits will provide a financial incentive for firms to develop and deploy more effective pollution prevention techniques and pollution-control technologies. But that equation works only if firms can actually sell those credits. Allowance markets have been inhibited by requirements that firms may not purchase allowances to meet existing technology standards.

Finding 10: States and EPA can use trading ratios to meet public policy goals, including ensuring environmental justice, encouraging the development of new monitoring technology, and providing environmental data to the public.

Recommendations

1. Authorize and encourage trading systems.

EPA and Congress should aggressively encourage states to develop and implement allowance trading programs, particularly cap-and-trade systems, and particularly systems designed to reduce nonpoint runoff of nutrients in watersheds.

a. Congress should authorize extended state or regional allowance-trading programs in watersheds for nutrients and other pollutants unlikely to create toxic hot spots. That authorization should ensure that states would be able to develop a variety of approaches likely to improve environmental conditions at reduced costs. For example, Congress should authorize states to implement nutrient cap-and-trade systems that would enable point sources to meet strict performance requirements by purchasing reductions from nonpoint sources.

b. EPA should revise its TMDL and NPDES rules to explicitly authorize allowance-trading systems and group permits within watersheds when those trades are linked to achieving a net improvement in water quality. The goal of those revisions should be to create dynamic markets for allowances with low transaction costs for participants and regulators alike.

c. Congress and states should encourage the coordination of allowance-trading systems with other market-based environmental programs, such as targeted subsidies to farmers for reducing nutrient runoff or restoring riparian habitat.

2. Create regional cap-and-trade systems for NO_x.

To reduce the pervasive health and ecological damage caused by smog in the eastern half of the United States, and to do so at the lowest possible cost, Congress should explicitly authorize EPA to create regional cap-and-trade systems to reduce nitrogen oxides and possibly other regional air pollutants such as fine particles. The authorization should also encourage state and federal efforts to reduce the cost of controlling VOC emissions, including carefully constrained cap-and-trade systems.

3. Develop monitoring technologies.

EPA should invest in developing monitoring technologies that will facilitate trading systems. EPA and states should create an incentive for the development and deployment of better monitoring technology by setting trading ratios that favor trades that can be closely monitored.

CHAPTER 4

Protecting Watersheds: A New Confluence

The next EPA administrator and Congress will have an opportunity to help reframe how the nation manages water pollution and the impacts of human activities on the health of watersheds, and to lead the way for all citizens and officials to become involved in that critical public issue. The challenge will be to find more productive ways to combine two distinct approaches to water protection: the technical, regulatory approach embodied in traditional point-source discharge permits and in new requirements for cleaning up impaired waters, and a "civic" approach that engages the broader public's interests in environmental quality and other economic and social goals in whole watersheds and communities.

EPA has been attempting to expand its focus from the narrow regulation of point sources to a more comprehensive management of whole watersheds to achieve specific ambient water-quality standards. EPA's latest effort—its adoption of TMDL regulations requiring states to allocate the responsibilities for cleanup of polluted waters among all sources, including individual landowners—is highly controversial. Yet EPA regulation is not necessarily in direct conflict with collaborative civic environmentalism. Research commissioned by the Academy strongly suggests that top-down regulatory requirements and local collaboration can co-exist, albeit uneasily. Indeed, both are necessary ingredients—along with technical assistance, environmental data, and funding—for improving water quality and achieving related environmental, social, and economic goals.

Making the transition to a regime that addresses both nonpoint and point source pollution effectively will take many years and be difficult. But it is essential to America's long-term environmental health, as summarized by a watershed biologist interviewed for this report:

> It is our children who will see the real benefits of this. I come up against this reality every time I do biomonitoring. If a point source appears or disappears, you can often measure the improvement. But work on nonpoint sources is by nature incremental. What you can measure at any point of the stream represents the sum of everything that happens, good or bad, upstream and upslope. You can't have measurable impact on the health of a stream draining 100 square miles by fixing a quarter-mile of bank.[138]

This chapter expands on the challenge of those words, and lays out a strategy for making progress. It also details the critical roles that EPA and its state counterparts have in cleaning up the nation's waters. Among the most pivotal challenges is choreographing the efforts of EPA and state agencies with the work of other federal and state agencies, local leaders, landowners, and the broader public. Reducing nonpoint pollution from agriculture and development will require a coordinated effort unlike any EPA has yet undertaken, because success will depend in part on changing how Americans use their land. The previous chapter noted several of the legal and regulatory hurdles EPA must overcome to encourage cap-and-trade systems for reducing nutrient runoff into surface waters. This chapter looks at how EPA and state environmental agencies can work alongside civic "watershed management" efforts, and identifies legal, organizational, and political hurdles to such cooperation.

The Academy commissioned four research teams to conduct case studies of watershed management efforts that have made environmental improvements. From that research, the panel again concludes that advances in technology, particularly information technology, coupled with the emergence of new institutions such as land trusts and local nongovernmental organizations, and with hard-earned experience in political problem-solving and collaborative decisionmaking, will make progress possible in the next decade.

The Problem of Nonpoint Water Pollution

The Clean Water Act of 1972 set the goal that all rivers, lakes, and estuaries should be swimable and fishable. To help in that endeavor, the statute created the National Pollution Discharged Elimination System (NPDES), which gives EPA powerful tools to reduce pollution from point sources, i.e., facilities that release significant amounts of pollution into waters in specific locations. Among those tools are the detailed agency regulations that tell point-source facilities what technologies they can use to meet emission standards.[139] In addition, since the act was passed, Congress has appropriated more than $75 billion for EPA's use in funding construction of local, publicly owned wastewater treatment works (POTWs),[140] which has proven valuable in reducing point source pollution.

Indeed, regulations and subsidies have been quite successful: point sources have significantly reduced their impact on rivers, lakes, and estuaries. And water quality has improved dramatically in many watersheds. On the whole, though, the goals of the Clean Water Act have not been met. When states surveyed the nation's rivers, lakes, and estuaries, they found that about half of the locations assessed failed to meet the states' own water-quality standards. The primary case of that failure is "nonpoint" runoff from farms, ranches, forestry operations, and developed areas. (See Table 4-1.)

The data cited in Table 4-1 are suspect. The summary figures are based on varying standards across states, on incomplete sampling, on different protocols for gathering and interpreting samples, and on extrapolating data from single points to long stretches of river. (They are, however, the best available: there is simply no reliable and consistent set of ambient water-quality data.)Nonetheless, most knowledgeable parties agree that nonpoint sources are indeed the primary cause of pollution in most rivers and lakes. Most would also agree that large-scale physical modifications of rivers and streams—damming, diverting, channeling, and draining wetlands—have substantially impaired water quality as well.

There is good reason to think that substantial reductions in nonpoint pollution and broader improvements in watershed health are technically achievable. Agronomists have developed simple tests that show whether there is so much nitrogen in the soil that additional fertilizers have no effect on yields. Precision farming—which involves placing global-positioning-system

TABLE 4-1: PRIMARY CAUSES OF FAILURE TO MEET WATER-QUALITY STANDARDS

	Rivers and Streams	Lakes, Ponds, and Reservoirs	Estuaries
Size	3.66 million miles	41.4 million acres	90,465 sq. mi.
Percent assessed	23	42	32
Water Quality			
Good: meets designated uses	55 %	46 %	47 %
Threatened	10	9	9
Impaired	35	45	44
Sources of Impairment in Impaired Waters			
Nonpoint sources			
Agriculture	58 %	31 %	15 %
Dams; hydromodification	20	15	
Forestry	7		
Habitat modification	5	5	
Atmospheric deposition		8	23
Urban runoff and point sources			
Urban runoff/storm sewers	11 %	12 %	28 %
Combined sewer overflows			12
Municipal point sources	10	11	28
Industrial discharges		6	15
Other sources			
Waste disposal on land	7	5	12
Resource extraction	9		

Source: U.S. Environmental Protection Agency, Office of Water, *The Quality of Our Nation's Water: A Summary of the National Water Quality Inventory: 1998 Report to Congress*, EPA841-S-0-001, June 2000, Available at www.epa.gov/ 305b/ 98report/ 98brochure/ pdf. Based on 1998 State Section 305(b) reports submitted by states, tribes, territories, commissions, and the District of Columbia. Note: Percentages may not add up to 100 because more than one source may impair a river segment.

locators on farm equipment and monitoring the application of fertilizer and pesticides—can tell farmers how to cut their chemical use—and thus their costs and nonpoint runoff—without reducing yields significantly. Interest in the functioning of ecosystems, along with the new discipline of conservation biology, has led to new scientific insights, and has sparked the development of new techniques for managing water bodies. Some suburban areas have crafted better ways to design stormwater management systems. Even planting vegetation along streambanks, or simply leaving those areas uncultivated, can reduce polluted runoff dramatically.

But farmers, developers, and other landowners have relatively weak incentives to use technologies or techniques that could reduce polluted runoff. Because it is in their immediate financial interest to do so, many ranchers and farmers still plant crops in highly erodable riparian zones where runoff is greatest. Precision agriculture has been marketed and adopted primarily to cut costs and raise yields, rather than to provide environmental benefits.

And EPA lacks authority to require permits from sources of "nonpoint" pollution. In particular, the agency has no statutory authority to regulate runoff from most agricultural operations, which are the single largest source of polluted runoff. Furthermore, EPA can regulate runoff from developed areas only if that runoff flows into storm sewers or combined sewerage systems.[141]

Then, too, EPA lacks statutory authority to regulate the *quantity* of water in rivers. Diversions from a river or lake can have a tremendous impact on "fishability" and "swimability." Especially in the West, however, state governments vigorously defend their authority over the allocation of water among users.

In short, EPA has a problem that it shares with many other federal agencies: limited tools and inadequate data to meet an ambitious goal. Of course, EPA's water program is not the only governmental entity that has tools and responsibility to improve water quality. Several other federal agencies gather data about water quality; study water-quality problems; have some regulatory authority over water quality or closely related problems such as endangered species; provide information to farmers; and spend billions to help farmers and others reduce polluted runoff.

In addition, state and local governments are part of the "answer" to water-quality problems. States help finance cost-sharing programs for preventing erosion and polluted runoff. State legislatures can enable agencies and nonprofit groups to purchase "instream" flows to assure that there is enough water in rivers to support fisheries and other public uses. Public health ordinances set standards for septic systems and stormwater runoff. State and local land use-statutes guide farming and forestry policies, as well as zoning and construction practices.

Finally, states can adopt environmental regulations that exceed federal requirements. The Environmental Law Institute reports that as of 1997, about half of the states had a water-quality statute that allows regulation of runoff from nonpoint sources, including farms and developed areas. Many states had crafted other ways "to make best management practices (BMPs) enforceable, or at least something more than voluntary, by linking them to other enforcement mechanisms."[142] Maryland has perhaps the strongest regulatory regime: its new nutrient management statute requires farmers in certain watersheds to draft and implement nutrient runoff plans, and to have those plans approved by state-certified consultants or by state extension agents or soil conservation district staff.[143] Many states have recently passed legislation to control pollution from confined animal feeding operations (CAFOs), where chickens, hogs, and steers are raised or penned.

It would seem, then, that state and federal regulation is an effective way to reduce nonpoint source pollution. But farmers have successfully resisted state and EPA regulation of practices that may affect water quality. Indeed, several states have adopted statutes limiting regulation of farming practices to measures approved by local landowners. Enforcement is also often cautious, and, complain environmental advocates, often ineffective. Most states rely more heavily

on technical assistance to landowners and on cost sharing of measures to control farm runoff than on enforcement, and many use enforcement as a small, last-resort component of programs to manage agricultural runoff.[144]

In truth, practical politics give property owners substantial discretion over how they use their own land. Zoning and other direct land-use controls are generally a prerogative of municipal or county governments, and, for many reasons, action at that level is often ineffective at addressing water quality at the watershed scale.

The heart of the challenge is this: Congress has directed EPA to improve water quality, yet the states and local governments have primary authority to regulate land use. Now that nonpoint sources are the most serious and pervasive sources of water pollution throughout much of the United States, the nation will be able to achieve its water-quality goals only if it finds ways to coordinate the efforts of federal, state, and local agencies, and to connect federal funds and authorities with state and local authorities, private voluntary actions, and a broad civic commitment for change.

Two New Tools: Collaboration and TMDLs

In recent years, EPA has tried two new approaches to focus action on improving water quality, as opposed to simply writing more or tougher NPDES permits: "community-based environmental protection," which entails supporting collaborative local efforts to protect individual watersheds or their components; and "total maximum daily loads" or TMDLs, a regulatory approach determined by ambient water quality.

During the 1990s, a new kind of watershed protection effort emerged rapidly in the country, particularly in the West. Local activists and leaders of interest groups made attempts to resolve conflicts in water use, water quality, and other environmental practices. In response, EPA and other federal agencies assigned employees to work full-time with local efforts, and began to promote the ideal of managing environmental problems at the watershed level, stressing the connections between and among people, their homes, their livelihoods, and their environment. EPA organized a "watershed academy" to train federal, state, and some nonprofit staff in technical issues of water quality, as well as how to design and manage a collaborative process for watershed protection. The agency also created web-based information systems to give citizens better access to water-quality data. In addition, EPA and other agencies changed their own planning processes, reaching out more aggressively to engage citizens from all affected groups, and trying hard to achieve consensus.

The TMDL initiative moves in a somewhat different direction: toward more federal regulation. (See Table 4-2.) The Clean Water Act required EPA and states to write plans that will assure that water pollution is reduced enough to meet state water-quality standards. But the complexity of monitoring water quality and implementing a system to achieve specific ambient results appeared overwhelming in the 1970s, so EPA gave priority to the simpler engineering and legal challenge of defining technology standards for point source discharges. As powerful members of Congress recommended,[145] EPA ignored the TMDL provisions of the Clean Water Act for years, saying quite openly in 1978 that the agency did not give them a high priority because other strategies were getting the job done.[146] Since 1997, however, a series of court decisions has forced EPA and states to start writing the plans.

As mentioned earlier in this report, EPA's TMDL regulations require all states to write plans for "impaired" watersheds—about 20,000 of them across the country. The plans are supposed to identify the total maximum daily load of pollutants that can be accommodated in a water body without violating its state's water-quality standards. TMDL plans must also allocate the

responsibility for pollution-reduction among unpermitted nonpoint sources, as well as among traditionally regulated point sources.[147] TMDLs could thus provide a tool for EPA and state environmental agencies to become more directly involved in land use decisions by local governments and in decisions by farmers and other landowners.

How Will TMDLs Work?

It is too early to know how TMDLs will function in practice. As of spring 2000, EPA had approved some 1,500 TMDLs, mostly within the past three years. Many of those addressed only point sources, however, leaving unclear the question of how nonpoint sources will fit into new watershed management efforts.

TABLE 4-2. TMDLS: A PRIMER

In 1972, Congress determined that state standards were not effective in reducing pollution, so it added two new requirements in the Clean Water Act of 1972:

subsidies for publicly owned wastewater treatment plants

technology-based regulations for effluents from different kinds of point sources

Congress also retained provisions for state water-quality standards; Section 303 of the act authorizes EPA to require that states:

write water-quality standards and identify waters where technology-based effluent requirements from point sources are not "stringent enough" to meet standards

prioritize those waters, "taking into account the severity of the pollution and the uses to be made of such waters"[148]

determine the total maximum daily load of pollutants "necessary to implement the applicable water-quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality" for water bodies that do not meet standards[149]

prepare plans to reduce pollutants so that the water bodies can meet standards

In practice, states do submit annual 303(d) reports classifying water bodies. For many years, however, EPA and states ignored the requirement to write TMDLs and prepare plans to allocate responsibilities for meeting standards.

Successful lawsuits by environmental groups in more than two-dozen states since 1996 have made moved TMDLs to the top of the agenda for EPA and most states. In July 2000, EPA published regulations that would require all states to estimate TMDLs and write implementation plans, regardless of whether they had been sued.

Quite clear, though, is the controversy surrounding the TMDL program. The agricultural industry has fended off EPA regulation for decades: it is hardly likely to embrace the TMDL regulations. Local governments also have strong financial incentives to resist a stringent TMDL system. If agriculture can dodge measures that would force farms to clean up, local wastewater treatment works and major industries will probably have to clean up their effluents to meet TMDLs.

In addition to political issues, there are questions about the administrative and technical feasibility of TMDLs. Experts disagree about whether TMDLs will be workable.[150] Many state environmental officials have been quite critical of the TMDL regulations, protesting that the necessary data are missing, models are flawed, and deadlines are too tight. They fear that TMDLs will drown local collaborative processes in a sea of paperwork and technical contro-

versy. Some of our researchers agreed, judging that a push to write TMDLs would upset collaborative processes and environmental improvements in the watersheds they studied. Others felt TMDLs would help, if implemented with care.

Comparing TMDLs and SIPs

One way to judge the possible impact of TMDLs—and to suggest ways of avoiding technical and management problems—is to look at how State Implementation Plans (SIPs) have worked for air quality. The Clean Air Act requires that those states participating in EPA's air-quality program to submit SIPs for air-quality control regions that do not meet National Ambient Air Quality Standards (NAAQS). Both SIPs and TMDLs require an assessment of whether pollution in particular locations—airsheds or water bodies—exceeds regulatory standards. Both require states to prepare and implement plans to reduce pollutants to meet standards.

But there are important differences as well, and those differences cast doubt on whether TMDLs as currently proposed by EPA can work effectively. (See Table 4-3).

TABLE 4-3: A COMPARISON OF THE SIPS AND TMDL PROCESSES

	SIPS	TMDLS
Technical Issues		
Number of pollutants	six	hundreds
Nature of key pollutants	chemical	chemical, biological, physical, and temperature
Who sets standards	EPA	states
Quality of ambient data national monitoring system	good	poor
Complexity of models	yes	?
umber of regions	15	possibly more than 20,000
Political Leverage		
Key environmental issues	public health	mostly ecological;
Federal sanctions	cut off federal highway funds	states cannot run EPA water-quality programs
Institutional Arrangements		
Regional institutions	metropolitan planning organizations;	No formal role for watershed or regional organizations under draft EPA regulations; USDA agencies often play key roles in watershed collaboration; some states support watershed councils or field staff.
Technical capacity and political influence of state environmental agencies	significant but often overpowered by transportation departments	significant: sometimes close, sometimes adversarial relationships with state departments of agriculture

Technical and Procedural Issues

SIPs have become a central feature of air-quality policy in the last 30 years, and are technically and procedurally quite complex. A SIP consumes massive amounts of time, paper, energy, and political capital: *The Federal Register* contains more than 300 pages of requirements for preparing, adopting and submitting a SIP.[151] As EPA regulations and guidance change, states must amend SIPs. Some SIPs are so long and so heavily amended that it is unlikely that anyone really understands them. In the words of one authority on environmental law, "The SIP process is widely recognized as unwieldy and cumbersome, dependent as it is upon institutional mechanisms of the most difficult kind."[152]

Although SIPs have been a powerful tool for improving air quality, many states and metropolitan areas have found it extremely difficult to write SIPs that are both technically sound and politically viable.[153] The SIP system is open to various kinds of confusion, delay, and gaming. The statutes set deadlines for writing regulations on various topics, but EPA is often unable to meet the deadlines. States, too, may be unable to meet the deadlines set by EPA regulations, and they occasionally prepare what some call "cheater SIPs," which clearly do not comply with EPA requirements. EPA, states, environmentalists, industry, and courts argue about questionable baselines, over-optimistic assumptions, and "paper offsets" which promise reductions in emissions that would never take place.

Currently, TMDLs are far simpler than SIPs. It is certainly conceivable, though, that the TMDL process could become equally cumbersome: having far more TMDLs for far more pollutants, as well as a heavy reliance on models of differing quality, all of which rest on inadequate data.

The Clean Air Act requires states to prepare SIPs in metropolitan regions that do not meet NAAQS. Currently there are 157 such regions, thus 157 SIPs. States have determined that about 20,000 separate water bodies fail to meet water-quality standards, so they might have to write 20,000 TMDLs.

EPA has established NAAQS for only six pollutants, including carbon monoxide, ozone, particulates (dust), lead, and chemicals that are the main ingredients of smog. TMDLs might cover many more pollutants. The number depends on how states have framed their water-quality standards. Clearly there are many factors that influence water quality. Problems are not the result of just a few chemicals; they follow as well from physical alterations to water bodies and adjacent land, biological factors such the introduction of non-native species, water temperature, and changes in the volume and timing of water flows. EPA's initial planning documents seemingly suggest that hundreds of substances could eventually be covered.

The technical foundation of a SIP includes monitoring data and mathematical models. States use such models to predict whether violations are taking place when adequate air-quality data are not available, whether changes in air emissions will cause violations, and whether control measures proposed by states will improve air quality sufficiently to meet NAAQS. EPA publishes extensive guidance that includes detailed specifications for modeling, as well as for the design and operation of various control measures.

Some early TMDLs have also been based on models that are complex and costly. For example, writing TMDLs for only one pollutant—nitrogen—in the technically and administratively complex area of Long Island Sound took four years and cost $20 million.[154] Our researchers reported that the models used in the watersheds they studied were of limited reliability, even after many years of use and improvement.

The authors of SIPs can feed their models with data from a well-established national system of air-quality monitoring, one that has uniform national standards and consistent procedures

for gathering data. Water-quality data are far less consistent and less reliable: there are no national standards. States face different water-quality problems: polluted runoff comes from farms, timberlands, and urban areas, depending on individual state makeup. In some states, water pollution comes from upstream or upwind. Soil conditions and climate vary widely. The uses of water also vary from state to state. For those reasons, Congress has allowed states to write their own water-quality standards.

Thus state standards are often quite different; adjacent states set levels for the same pollutant that may differ by orders of magnitude. EPA's initial catalogue of "major pollutants causing impairment by state" illustrates that fact. It groups pollutants into eight broad categories, and shows that some states report minimal problems with pollutants that cause major problems in neighboring states with similar climates, soils, and land uses.

States also use different protocols to gather and report water-quality data. Both EPA and state environmental agencies gather far more data about emissions from regulated point sources than about ambient conditions. The U.S. Geological Survey and the National Oceanic and Atmospheric Administration do have national monitoring systems for water, but their data focus primarily on issues of interest to them, such as water flows and aquatic life.

As water-quality professionals write TMDLs over the next 15 years, they may develop inexpensive ways to gather water-quality data and build models to serve as the foundation for allocating responsibilities for cleaning up watersheds. Across the nation, many state and local governments, as well as federal agencies, nonprofits, and commercial firms, are rapidly assembling databases grounded in geographic information systems, using data collected both by remote sensing data and more conventional methods. Together those entities are also making progress in overcoming the technical barriers to bringing the data together in usable form.

The U.S. Forest Service has already proven an inexpensive way to document water-quality problems in the Pacific Northwest: scientists fly over streams in small airplanes with instruments that measure water temperature and clarity. With those data, and information about land uses nearby, they can pinpoint spots where temperatures are warm, and where there is significant sedimentation and emissions of pollutants. The process is relatively inexpensive, costing about $20,000 per day, and, in a small watershed, taking only a day or two to complete. State regulators used that method to gather data for a TMDL in the Grande Ronde watershed in Oregon.

On the whole, the attempt to create a model watershed program in Grand Ronde illustrates how civic watershed protection efforts can keep TMDLs from becoming an expensive and controversial overlay. With more than $5 million of support from the Bonneville Power Administration and the Northwest Power Planning Council, farmers, ranchers, and government agencies have been working collaboratively on watershed water-quality issues since 1992. A committee of local leaders and federal and state agency officials, supported by a technical interagency committee, approved 260 projects to protect endangered species and control nonpoint pollution. Projects included fencing to keep livestock out of streams and riverbanks; fish passages; channel restorations; and planting vegetation to control erosion and shade the stream, thus cooling waters for salmon.[155]

Over the years, collaboration has built a technical foundation and shared understandings that have led to agreement about how a TMDL might be written and implemented. When Oregon had to write TMDLs for portions of the watershed, the participants agreed that there should be only one TMDL for the watershed, and that it should be narrow in scope. They selected water temperature as the limiting factor in providing habitat for salmon and thus the one variable to be addressed by the TMDL.[156]

Links Between Planning and Action

SIPs have two powerful features which TMDLs lack: sanctions if states submit unacceptable plans and links between SIPs and other key regulatory mechanisms including land use.

SANCTIONS

SIPs can trigger sanctions that are powerful enough to foster substantial local debate, and sometimes, significant local action. The Clean Air Act provides that states unable to submit an acceptable SIP cannot receive federal highway funds.[157] State transportation agencies must submit Transportation Improvement Plans to the U.S. Department of Transportation in order to obtain federal transportation funds. And the Transportation Equity Act for the 21st Century (TEA21) provides that a state's TIP must be in "conformity" with its SIP.[158]

On paper, the conformity requirement is a powerful tool. In practice, the transportation planning process has a great deal of technical and political momentum which Metropolitan Planning Organizations (MPOs) and state environmental agencies cannot easily stop, or even deflect. Transportation plans take years to prepare, and make extensive predictions for the future. They forecast patterns of development and the demand for highways and other transportation facilities; they describe construction and maintenance projects to meet that demand; and they document who will pay for the projects. Those are highly contentious issues involving large sums of state and local money, as well as many private, local, and state decisions about land use.

The first round of decisions about TIP-SIP conformity under ISTEA and TEA21 occurred in the late 1990s. Research by Arnold Howitt and Elizabeth Moore in 15 major metropolitan areas found that state air-quality agencies and MPOs had a difficult time influencing transportation planning. Both had to add significant staff with expertise in modeling transportation demand, and had to build new working relationships with state transportation departments. Thus environmental agencies and MPOs were generally reactive, not proactive, participants in transportation planning.[159]

Momentum has also been on the side of transportation planners at the federal level. Statutes require that the U.S. Department of Transportation decides whether to accept an MPO's decisions about conformity. Howitt and Moore report that in practice, the Federal Highway Administration has led that review, working closely and generally agreeing with EPA and the Federal Transit Administration. However, since the Federal Highway Administration has offices in every state, it has generally been far more directly involved with MPOs and state decisions than has EPA.[160]

The conformity rules also provide for extensive public participation. The Surface Transportation Policy Project, a relatively well-financed and sophisticated national organization, works closely with local groups to encourage federal and state transportation departments to build more mass transit and write plans that will protect air quality. Howitt and Moore, however, report that such advocates have played key roles in only a third of the regions. In several regions, they have been so discouraged by the complexity of the TIP-SIP-conformity process that they have ignored it, directing their energies elsewhere.[161]

In most metro areas, the media and top state and local officials have paid little attention to the TIP-SIP-conformity process, reacting only when federal highway funds are threatened as a result of disagreements among agencies.[162]

The sanctions for not writing acceptable TMDLs are far weaker. EPA can write TMDLs when it finds that a state's drafts are unacceptable. And the agency can withdraw state authority for administering Clean Water Act programs and cut off federal funds. But since EPA lacks

authority to regulate nonpoint sources, throwing out state TMDLs would mean that EPA would have less authority and less money than state agencies to achieve the goals of the Clean Water Act.

Nonetheless, EPA and Congress could create incentives for strong state TMDL programs. The federal government invests more than $4 billion annually in cost-sharing programs for farmers and other landowners. Congress and the U.S. Department of Agriculture have already made some adjustments to these programs to target subsidies to actions that would have the biggest environmental benefits: they could add explicit links to TMDLs. EPA could enforce its suggestions that states similarly target 319 funds for nonpoint source cleanup. In addition, Congress might link state TMDLs to bigger pools of federal funding such as income-support payments for farmers, but agricultural interests would resist that strongly.

EPA could also encourage states to link the TMDL process to funding decisions by giving local collaborative processes important roles in writing TMDLs. Those processes might build agreement on how to spend available monies.

LINKS TO OTHER REGULATORY PROCESSES

NAAQS and SIPs trigger other regulatory requirements besides SIP-TIP conformity. In regions that do not meet NAAQS, new sources of air emissions must comply not only with detailed, industry-specific emission standards (new source performance standards) but must also install "reasonably achievable control technologies" for all sources. New and expanding industries may emit significantly more of the six pollutants covered by NAAQS only if they compensate by offsetting reductions in other sources. In regions that are pristine, such as national parks and wilderness, new sources must comply with comparable regulations for "prevention of significant degradation" in air quality. SIPs do influence key decisions about air quality, but their most powerful impacts are probably indirect—through NSPS, RACT, and PSD technology-based regulations for specific industries.

SIPs also encourage states to address air-pollution problems not directly regulated by EPA. In some regions, states have developed voluntary or regulatory programs to reduce emissions from small sources, and they have tried various strategies for cleaning-up vehicle emissions, or even slowing the steady growth of vehicle-miles-traveled. EPA develops methods to quantify the air-quality benefits of such measures so states can get "credit" for them in modeling to determine whether their SIPs meet air-quality standards.

There are also links—weak but well targeted—between SIPs and local land use decisions. One of the strong points of the SIP process is that SIPs make sense geographically. States prepare SIPs for metropolitan regions where air-quality problems are concentrated. By statute, metropolitan planning organizations (MPOs) play a central role in decisions about SIPs. Regional councils of governments, which are controlled by local elected and appointed officials, manage most MPOs. That link provides a bridge to bring land-use issues into transportation and air-quality planning, even though local officials generally guard vigilantly against any weakening of their control over land use.

There are also institutional paths to address interstate air-quality problems. EPA and states have formed multistate entities to negotiate agreements about interstate air-quality issues, and they would have to work out ways of enforcing any agreements. Such efforts are always difficult, but have had some measure of success. In the early 1990s, for example, state environmental agencies formed a multistate consortium, the Ozone Transport Assessment Group (OTAG), to develop better methods of measuring the movement of air pollutants from the Midwest to the East. OTAG successfully accomplished that task, but was unable to negotiate an agreement among states about how to share responsibilities for cleanup. So the final decision was left to EPA—and to the courts.

In contrast, the Clean Water Act provides few links between TMDLs and other regulatory processes. Congress could make specific provisions for tougher regulatory requirements for point sources, nonpoint sources—or both—for water bodies that do not meet water-quality standards. Congress has directed that some USDA funds for conservation be targeted to high-priority watersheds, but it is up to states to make an explicit link to TMDLs. Several of the states that have enacted enforceable requirements for nonpoint sources have targeted the most stringent regulations at high-priority areas like estuaries, wild and scenic rivers, and impaired waters.[163]

Neither the Clean Water Act nor EPA's new TMDL regulations provide for any mechanism to connect TMDLs with interstate water-quality issues or with land-use decisions. Once again, it is up to states to make the link. Eventually, EPA and the states may find it useful to establish a similar body to address interstate water pollution issues—possibly to design a strategy to clean up the "dead zone" at the mouth of the Mississippi River, for example. So far, EPA has shied away from linking TMDLs to interstate issues in the Mississippi drainage, hoping that cleaning up all of the smaller tributary watersheds would eventually restore life to the dead zone, and address other downstream water-quality problems as well.

In any event, the TMDL process faces an uncertain future. Although EPA has enacted regulations to drive the program, there is no guarantee that the regulations will work effectively. Indeed, without tough sanctions and without well-developed links to other regulatory processes or to state and local decisionmaking systems, the program could founder under the weight of inadequate data, weak models, and environmental complexities.

On the other hand, the example of the Grande Ronde TMDL suggests that the regulations just might work in watersheds where citizens and agencies have built good working relationships on watershed issues.

Civic Approaches to Watershed Protection

For decades, the federal government has made attempts at comprehensive watershed management. In the 1930s, for example, the Water Quality Board within the National Resources Council developed a national template for comprehensive watershed planning. From the 1950s through the 1970s, the Interior Department supported planning councils for major water basins, usually those affecting multiple states. With the exception of the Tennessee Valley Authority, however, which implemented a broad program of dams, power generation, soil conservation, education and social development, most of the proposals have not gotten far beyond planning.[164]

The 1972 Clean Water Act continued those efforts with its new requirements for comprehensive watershed planning, including the Section 208 process led by multicounty planning agencies. But lacking statutory authority and political clout, most planning agencies were able to do little to implement the 208 plans, so the plans have, for the most part, lain fallow. Congress, EPA, and most state environmental agencies eventually lost interest in comprehensive planning, putting their resources toward technology-based regulation of individual sources, as well as subsidies for wastewater treatment plants.

The 1987 amendments to the Clean Water Act created three new watershed programs at EPA. The Great Lakes and Chesapeake Bay programs were formal federal-state efforts.[165] The amendments also created the National Estuary Program, which has provided substantial EPA grants for comprehensive, intergovernmental multiyear planning in 28 estuaries.

In the 1990s, a new wave of "bottom-up" watershed efforts emerged around the country. Some were truly grassroots programs, organized and led by citizens, local officials, or nonprofit groups. In many cities, business, civic, and elected leaders have tried to spark economic development by cleaning up downtown waterfronts and industrial areas. In the suburbs and the country, too, citizens have organized such efforts to improve the quality of life.

Other bottom-up efforts have taken a more aggressive approach, working to build agreement among differing local groups—even if it means redefining issues and challenging policies and programs of governments. Indeed, many of the grassroots programs began as reactions to bureaucratic failures to address problems, or as confrontations between regulators and local interests about new regulatory proposals. Thus independence from agencies is a hallmark of many such collaborative actions. (The 1997 Academy report on EPA included a case study of a grassroots effort in Montana that persuaded the state legislature to let it resolve local watershed disputes, but which refused public funds for its work, getting its support from a philanthropic foundation.)[166]

Such efforts have been particularly widespread in the Rockies and Pacific Northwest. Some have sought to resolve conflicts about salmon or other endangered species. Others began when state fish and game departments tried to set aside waters for in-stream flows to protect fisheries. Some arose when conservation-minded individuals moved into ranching, logging, and mining communities, and began pressuring the Forest Service, the Bureau of Land Management, and other federal agencies to enforce the requirements of environmental statutes passed in the last 30 years. Rather than divide their communities, some new arrivals and long-term residents searched together to craft compromises.

Other civic watershed-protection efforts have emerged from government agencies themselves. State and federal field staff have often taken the initiative to establish new mechanisms for working collaboratively across agency lines and with citizens. And a few states—notably Massachusetts, Oregon, and Washington—established watershed councils that included representatives of various stakeholder groups, as well as front-line staff from multiple agencies.

For this project, the Academy commissioned research teams to assess 17 different civic watershed efforts. Three teams studied eight local- and state-led efforts in relatively small watersheds (from 32 to 250,000 square miles). The cases illustrate the different ways that such attempts at watershed protection emerge and influence events:

Caron Chess and Ginger Gibson of Rutgers University studied a small basin in the New Jersey suburbs outside New York City:

Navesink River, New Jersey. The study examines a 15-year effort to reduce polluted runoff from horse farms and new developments, as well as to reduce pollution from marinas and boats, so that the state could re-open shellfish beds for commercial use. The project began with an agreement between the EPA regional administrator and the state environmental commissioner to invest discretionary funds to demonstrate how regulators could work cooperatively with agricultural interests. A state employee worked in the area for years and encouraged a host of local initiatives. Six local towns set up a joint committee, and their officials, along with county health staffs, local nonprofit groups, and individuals, took leadership roles. The results included tougher local zoning ordinances, a prohibition on discharges of waste by boats, cost sharing of improved farm management practices and marina pump-out stations, and the opening of shellfish beds.[167]

Stephen Born and Kenneth Genskow of the University of Wisconsin at Madison studied six local efforts in Washington, Wisconsin, and North Carolina, as well as state efforts to promote collaborative watershed action: [168]

Dungeness Watershed, Washington. After conflicts between farmers and the Jamestown S'Klallam tribe about irrigation, fishing, and endangered salmon, a county commissioner organized a collaborative process, led by a local agricultural extension agent. That led to a series of formal and informal teams, studies, and organizations; state funding; the creation of an educational center; various restoration projects; and an agreement to protect salmon in dry periods by reducing irrigation.

Nisqually River, Washington. After litigation between a municipal wastewater treatment system and the Nisqually tribe about water withdrawals and fishing of endangered species, the local state legislator had the state environmental agency write a "stewardship plan" for the river. The plan sparked the formation of five affiliated organizations, including a collaborative, nonregulatory planning group, a land trust, an educational project, an interpretive center, and a citizens group. The groups have addressed fisheries, shellfish, habitat, runoff, aesthetic problems, and other issues.

Tomorrow-Waupaca Watershed, Wisconsin: A local landowner who was an active member of Trout Unlimited became concerned about erosion and sedimentation in a fishing stream that runs along her property. Finding no single agency was responsible for the overall welfare of the river, she formed a citizens group, which learned how fertilizers and manure from farms were degrading water quality. The group lobbied for a state appropriation for a special planning effort. State agencies brought other issues into the effort: that farm fertilizers and pesticides were seeping into the groundwater and would eventually contaminate wells and streams as well. As a result, the state has spent almost a million dollars on cost sharing of best management practices on farms, streambank protection, and stocking wild trout.

Black Earth Watershed, Wisconsin: A local chapter of Trout Unlimited, which had organized many conservation projects along the stream, invited the state agency and faculty from the nearby state university to conduct a comprehensive study. The university group worked with county extension agents and the U. S. Department of Agriculture's Natural Resources Conservation Service (NRCS), and cooperated with a broader emerging citizen group. When a large landfill was forced to close, those participating in stream cleanup pushed for regulations and cost-sharing programs to reduce polluted runoff from farms and expanding suburbs.

Upper Little Tennessee River, North Carolina. A local resident who was a fisheries biologist organized a conference convened by a small town, a citizens group and the Tennessee Valley Authority. That meeting led to creation of a non-advocacy conservation organization, which has worked with NRCS, a local power utility, and others to organize projects to reduce polluted runoff from farmlands.

Long Creek, North Carolina. In response to fish kills, contamination of drinking water wells, and concern about water quality in the watershed for a small town's water supply, the county organized a citizens commission. It works with the extension service and a local resource conservation district to organize water-quality monitoring, education and outreach, and cost sharing for best management practices on farms.

Mark Imperial of Indiana University and Tim Hennessey of the University of Rhode Island studied a state-local effort in a small watershed in Rhode Island:[169]

Salt Ponds, Rhode Island. The state coastal zone management program provided funds to the state university to write a management plan for nine small ponds inside a strip of barrier islands. The resulting plan led to tighter local zoning regulations to protect wetlands and groundwater, extension of sewage lines, and state review of local decisions about developments near the water or over a certain size.

How Civic Efforts Work

As those brief vignettes illustrate, each civic watershed effort has a unique story. Each of the Academy's research teams asserts emphatically that no template fits every case. Indeed, the key to success is for participants to design a collaborative process that fits local environmental issues, institutions, history, and personalities. As Table 4-4 demonstrates, however, there are some common elements.

TABLE 4-4: COMMON FEATURES OF COLLABORATIVE WATERSHED PLANNING

SCIENTIFIC, RATIONAL

Geographic scope: focuses on systems and subsystems (watersheds and tributaries);
Information base: relies on inventories of scientific and technical information about watershed resources;

COMPREHENSIVE

Goals: sets broad, ecosystem-oriented goals as well as economic and sometimes social goals;

PARTICIPATORY

Organizational links: includes intensive efforts to engage nonprofit, civic, and sometimes private sector organizations as well as to coordinate multiple agencies and levels of government;

Decisionmaking style: engages leading citizens and agency officials in voluntary efforts to build mutual understanding and agreement about goals and activities;

Tools: uses a wide variety of tools to engage participants and motivate action, including market incentives, regulations, social pressures, and education.

ADAPTIVE

Activities: works incrementally, relying on monitoring and assessment to adjust activities to changing conditions and to lessons learned.

Source: Adapted from Born and Genskow, 3, with elements from Chess and Gibson, 79. For a similar framework, see Adler, Straube and Green, 9.

At the heart of many successful watershed efforts are formal collaborative processes that bring together representatives of agencies, landowners, and citizens. Formal collaboration is important for two reasons. The first is that key interest groups may not share the same knowledge about environmental problems or about underlying economic and social interests. Structured collaborative processes are ways to bring the leaders of various interest groups to the same level of understanding.

The second reason is the deep differences of opinion that often exist about how to allocate the responsibilities for reducing runoff, or for protecting habitat and ecological balances. Regulated parties, such as wastewater treatment plants and large industries, may argue that they have already paid to meet their own permit requirements, and should not have to cover the cost of reducing nonpoint pollution caused by the practices of unregulated businesses. Unregulated parties, including farmers, real estate developers, and small landowners, may resist regulation and pressure to change their practices. A carefully designed and well-managed collaborative process may yield an agreement about how to allocate costs and other burdens fairly.

The basic rules for collaborative decisionmaking apply to watershed-level efforts. Formal collaborative processes bring together a small number (usually between 10 and 50) of representatives of different interests, responsibilities, and points of view. Often each group or agency represented starts with a more-or-less fixed position about what should or should not happen next. One way to find common ground is to shift the discussion from current positions to shared goals. If participants can agree on specific goals, they may then be able to agree on how to achieve those goals—and thus modify their positions.

Collaborative processes in watersheds usually work as follows: [170]

Crisis: Collaborative processes often work best when there is a crisis that threatens a number of parties. In some cases, a pending agency decision—e.g., a TMDL, a effort to make a point source spend significantly to bring it into regulatory compliance, or the listing of an endangered species—provides the crisis. Representatives of the interested parties will usually participate only if dropping out would threaten their interests.

Inclusion: The processes will not be successful unless the participants include representatives of all interests that might veto the implementation of an agreement. But there are some groups that often cannot participate easily in local collaborative processes. Poor people, minorities, and new arrivals in communities may be left out, for example, and national environmental groups often lack the resources to participate in local processes. A small grant by EPA, the relevant state environmental regulator, or another public agency for travel costs and technical assistance to such groups can sometimes help involve those who might otherwise not be included. Small grants to hire a professional facilitator may also help.

Rules: Collaborative processes function best if they have a clear set of rules to guide their discussions. In addition, agency staff can help participants by explaining the formal procedures and substantive rules of governments, as well as by demonstrating informal ways to make the system work.

Communication: Each of the participants should have an explicit strategy for keeping in touch with peers or home agencies, as well as "permission to negotiate," to assure that the constituencies they represent will agree to the results of collaboration. To foster broad community interest in reaching agreement, collaborative groups also need an explicit strategy for keeping in touch with the general public.

Time: It usually takes a great deal of time to build the trust and mutual understanding necessary for agreement on shared goals—and on strategies to meet those goals. But deadlines are also helpful: otherwise participants may tire and drop out. Some groups can muster the internal resolve to set their own deadlines, but often agency processes create the pressure to come to agreement. Of course, if agency deadlines are too tight or too distant, they can derail local negations.

Local or regional watershed processes are intensely political processes: not in the partisan sense, but in that a mix of public interest and legal schedules drives them. They become forums for bringing better technical information into the political process and management decisions.

Watershed efforts do not function as a rationally designed engineering or legal process, however, but as turbulent democracy at work. The enthusiasm and energy of citizens ebbs and flows. Under the leadership of a charismatic leader, or in response to a dramatic event, volunteers may galvanize for "victory." But following a win, they may become weary, may even be happy to turn over leadership to agency staff once a collaborative effort comes to agreement about goals and priorities. At that stage, it may be wise to let a formal collaborative process become dormant. If the problems in a watershed are complex and conflicts are deep, however, it may take a series of collaborative efforts to make significant progress.

Agency involvement also ebbs and flows. Chess and Gibson report that the process in the Navesink watershed in suburban New Jersey ran in reverse from that in Tomorrow-Waupaca: top agency officials started the effort, but citizens and local officials took over.

Federally Supported Watershed Management Efforts

The research teams also studied nine efforts organized under federal authority in larger watersheds.

Imperial and Hennessey studied four National Estuary Projects, as well as a unique federal-state effort at Lake Tahoe. EPA's National Estuary Program (NEP) provides between $4 million and $10 million for four to five years of scientific research and planning for each project, all of which involve many federal, state, and local agencies, as well as user groups, scientific experts, and other interested parties. The result is a comprehensive conservation and management plan, which covers the full array of issues confronting the watershed in question. EPA approves the plans and then provides small continuing grants to the sponsoring organization, but does not provide special funding for implementing the plans.

Delaware Inland Bays, Delaware. One of the first participants in NEP, Delaware Inland Bays cost about $2 million. It focused on nutrients from the poultry industry, stormwater runoff, septic systems, and sewage treatment plants. At the last minute, however, the agricultural industry refused to endorse the plan, and EPA reluctantly agreed to accept a less aggressive draft. The Delaware legislature then converted the planning body into a nonprofit organization, which is a neutral convener of discussions about water-quality issues. The nonprofit has helped the state environmental agency develop TMDLs for nutrients that have won general acceptance.

Narragansett Bay, Rhode Island. Narragansett Bay was another of the first participants in NEP. The program cost EPA $11 million, and it took seven years to conduct scientific research and write an exhaustive plan that contained more than 500 recommendations: and that would cost an estimated $392 million to implement. The

state environmental agency is working on many of the plan's ideas, but the research team reports that the plan is generally ignored, and that the planning process was so difficult that it retarded rather than promoted cooperative problem solving.

Tampa Bay, Florida. The project at Tampa Bay is one of the most successful NEP efforts. Building on earlier state and regional planning, it forged an agreement among local governments for specific measures to reduce pollution from wastewater treatment plants, reduce nutrients, and grow more seagrasses. Key local governments established a new organization under the state joint powers act to oversee implementation. The commitments to reducing nutrients were accepted by EPA as a TMDL.

Tillamook Bay, Oregon. Tillamook Bay is a recent NEP effort built on a long series of other planning efforts led by federal and state agencies. Thus the planning was relatively free of conflict. The management plan addressed such difficult issues as nutrient and bacterial runoff from the watershed's many dairy farms, sedimentation from farms and timberlands, degradation of shellfish beds, and endangered salmon. The county established a new "partnership" organization to oversee implementation of the plan's goals and projects, which have begun to attract federal and state funding.

Lake Tahoe, California-Nevada. A federal-state compact created a regional planning authority with regulatory authority over land use and environmental issues. After a great deal of controversy, the authority adopted a plan that included some tight regulations. Since 1987, citizens, the business community, and the authority have tightened regulations, organized a bus system to reduce air pollution and traffic, and developed a plan for $900 million of actions to protect water quality and other environmental values.

Robert Adler, Michelle Straube, and Heather Green studied what they call the oldest continuing operating effort in the country to address nonpoint pollution.

Colorado River Basin Salinity Control Program. Since 1972, the United States has agreed that 1.36 million acre feet of water with no more than about 115 ppm of salts would flow into Mexico in the Colorado River. Almost half of the salinity comes from natural sources; most of the rest is from irrigated agriculture or evaporation from reservoirs. The project began as a federally controlled public works effort. The Bureau of Reclamation spent $120 million on a desalination plant that has never been operated because small salinity control projects upstream have made sufficient reductions. Congress has appropriated almost half a billion dollars for such projects, including between $9 million and $50 million in recent years to three federal agencies. States participate in the projects and oversee activities through two councils, but there are no provisions for formal participation by other parties.

They also evaluated three newer large ecosystem restoration projects that are much more collaborative in character, comparing them with the key features of the Colorado River Basin Project:

Central and South Florida Project. A U.S. Army Corps of Engineers project is the centerpiece of federal-state efforts to restore the Florida Everglades, a vast area in Florida that includes a national park, a wildlife refuge, as well as extensive state, tribal, and private lands. The project is part of the settlement to an unusual lawsuit by

the national park and refuge, charging Florida with failure to apply its own water-quality standards to runoff from large privately owned sugar cane farms. The Corps has proposed $8.3 billion of modifications to an extensive system of canals it built 50 years ago to drain private farmlands and to protect the coastal cities and suburbs of South Florida from floods. Many state and federal agencies participate in various committees overseeing the Corps' work and related projects. Congress and Florida have set aside substantial funds for the CS&F and other restoration projects, but far from the full $8.3 billion.

Chesapeake Bay Program. The Chesapeake Bay watershed reaches into seven states, three of which have participated actively in the program under a formal agreement with EPA and the District of Columbia. Each of the three states agreed to reduce nutrients flowing into rivers and thence to the bay by 40 percent by 2000. Congress provides about $19 million annually to the program, supplemented by state funds and such other measures as states decide to take.

CALFED Bay-Delta Program. The CALFED program is an interagency, federal-state-local effort to protect water quality, endangered species, and habitat in the Sacramento River Delta, which lies downstream from California's vast Central Valley and just upstream from San Francisco Bay. Agriculture, mining, logging and urban development in the Central Valley and in the delta itself contribute to poor water quality in the area. In addition, extensive irrigation and levees for flood control have changed the flow of water. CALFED has developed a plan for restoring the ecosystem in the delta, and has already spent $177 million of state and federal money on restoration activities.

Comparing Civic and Agency-Led Collaborative Efforts

While the Colorado River Basin Salinity Control program is a traditional public-works project, the other agency-led collaborative processes have a great deal in common with bottom-up civic watershed efforts.

There are important differences, however. One concerns the size of the watershed. The larger a watershed, the harder it is for citizens to lead. Collaborative processes depend on regular face-to-face contact, and time constraints and distance interfere with such interaction. Thus, citizen-led efforts usually focus on small watersheds, perhaps less than a hundred miles long in rural areas, even smaller in more congested areas. In larger watersheds, agencies often dominate the process of collaborative planning, perhaps along with a well-funded, professional advocacy group like the Chesapeake Bay Foundation.

The scale of the watershed thus shapes the kind of planning and problem-solving approach that may work best. Where problems and solutions are local, a collaborative process may succeed; where problems are larger or involve more interests, government agencies may need to take a stronger hand.

One of the biggest challenges of watershed management is designing an institutional system—a political jurisdiction or set of jurisdictions that can act on problems—to fit the natural system of a watershed. As the Chesapeake Bay Program illustrates, some watershed efforts are "nested." That is they include both citizen-dominated efforts for small tributaries and agency-led efforts for the larger watershed. In such cases, the agency-led efforts set broad goals and policies with input from the collaborative processes for tributary streams, coordinate agency regulatory processes, mobilize funding for restoration and cleanup, and marshal resources for

research. Meanwhile tributary-level efforts involve volunteers, try to influence broader watershed goals, obtain their shares of funds and other resources, shape local government policies, and meet their shares of watershed-wide goals.

If they are successful, both agency-led and citizen-led efforts develop a kind informal authority. Successful collaborative citizen-led processes have no legal authority, but they may accumulate moral authority. Participants learn to respect one another's individuality and values. Ideally, the participants also gain stature in the community for their hard work and leadership, while the organizations they represent accrue credibility as well.

Agency-led watershed efforts may generate similar informal authority. Working relationships among front-line agency staff may become powerful forces for agreement and action. Imperial and Hennessey report that in some of the watersheds they studied, the recommendations of a formal multiagency planning process became social norms that governed the behavior of local officials and their agencies.

In addition to informal authority, political backing and legal authority are important to both agency-led and citizen-led efforts. Some citizen-led efforts seek formal recognition from their legislature or from an executive branch agency. It can also be helpful for a top elected official to "sponsor" local collaborative efforts: encouraging them, earmarking small amounts of public funds for planning and start-up projects, and ensuring that agency managers and lawyers give front-line staff sufficient latitude to custom-design local agreements.

Strong support from top elected officials also helps agency-led efforts. In the Everglades, front-line experts from federal and state agencies, as well as from universities and well-financed, professional environmental advocacy groups, came to an informal consensus about what needed to be done to protect the ecosystem from nutrients. That informal agreement developed a powerful informal authority. The start of meaningful interagency discussions came when the state's governor told his lawyers to back off litigation and leave the issue to the experts. The result was a formal collaborative process among agency staff that eventually led to the design of the Everglades restoration project.[171]

Thus if collaborative efforts are successful, they can develop powerful political and bureaucratic momentum. They can mobilize political commitments by elected officials, set new agency policies, change agency practices and procedures, influence landowner practices, and arouse an interested citizenry. They can create a context in which TMDLs and other regulatory requirements might work.

Civic Watershed Efforts Can Improve the Environment

Agency staff and environmental advocates who are comfortable with traditional regulatory practices are often skeptical about collaborative civic processes. The words of a former state agency official about the civic action devoted to cleaning up the Navesink River summarize that feeling:

> It's a buzzword . . . Show me where EPA is enforcing. Show me the building bans [when municipalities reach the capacity of sewage treatment plants]. Even with the new ways of doing things, you can't forget the municipalities only do what they have to do.[172]

The Academy panel directed its research teams to identify watershed efforts that were reported to have produced positive environmental results. In most cases, the researchers found significant environmental improvements, beyond what would have happened through traditional regulatory programs alone.

TABLE 4-5: SUMMARY OF CASE STUDIES

WATERSHED /PROGRAM	POPULATION SIZE/ WATERSHED AREA	PROBLEM	POLICY CHANGES AND ENVIRONMENTAL OUTCOMES
Delaware Inland Bays (DE)	133,100/ 300 square miles	Nutrients from poultry farms, septic systems, stormwater, and sewage treatment; habitat loss from development.	• Agricultural BMPs implemented • New sewers: $158 million • 1592 acres of land acquisition: $13 million • 37,594 acres of farmland preservation • 60,000 acres of farmland conservation planning • 1 point source removed • water use plan, TMDL, and tributary strategies developed.
Narragansett Bay (RI, MA)	2,000,000/ 1,600 square miles	Sewage treatment, sewer overflows, failing septic systems, sediment contamination.	• Whole state designated "no discharge zone" for recreational boating
Salt Ponds (RI)	32,000/ 32 square miles	Nutrients from septic systems, sewage treatment plants, and stormwater.	• Prevented development on undeveloped barrier beaches. • Required higher density requirements in large developments, buffer zones and setbacks, • Coordinated state/local review of development projects • Consistent state/local priorities for investment in infrastructure.
Lake Tahoe (CA, NV)	53,000/ 501 square miles	Nutrients from stormwater runoff; sediment erosion and habitat destruction from development.	• BMP retrofit program encouraged homeowners to install NPS controls • Coordinated transit system and implemented redevelopment projects • Proposed an Environmental Improvement Program: 1018 actions, $900 million
Tampa Bay (FL)	2,000,000/ 2,300 square miles	Nutrients from stormwater runoff, sewage treatment, phosphate mining, fertilizer production. Habitat loss.	• Established 11 measurable goals for nutrient reduction and habitat restoration • 41 action plans developed that are expected to exceed goals. • Established collaborative monitoring program, Florida Yards and Neighborhoods program, and developed Boaters Guide to Tampa Bay. • Created Tampa Bay Estuary Program, a partnership of six local governments to manage over 200 actions identified in the action plans.

TABLE 4-5: SUMMARY OF CASE STUDIES (continued)

WATERSHED /PROGRAM	POPULATION SIZE/ WATERSHED AREA	PROBLEM	POLICY CHANGES AND ENVIRONMENTAL OUTCOMES
Tillamook Bay (OR)	17,000/ 570 square miles	Closed shellfish beds and threat to salmon from bacterial contamination; sedimentation from dairy farms, septic systems, stormwater runoff and forestry.	• Habitat restoration projects and BMPs implemented in Tillamook State Forest and on agricultural land. • Specific targets established for nutrient reduction. • Created Tillamook County Performance Partnership
Navesink River (NJ)	95 square miles	Coliform bacteria from agricultural and urban runoff, and boats.	• Opened 600 acres of shellfish beds. • Stricter requirements imposed on some new developments. • Agricultural runoff reduced with federal assistance of $1.2 million in cost shares to landowners for BMPs • River designated as "no discharge" area for boats; pumpout stations installed in marinas.
Dungeness River (WA)	15,000/ 260 square miles	Water allocation, land conversion, sediment, bacteria, irrigation and agricultural runoff; threats to salmon and shellfish beds.	• Special trust water rights created to protect salmon based on agreement by irrigators to limit water withdrawals for irrigation during periods of low flow. • Habitat restoration projects developed and implemented • Research and public education conducted via Dungeness River Natural History Center • Dungeness River Management Team formed – a partnership among 13 stakeholder groups and intergovernmental agency representatives that generated substantial funding.
Nisqually River (WA)	722 square miles	Development, agriculture, forestry, land and stream modifications; threats to aesthetic values, salmonid habitat, water quality, and shellfish beds.	• Land trust facilitated sale of land to public utility for mitigation measures to protect riparian conservation corridor. • Wastewater treatment plant used innovative process for reclaiming all of its effluent • BMPs adopted throughout watershed

TABLE 4-5: SUMMARY OF CASE STUDIES (continued)

WATERSHED /PROGRAM	POPULATION SIZE/ WATERSHED AREA	PROBLEM	POLICY CHANGES AND ENVIRONMENTAL OUTCOMES
Tomorrow and Waupaca Rivers (WI)	13,000/ 300 square miles	Nutrients, ground-water contamination, sediment, and degraded habitat from agriculture and urban development; threat to coldwater fishery.	• Changes in agricultural management practices led to drop in phosphorus and sediments running into streams by 21 percent and 12 percent, surpassing 10 percent reduction goals. • State funding used to pay for land use planning that resulted in a significant reduction of stormwater problems and increased citizen understanding • Habitat improvements carried out along a mile of river
Black Earth Creek (WI)	100 square miles	Nutrients, sediments, and habitat degradation from urban and rural sources.	• BMPs totaling $2.5 million installed by 108 landowners • Acquired wetland and riparian corridors and carried out instream improvements • Prevented further degradation of water quality and sustained coldwater fishery in the face of population and economic growth. • Formed regional bi-county sewage treatment commission
Upper Little Tennessee River (NC)	28,000 full-time residents, up to 50,000 during summer/ 450 square miles	Sediment, urban and agricultural runoff, streambank erosion; threats to endangered species	• Planted trees, installed fencing, restored and organized cleanups along various segments of riverbank; also subsidized agricultural BMPs and conducted volunteer monitoring • Measurable increases in wildlife and decreases in siltation. • Residents formed a land trust to carry out land acquisition; high landowner acceptance
Long Creek (NC)	68,000+/ 62 square miles	Agricultural and urban runoff, streambank erosion; sediment, nutrients, and bacteria.	• Assistance to farmers who installed 1270 BMPs; agricultural erosion reduced by 60 percent, nitrogen by 10 percent, and phosphorus from four dairies by 70 percent. • Construction of wetland, and restoration of a reach of urban riparian corridor

TABLE 4-5: SUMMARY OF CASE STUDIES (continued)

WATERSHED /PROGRAM	POPULATION SIZE/ WATERSHED AREA	PROBLEM	POLICY CHANGES AND ENVIRONMENTAL OUTCOMES
Colorado River Basin Salinity Control Program (CO, WY, UT, NM, AZ, NV, CA)	250,000 square miles	Salt loading from inefficient irrigation, erosion from development, and water diversions for increased consumption, and point sources.	•Initially implemented irrigation improvement projects, then on farm improvements in water delivery which had 100-percent farmer participation • Introduced market based open bidding approach for selecting salinity control projects. • Comprehensive program to control salinity from BLM lands (35% of the basin). • Colorado River Salinity Control Forum established among the 7 basin states, adopted and maintained uniform salinity standards, preventing further degradation in the face of population and economic growth.
San Francisco Bay-Delta Program (CA)	N/A.	Mining, wastewater treatment, urban and agricultural runoff; effects of land use and water diversions on water quantity and distribution; threats to endangered species	•Funded more than 173 restoration projects totaling approximately $177 million
Central and South Florida Everglades Program (FL)	N/A.	Alteration of water flows; mercury, nutrients, water shortages, salt-water intrusion; threats to birds, fish and endangered species.	• Strategic plan developed by South Florida Ecosystem Task Force intended to coordinate more than 200 projects focused on restoration. • Comprehensive plan for restoration developed by Army Corps of Engineers and SFWMD with input from federal state local and tribal agencies and academic institutions
Chesapeake Bay Program (DC, MD, PA, VA)	64,000 square miles	Nutrients, wetlands loss, decline of submerged aquatic vegetation, reduced fish populations.	• Ban on phosphate detergents • According to model, 40-percent reduction goal met for phosphorus and will be met by 2002 for nitrogen, but the model' s assumptions have been questioned. • Agreement to a goal of 40-percent reduction of nutrients by 2000, reduction targets for each of the major tributary basins, and more specific performance goals, such as restoration of submerged aquatic vegetation from 70,000 to 114,000 acres by 2005.

In the Navesink River, water quality improved so much that the state could open 600 acres of commercial shellfish beds that had been closed since the 1960s. In addition, local governments imposed stricter requirements on some new developments, enforced some land-use laws more strictly, and passed a new "pooper-scooper" ordinance (domestic animal waste is quite significant in some suburban watersheds). In addition, the state imposed a no-discharge policy on boats, and helped finance installation of pump-out stations at marinas.

In the Dungeness watershed, farmers agreed to limit their withdrawal of water for irrigation during periods of low flows to ensure there would be adequate water for salmon.

In the Nisqually watershed, several hundred acres of valuable riparian lands were purchased by land trusts and state parks; and a local wastewater treatment plant reclaimed all of its effluent so as not to add pollutants to the stream.

In the Tomorrow-Waupaca watershed, phosphorous and sediments running into streams dropped by 21 percent and 12 percent respectively. In addition, there have been "physical changes [that] remove significant stormwater problems and changes in the design of new subdivision developments that reduce stormwater problems" along with greater citizen understanding that could lead to more land use changes.[173]

In the Upper Little Tennessee River, farmers have adopted animal feed- and waste-management systems, changed cropping practices, protected streams and riparian areas with fencing, and planted stabilized vegetation along 15 miles of riparian corridors. The results include reducing agricultural erosion by 60 percent, as well as a 10 percent reduction in nitrogen and a 70 percent reduction in phosphorous from animal waste systems at four dairies.[174]

In the Salt Ponds, new rules prevented development on barrier island beaches and tightened requirements for density in large developments, buffer zones and setbacks, on-site waste disposal systems, and stormwater and erosion control.[175]

In Tampa Bay, local governments have agreed on 105 projects that their models say will reduce nutrient loadings and surpass the goal of returning the acreage of seagrasses to 1950 levels. The governments are also well on the road to exceeding their goal of restoring 1,600 acres of habitat.

The Colorado River has delivered the required amount of water, within the salinity limits established by treaty.

In the Chesapeake Bay, the agreed reductions have been achieved for phosphorous, and will be achieved shortly for nitrogen. EPA and the signatories to the agreement recently adopted new goals for nutrients, other pollutants and for seagrasses.

In the Everglades, the Corps has not yet won approval and full funding for its proposed massive "re-plumbing," but both Congress and the state have dedicated hundreds of millions of dollars to purchase sensitive lands as part of the restoration effort.

The researchers concluded that those results were significant, but cautioned that it is difficult to prove that collaborative processes and interagency coordination were the key factors that resulted in environmental improvements. As is often true in program evaluation, there were no easily comparative cases. Each watershed effort involved a complex mix of activities and relationships, so it was difficult to compare links among the cases, or with watersheds where there had been no collaborative process. During the course of all the efforts, there were many changes in local economic conditions, laws, programs, budgets, and personnel, so it was even hard to compare the before-and-after of individual cases. There were also big data gaps, including data about environmental conditions, agency expenditures, and volunteer activities.

The Academy's research concludes that watershed management approaches—both civic and agency-driven—can produce environmental gains. Measuring those gains is difficult, however, especially in the short term; and proving conclusively that any particular strategy, agency activity, or collaborative breakthrough was the sole cause of a change in water quality is usually impossible. (The Academy panel decided against commissioning studies that would try to set up rigid control situations, or deliver statistically valid answers because it believed such studies of that kind would be very difficult to design, as well as quite expensive.)

Judging the success of watershed efforts solely on the basis of a few months or years worth of water-quality data may be misleading. Some political actions may take many years to produce a measurable impact on water quality; and measurable changes in water quality may have more to do with changing weather or economic conditions than with any underlying change in land use or management.

Furthermore, because science cannot fully model all the interactions in a watershed many changes are inherently ambiguous. Rhode Island's Salt Ponds, for example, cover only 32 square miles, and are one of the most heavily researched shallow lagoon systems in the world, yet scientists do not fully understand how surface water and groundwater interact and what the optimum nitrogen loading might be at the site.[176] So although there are signs of real progress at the Salt Ponds, e.g., tighter controls on land use, no one really knows how effective those measures will be in protecting environmental quality. The same scientific uncertainty that makes policymaking difficult makes program evaluation ambiguous.

Changes in water quality are not the only valuable criterion to use in assessing the success of watershed efforts. The research teams also considered whether the efforts strengthened jurisdictional understanding of local environmental challenges, as well as capacity to take wise action.

The researchers found that most of the efforts they studied did lay the basis for effective long-term, adaptive management. In most cases, Imperial and Hennessey report, watershed collaborations improved the morale, job satisfaction, and efficiency of agency operations. Collaborative efforts led to the creation of governmental and nonprofit institutions that are successfully raising funds for projects, monitoring water quality, helping with cleanups, and educating the public. And in communities with bitter divisions among environmentalists and loggers, ranchers, or farmers, collaboration has helped rebuild communication and trust, which is certainly important both to the participants and to the health of the local political process.

On the other hand, the researchers found examples of collaborative watershed efforts that had not yet proven their long-term worth. For example:

> In Delaware Inland Bays, the second phase of the NEP process has led to agreement on a TMDL, which is reducing nonpoint runoff of nutrients by 40 to 85 percent and atmospheric deposition of nutrients by 20 percent.[177] The state environmental agency is

now working to allocate responsibilities to meet the TMDL goals, however, which may not be easy for both technical and political reasons.

The Long Creek effort in North Carolina is still young, according to Born and Genskow, and depends primarily on funds from USDA and the local conservancy district, rather than on active support in the community. While it has reduced agricultural runoff, "the partnership has not addressed the watershed's major water-quality threats related to urbanization . . ."[178]

Neither did the Upper Little Tennessee Watershed effort face up to land-use issues in its early years. However, Born and Genskow do report that efforts to date have built public interest in watershed protection and "added legitimacy and increased the scope" of the work of the local conservancy district. As a result of a controversy about land use, a citizens group has begun lobbying the county commissioners for zoning changes in flood plains, as well as for new construction standards for rural gravel roads.[179]

Often collaborative processes start slowly, as leaders look for early successes to keep people and agencies involved and excited. The first accomplishments may be small demonstration projects, cleanup or restoration of particularly visible sites on a river or lake, the purchase of a particularly scenic tract of land or conservation easement, or an educational project for students and local citizens. Sometimes such small projects can generate the agreement and energy to lead to larger initiatives. At other times, however, the result is what Imperial and Hennessey call "random acts of environmental kindness," small, unconnected actions that do not address the big issues.[180]

Making Watershed Approaches Work

Which collaborative watershed efforts pay off in long-term, systematic improvements in water quality and which make only a marginal difference? Myriad factors play a part. Not all communities have the social capital—shared concern about environmental conditions, cadre of local leaders, network of relationships, and effective local institutions—to organize an effective collective process. Successful collaborative processes do build social capacity, but they must be based on some shared experiences and beliefs.

The working relationships between agencies and local collaborators are also critically important. To accomplish more than "random acts of environmental kindness," collaborators need access to solid scientific information about local situations, as well as to sufficiently credible data to monitor environmental conditions. They must set significant but achievable goals, which are often driven by regulatory requirements or standards.

Equally important, agencies need to open their doors to working with collaborative processes. Regulators often find that difficult.

Finally, money is important. Agencies and local collaborators need enough money for planning—but not too much—and they need funding to help finance prevention and restoration projects.

Setting Useful Goals

Achieving the next increment of improvements in water quality in most watersheds will require change in how many sectors of the economy use land, which will in turn require changes

in people's understanding of environmental problems, attitudes, and practices. Neither EPA nor most state agencies can—or should—force change of that magnitude, but they can foster change through watershed initiatives. Balancing the political and technical aspects of watershed management is one of the great challenges currently facing public officials.

Watersheds are inherently complex systems, and the new model of watershed management described in this report attempts to acknowledge that complexity, and to deal comprehensively with an individual system as a whole. Narrowing the range of choices, focusing on the most salient goals, describing uncertainty and setting reasonable expectations: those are the skills required of agency leaders and citizens in watershed management efforts. In cases where agencies succeed, they can improve the ability of citizens and voters to make informed political decisions.

Collaborative watershed efforts can lead to major, sustained improvements in water quality and other environmental conditions only if they reach agreement about technically sound on-the-ground changes. EPA and state agencies can improve the chances of success by providing accurate data about water-quality conditions, as well as reliable tools for estimating the impacts of various measures for improving water quality.

Most of the 19 watershed efforts studied focused their activities on a small number of water-quality goals that could be quantified and tracked over time. In some watersheds, scientists are able to identify one or two "limiting factors" that prevent a stream from supporting an important use. For example, cool water is critical for supporting salmon in small tributaries in the Pacific Northwest. Thus rising water temperatures, often caused by streambank alteration, are an obvious indicator of trouble.[181]

In estuaries and bigger rivers, the limiting factor may be nutrients—nitrogen or phosphorous—which stimulate the growth of algae, make the water more turbid, and ultimately, deplete it of life-supporting oxygen. The Chesapeake Bay Program and the Tampa Bay Estuary Project focus primarily on reducing runoff of nutrients and increasing the acreage of seagrasses. In Delaware Bay, the most recent goals are to reduce atmospheric deposition of nutrients and nonpoint runoff of nutrients.

Focusing on one or two narrow goals can be a useful strategy because it simplifies the political challenge of motivating change and communicating results. It can also keep actors focused on a clearly defined set of objectives. For example, the Colorado River Basin Salinity Control Program has focused for almost 30 years on the average annual salinity—the concentration of dissolved salts—at one point in the river. That has provided a stable target and an easy way to set priorities.

The disadvantage of a narrow goal is that it makes it possible for participants in the watershed process to ignore other environmental problems, and/ or to miss opportunities for comprehensive watershed improvements, including economic gains. Then, too, a narrow focus may even encourage adoption of policies that exacerbate other environmental or social problems. In the Colorado River, the focus on salinity drives programs that are indifferent to possible impacts on threatened and endangered species. Adler, Straube, and Green recommend that the program broaden its goals to include endangered species. They do note, however, that projects that reduce salinity also often reduce other environmental problems, such as sedimentation.

Too many goals can be as much of a problem as too few. The Narragansett Bay National Estuary Project was unable to agree on a specific goal and suffered as a result. Imperial and Hennessey report that:

> [T] he final [plan] contained more than 500 recommendations addressing almost every conceivable problem . . . recommendations to coordinate existing policies and activities, develop new policies and plans, prepare legislation and new regulations, enforce laws and regulations, provide technical assistance and public education, make investments in environmental infrastructure, and to conduct monitoring and environmental assessments . . . goals were vague and there were no performance measures.[182]

The researchers reported several different formulas for striking the right balance between complexity and political expediency.

Some of the projects stated their goals in terms of ambient conditions, and many focused on a mix of environmental conditions and technology-specific operating standards, or on particular high-priority problems. In Tillamook Bay, citizens and agency staff had been through so many other watershed planning efforts in recent years that they were eager for action. They developed list of specific goals, including:

> Achieve at least a 25 percent reduction in bacteria and sediment loads to rivers (apparent decreasing trends by 2005; statistically significant results by 2010.)
>
> Protect against decline in eelgrass beds due to degradation or loss.
>
> Manage 67 percent of the watersheds privately held forested riparian areas under endangered species Habitat Conservation Plan standards.
>
> Enhance 500 miles of continuous riparian habitat in the 0-500 foot elevation band to healthy conditions by 2010.
>
> Upgrade 1400 miles of state and private forest roads by 2010.
>
> Construct 18 cow pads to protect livestock in flood-prone areas by 2000.[183]

In many smaller watersheds, citizens insist on setting both environmental and social goals. In such cases, collaboration really begins when environmentalists and agency staff agree that it is important to preserve a strong local agricultural industry, while farmers agree that it is important to protect the environment.

Standards

The research teams generally agreed that regulatory standards could drive collaborative problem solving. But Adler, Straube, and Green who studied the largest watersheds, stressed the importance of legally established water-quality standards as the foundation for goals. The Colorado River salinity goal, for example, is anchored in the granite of an international treaty.

According to Adler, Straube, and Green, the goals of the CALFED project rest on an agreement between the state and EPA about interim water-quality standards, which were adopted in 1994 after years of controversy. As they note:

> Prior to the negotiated standards, it was not possible to make significant investments in restoration, because the end point of restoration efforts was in dispute. This confirms the findings from the CRBSCP and Chesapeake Bay evaluations that consensus decisions on basic program performance standards

> is an extremely important foundation on which to build a more comprehensive program of intergovernmental cooperation.[184]

The researchers are critical of restoration efforts in the Everglades because there is no firm agreement about water-quality goals. The project is preceding more like a traditional public works effort, focused on construction to meet certain technological standards, rather than as a search for ways to meet a numerical goal.[185]

The effort is driven by a court agreement about one performance variable: the concentration of phosphorus in waters that leave a vast area of privately owned sugarcane farms in central Florida north of the Everglades. By 2003, the state of Florida must win EPA's approval for a phosphorus standard, or a court-ordered, default standard of 10 parts per billion will become enforceable. But Adler, Straube, and Green believe that the uncertainty about how the success of wetlands efforts could undermine agreement. They write

> . . . at least during the initial phases of the program, the absence of a numeric water quality standard may be less relevant because the planned controls are more technology-based than water quality-based . . . depending on the success of this treatment method or the state of Florida's future success in adopting a water quality standard less stringent than the federal default standard, it is possible that additional treatment will be required . . . postponing the resolution of this uncertainty until the indeterminate future may compromise timely ecosystem restoration.[186]

Imperial and Hennessey studied somewhat smaller watersheds where many agencies had been working on water-related issues for some time. They describe how agencies may come to agreement on specific goals, and then try to ratify the goals in regulatory processes like TMDLs. EPA did accept the goals and action plan written in Tampa Bay, and it has accepted the goals that the Delaware Inland Bays project wrote. In Tillamook Bay, however, it is not yet clear whether the state environmental agency and EPA will accept the goals and plans as TMDLs.

Improving Data, Improving Decisions

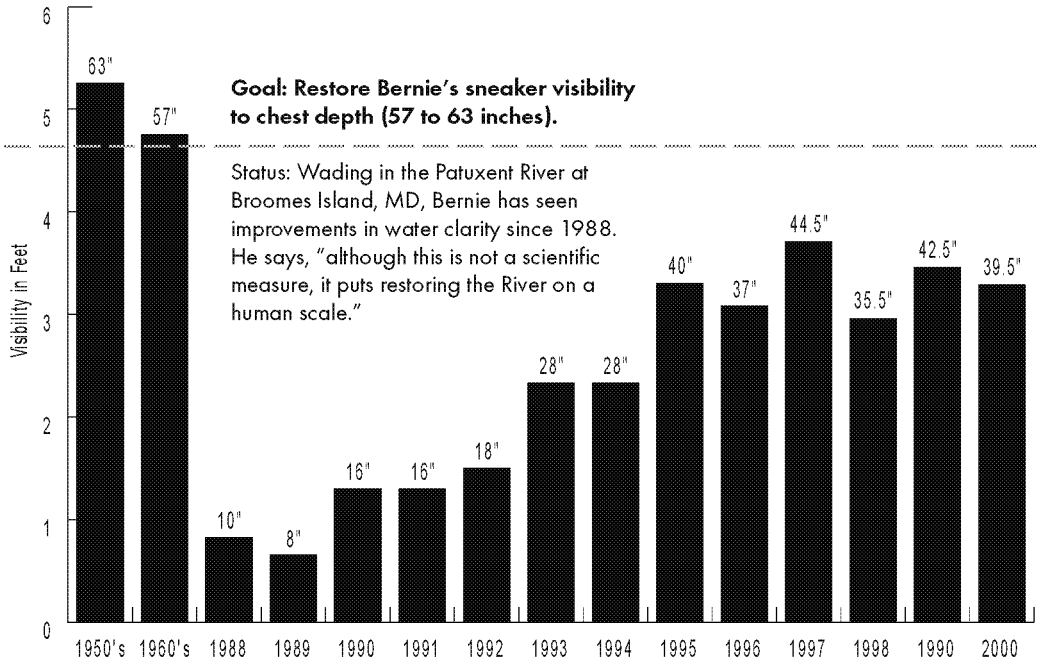
In a successful watershed effort, decisionmakers—including the general public—get frequent updates on their progress toward meeting their goals and objectives. That information keeps people focused on what they are trying to accomplish; the information may also help them revise their goals as they learn more about the way their watershed and economy interact.

Part of EPA's challenge in watershed efforts is helping to develop a set of environmental and management indicators that will inform decisionmakers and be significant to the public. The Chesapeake Bay effort started with the goal of restoring fish and oysters to the bay. Although there was disagreement about why fisheries had collapsed (overfishing? disease? nutrient runoff?), everyone involved wanted to restore a healthy ecosystem. And one indicator of health would be the clarity of the water: a healthy oyster population would filter out turbidity, and perhaps less turbidity would foster a healthy oyster population.

Maryland State Senator Bernie Fowler, who was formerly a commercial fisherman, drew attention to turbidity—which does not generally factor into daily conversation—by creating "the Bernie Fowler Sneaker Index," a public version of a Secchi Disk test. On a fixed day every June, Fowler wades into the Chesapeake Bay at the same spot, announcing the depth at which

his sneakers disappear from his sight. Figure 4-1 indicates his progress toward his ultimate goal: visibility in chest-high water. Fowler's publicity efforts have galvanized people to care about the total ecological health of the bay. And, as discussed earlier, it was the state agency that alerted citizens in the Tomorrow-Waupaca watershed that their water problems went far deeper than sedimentation and fish habitat. Only through the agency's efforts did the general public realize the risks from agricultural chemicals seeping into the groundwater.

FIGURE 4-1: BERNIE FOWLER SNEAKER INDEX



Source: C. Bernard Fowler, 1992-1993 Charlotte Chesapeake Bay Commission; U.S. EPA Chesapeake Bay Program

To tap the energies and political support of citizens and to engage local governments, agencies may organize separate planning and activities around smaller tributary watersheds. In addition, agencies often organize extensive outreach efforts to foster involvement. One of the most productive ways to do that is through volunteer monitoring systems: they are excellent ways to build public support, and to educate the general public about watershed problems and opportunities. In the Chesapeake Bay, for example, volunteers have helped restore seagrass beds, conducted inventories of streamside forest buffers, and prepared a comprehensive assessment of one of the more impaired creeks in the basin. And the Alliance for the Chesapeake Bay's citizen monitoring program,[187] launched in 1985, has 145 volunteers who monitor water quality weekly. Although some legal and technical agency staffers are reluctant to rely on data gathered by volunteers, EPA and many state agencies have developed formal protocols and quality-control procedures to ensure the reliability of that information.[188]

The Role of Science

Bernie Fowler's sneaker index is a demonstration of sound scientific research: he took the science and made it comprehensible to everyone. People now know that it is not just the big Baltimore industries that are polluting the Chesapeake Bay, but runoff from farms and developed areas, as well as atmospheric deposition. Of course, science cannot always count on a meaningful presentation of its results. Scientists themselves must find ways to help decisionmakers understand environmental problems and identify choices for action.

Almost all watershed efforts invested in scientific research to assess problems, help set goals, and monitor progress. For example, Born and Genskow report that all of the six watersheds they studied organized water-quality monitoring efforts, and that four of the six used watershed-scale inventories or modeling. And all the Academy's researchers reported that scientific inquiry and monitoring provided an invaluable foundation for planning and action. In no case, however, did technical information by itself answer the kind of value-laden questions at the heart of most watershed management efforts. Indeed, as Chess and Gibson report "over-reliance on scientific indicators to the exclusion of other concerns may swamp a watershed effort."[189]

To set goals and develop strategies to meet them, decisionmakers have to exercise their judgment. Technical information—whether it concerns the interrelationships of species in a river, information about the hydrology of a watershed, or predictions of economic growth and its impact on environmental stressors—is an essential component of a wise decision. Uncertainty in all aspects of information usually confounds decisionmakers, however. Reducing uncertainty over time through additional research and regular monitoring of conditions strengthens the capacity of the public and their representatives to keep refining their decisions. The specific goals of successful watershed projects are usually based on a mix of scientific information, values, and political calculations.

Then, too, in many of the watersheds studied, there is ongoing controversy about the scientific basis of goals. For example, agencies have been using the same model of flows in the Colorado River Basin for more than 25 years, yet the model does not adequately describe the historical flows in the river.[190] The models that describe salinity in irrigation return flows seem solid, but there is "considerable uncertainty . . . about the efficacy of individual salinity control projects." Therefore, say Adler, Straube and Green, estimates of salt reductions for specific projects "should be used for planning purposes rather than precise predictions."[191]

There are similar questions about the Chesapeake Bay model.[192] The CALFED project is focusing a great deal of attention on fish health and habitat, but there are four competing models to measure hydrology—and extensive controversy about their relative merits. As a result, the project is not using the models to make decisions about which projects to fund.[193] Imperial and Hennessey also argue that since many computer models rest on data and assumptions that are open to challenge, they are useful for planning purposes, but not for setting regulatory requirements.

In fact, most of the nation's environmental protection system rests on imperfect models of one kind or another. The quantitative risk-assessment tools EPA has used for decades to establish regulatory standards for drinking water, air pollution, and the cleanup of hazardous waste sites are controversial and unverifiable. Scientists and regulators understand the uncertainty involved in those tools and compensate for it with large safety factors when they set regulatory standards. (The safety factors are also controversial: scientists and advocates argue about whether they are over-protective or under-protective.) But the general public is often surprised to discover how few questions science can answer definitively. One of the challenges facing agencies and leaders in watershed management projects is helping others understand that the limits of

science—along with the inevitability of uncertainty—need not preclude decisive action, including regulation, standard setting, and public commitment to attaining specific goals.

Integrating Collaboration into Agency Processes and Cultures

Many agencies do not have an easy time participating in local collaborative processes, or even coordinating their work with other agencies. There are several impediments, including entrenched regulatory processes, agency structure, staff without necessary skills, and insufficient resources.

REGULATORY PROCESSES

Sometimes regulatory decisions provide the spark that gets collaboration going. Endangered species were key drivers in the Nisqually and Dungeness watersheds, and litigation about water-quality standards was a driving force behind collaboration in the Everglades, the Colorado River, and the CALFED project. In other watersheds, there were other immediate drivers, such as citizen concerns about water quality, but regulatory concerns were important as well.

Even though regulations often sparked local action, our research teams reported unanimously that EPA and state regulatory programs were not well linked to local collaborative processes. Agency staff responsible for regulatory programs or subsidies for wastewater treatment went about their work quite independently of their agencies' efforts to support local watershed activities.

Several researchers reported that some participants in collaborative processes had difficulties working with state and EPA regulators, even though staff members from other parts of state agencies were actively involved in local discussions. In the Navesink watershed, for example, state regulators delayed for months before taking action on a project that was an important part of the collaborative effort, finally deciding that it did not need a permit.[194]

Born and Genskow report that efforts by states like Wisconsin to organize agency operations around sub-state regions—in Wisconsin, around watersheds—could be extremely helpful to local watershed efforts.[195] North Carolina and some other states have reorganized their permitting programs to synchronize the renewal of permits within watersheds. Although that should facilitate planning and action in the watersheds, the Academy's researchers did not find any signs it was doing so yet.

Oregon, Washington, Massachusetts, New Jersey, and some other states have begun building state watershed councils and statewide networks of councils in individual watersheds. The researchers did not study those councils in depth, but they did report skepticism on the part of some local leaders. One issue is whether the state-established councils cover areas that are too large. Leaders in the Navesink watershed, for example, expressed concern about being combined with other nearby watersheds.

STAFF CAPACITY

Front-line state and EPA staff, participating directly in local collaborative processes, played key roles in many watersheds. But state and federal agency staff that participate in such efforts must have a special set of skills; engineering ability and a knowledge of environmental regulations are not enough. As a county health official told Chess and Gibson:

> I found that . . . getting the water clean is the easy part. The hard part is the human side and getting people to work with one another, getting mutual respect and confidence . . . building those bridges. [196]

Agency staff must learn about the particular local mix of institutions and political traditions in individual watersheds, as well as the history of past collaborative efforts. They must have good communication skills, must listen carefully, treat unschooled citizens respectfully, and explain agency rules and scientific debates clearly. They must also protect the interests of their agencies, and the integrity of agency processes, without being defensive or domineering. Agency staff members who lead local collaborations must also be able to raise and manage funds from disparate sources without losing their focus on the goals of the local watershed process.

Imperial and Hennessey report that watershed collaboration is "advanced governance," and that training programs for many environmental regulators do not cover the necessary skills and knowledge.[197] Furthermore, many agencies do not give their employees much incentive to participate in collaborative processes. Regulatory agencies, for example, usually have far more permits to write and facilities to inspect than staff available. Collaboration is often personally rewarding, but it usually means adding more work and more stress—without more pay or promotions.[198]

INVOLVING OTHER AGENCIES AND GOVERNMENTS

Certain agencies are almost always indispensable participants in collaborative watershed efforts. Involving the U.S. Department of Agriculture's Natural Resources Conservation Service is often crucial, partly because its staff in virtually every county enjoys good working relationships with individual farmers, local farm organizations, and state and local conservation districts. Often NRCS staff, and sometimes USDA agricultural extension staff as well, play critical roles. In the Naveskink watershed, for example, agricultural extension staff worked with farmers to reduce runoff from manure, as well as to develop cost-sharing requirements for implementing improvements.

It is also important to get local government officials involved, especially in rural counties and rapidly developing suburban and exurban municipalities. Unless those agencies are involved, watershed collaborators will be unable to address land-use issues. Imperial and Hennessey report that the Narragansett Bay NEP was unable to involve local officials actively in collaborative activities, which largely accounts for its meager results.[199]

It is equally important—but often difficult—to get state and county transportation departments involved. Highways and roads often contribute to nonpoint problems, and transportation departments often have budgets that are large enough to afford some measures that would prevent such pollution.

Financing Watershed Protection

Collaborative approaches to watershed protection almost always appear costly in the short run: they must be custom-designed and are inevitably time-consuming. In addition, there is often only inadequate water-quality data, and/ or poor information about the effectiveness of cleanup strategies. Agency managers often find it easier to put their resources into permitting, into reviewing applications for renewal of permits for point sources, for example. Our researchers reported almost unanimously that it is much easier to start a collaborative watershed effort when agencies have a small amount of slack resources they can devote to local collaborative processes.

On the other hand, too much money for collaboration, planning, and science can be detrimental if decisionmakers lack the will to make decisions in the face of uncertainty. Imperial and Hennessey reported that the $11 million in grants to the Narragansett Bay estuary project

impeded agreement. The money encouraged participants to invest too much time and energy in planning: they supported scientific research that was of only marginal assistance in making decisions, for example.[200] The researchers recommend that Congress and EPA redesign the National Estuary Program to provide less funding for planning, some funding for implementation projects, and a cutoff for all funding after a period of time.

The researchers all reported that money for implementation was more important, and often harder to find, than money for planning. Moreover, implementation usually takes much more money than planning over longer periods of time. Adler, Straube, and Green report that relatively stable funding is one of the strongest aspects of the Colorado River Basin Salinity Control Program, even though the funding for implementation depends on congressional appropriations that do vary from year to year.

The U.S. Department of Agriculture has long offered subsidies to farmers, ranchers, and foresters who will take steps to prevent soil erosion. Its Conservation Reserve Program (CRP) paid farmers to withdraw erosion-prone lands from farming for 10-year periods. The CRP accounts for 65 percent of all federal funds allocated to control of nonpoint source pollution and is the single largest source of federal funds for watershed protection projects.

Until recently, CRP was designed largely to compensate farmers for withholding their lands from production, not for protecting water quality.[201] Since the 1996 Farm Bill, however, USDA's Natural Resources Conversation Service (NRCS) has given farmers 120 percent cash incentives to create nutrient "filter strips" along ditches, creeks, and rivers, i.e., not to till or plant in those riparian areas. That incentive has been enough to encourage many midwestern farmers to retire lands, but has been less effective in regions with higher land prices. NRCS's Conservation Reserve Enhancement Program (CREP) allows states to add their funds for taking riparian land out of production. As of mid-2000, almost a dozen states had done so.

The Farm Bill addressed water quality in other ways as well. It consolidated several programs into the $200 million Environmental Quality Incentives Program, and directed that EQIP funds be targeted to "the highest environmental benefits per dollar spent," as determined by state agencies, technical committees, and local work groups. Sixty percent of the funds go to "priority" watersheds, those with serious water-quality problems. For example, NRCS is investing EQIP funds heavily in hiring experts to prepare nutrient management programs, which help farmers use fertilizers more efficiently.[202]

But Congress has declined recent proposals to increase funding for EQIP. Instead, it has increased fivefold over the past decade the appropriation for EPA's Section 319 cost-sharing program for reducing nonpoint pollution, as shown in Table 4-6.

When they are available, funds from EPA's 319 program are very helpful to those who want to implement in their watersheds plans that emerged from collaborative processes in other watersheds. But while 319 was designed as a demonstration project, EPA is now encouraging states to use it to reduce pollution in high-priority watersheds, not to attempt to replicate successful efforts from other areas

Even with that change, however, Imperial and Hennessey criticize the 319 program. It is, they say, still too poorly focused in many states; its funding, as well as other funding for implementation, is often directed to purposes that may be different than local objectives. According to them, the criteria for federal grants change frequently, making it difficult for watershed leaders to plan and act effectively.[203]

Indeed, the process of funding implementation of watershed protection efforts is not always pretty. A peer reviewer of Adler, Straube, and Green's report said that the early history of the Colorado River Basin Salinity Control Program "illustrates the worst qualities of pork barrel

TABLE 4-6: FUNDING FOR EPA'S SECTION 319 PROGRAM

FISCAL YEAR*	NONPOINT SOURCE GRANTS**	AVAIL. FOR TMDL DEV' T
1990	$38.9	
1991	$51.0	
1992	$52.5	
1993	$50.0	
1994	$80.0	
1995	$100.0	
1996	$100.0	12.8
1997	$100.0	12.8
1998	$105.0	12.8
1999	$200.0	40.0
2000	$200.0	40.0
2001	250.5	

* Operating Plan, except 2001, which is the President's Budget. ** Dollars in millions

Source: U.S. EPA Office of Water

politics" by reaching consensus "through the use of subsidies and by ignoring controversial issues and solutions regardless of their merits."[204]

The politics of watershed protection often resemble those of traditional public works programs, marked as they are by intensive lobbying, and the earmarking of funds for politically favored watersheds. In contrast, the competitive-bidding process that the Colorado River Basin Salinity Control Program has adopted is a promising way to direct funds to the most environmentally beneficial purposes.

There is, however, a benefit to applying traditional public works politics to watershed management and the cleanup of polluted runoff: they are an effective way to mobilize resources and get things done. If local collaborative processes are successful in persuading citizens and local officials that watersheds are worth protecting, both private and public money may follow.

Private funds for protecting natural areas and environmental quality have increased dramatically. Federal and state tax laws, along with state land-use legislation authorizing conservation easements and similar arrangements, provide the tools used by land trusts, for example. And those local, regional, and national bodies have grown rapidly—from 743 in 1985 to 1,227 in 1999—and have protected approximately 4.7 million acres of land.[205] Although the source of that data does not distinguish among the types of land protected, it is likely that much of the work of land trusts in America has had direct or indirect benefit to water quality.

TMDLs and Watershed Protection

The agency's TMDL regulations do not provide an adequate frame for effective water-quality management. They contain detailed information about procedures, the scope of TMDL documents, and deadlines, but they are silent many topics that are critically important in crafting watershed programs that can tap the energy and political capital of local collaborative processes while also informing, driving, and disciplining these process so they can achieve real environmental gains rather than making only marginal improvements.

For example, they:

Require public participation at several specific points in the TMDL process, and offer general encouragement for watershed collaboration, but offer states no flexibility in designing that participation to fit local collaborative processes.

Direct states to complete TMDLs within 10 to 15 years for all waters that do not meet water-quality standards, but set no goals for actual improvements in water quality until 10 years after a TMDL has been completed. Thus the program sets no real performance goals. Neither does it require any independent assessment. Inevitably, then, EPA oversight will focus on procedural compliance.

Encourage the "watershed approach," but do not explain how states might implement that approach when a watershed lies in multiple states, or when only portions of it fail to meet water-quality standards.

Describe current federal programs, but offer no vision of how the 319 program, the National Estuary Program, or other federal water programs might change to help meet the deadlines for writing TMDLs, to take practical steps to bring watersheds into compliance with water-quality standards, or to address other environmental, economic, and social goals.

Require that states develop reliable data for TMDLs, but offer no advice about how to deal with inadequate data and no significant commitment for help in improving data.

Do not specifically authorize the use of cap-and-trade systems as a means to reduce runoff; and do not resolve the problems created by the NPDES permitting regulations that inhibit states from issuing group permits or allowing permit modifications by rule.

Require that states provide a "reliable and effective delivery mechanism" to ensure that a TMDL plan will lead to clean water, but do not explain how EPA will determine if that condition has been met.

State environmental agencies are in a much better position than EPA to design effective policies and programs to address problems in specific watersheds. States and local governments have substantial constitutional authority over land-use practices. Environmental conditions and the "ecology of governance"—the institutions, working relationships, and attitudes that make collaboration and effective action possible—vary so widely from one watershed to another that no single collaborative model will work nationally. And because states have more extensive and diverse field presence than EPA, they are better able to link environmental programs with other environmental, economic, and social programs.

By failing to explain how the TMDL process will work, and failing to specify how much discretion EPA will allow states to exercise in working with collaborative watershed processes, the TMDL regulations have fostered fears that many EPA regional offices will micromanage state TMDL programs. Lacking any near-term performance goals or independent assessment of progress, states fear that EPA oversight will inevitably focus on procedural details, impeding state efforts to custom-design watershed management programs to fit local conditions. Furthermore, tough EPA oversight about procedural matters will necessarily insert EPA far more deeply into the details of state and local land-use decisions and into the management of state agricultural and infrastructure: programs about which EPA has limited expertise—and less legal authority.

There is, of course, no statutory basis for EPA to conduct negotiations with states about goals for watersheds or other purposes. But the Government Performance and Results Act does require EPA and other federal agencies to set national goals, and over the last five years EPA and the states have developed a system that could be used to reconcile EPA's GPRA goals with states' own performance goals. EPA and states could use such a system to craft a national watershed protection strategy that would allow states to customize the TMDL program to their institutional and environmental situations, and would give EPA tools to ensure accountability, transparency, and effectiveness. The following chapter reviews how that system has worked so far, and explores the management and organizational changes that will be necessary to allow that performance-based approach to function effectively in EPA.

Findings

Finding 1. The nation has new opportunities to make progress in its long drive for cleaner, healthier, more economically valuable surface waters. An increasing number of communities have organized collaborative watershed protection efforts in recent years. In addition, land trusts and "save-the-river, save-the-bay" advocacy groups have grown. New technologies are increasingly capable of documenting polluted runoff, and of providing comparatively inexpensive ways of reducing such pollution. Many farmers, developers, and other landowners have become increasingly aware that polluted runoff is a major environmental problem in many watersheds. Federal court decisions about TMDL regulation, listings of endangered species (especially in the West), and slowly tightening state regulation are persuading many landowners that if local collaborative processes are not successful, additional state and federal regulation may be inevitable. Thus popular support for more effective control of nonpoint pollution is slowly building nationally and locally.

Finding 2. Collaborative processes lead to improved environmental quality in many, but not all, watersheds. They can help build public understanding of environmental problems in watersheds. They can develop social norms and political momentum that can transform attitudes, thus encouraging voluntary watershed protection activities, improved compliance with regulatory requirements, and state and local initiatives to protect water quality—including tighter regulation. They can develop strategies to meet broader environmental goals than just water quality (e.g., protection of critical or scenic habitat), while also addressing local economic and social concerns. They can also help integrate technical and political information, thus producing workable policy options, as well as decisionmakers equipped to manage their responsibilities.

Even smoothly functioning processes may lead to isolated, ineffective projects in some situations, however. Lacking good data about the extent and causes of environmental problems or

enough political will to challenge powerful local interests, collaborators may settle for "feel-good" projects that make no significant impact on environmental quality. And if key landowners feel they can afford to refuse to participate, collaborative processes are likely to fall apart, or to result in little environmental improvement.

Finding 3. Regulation and collaborative civic environmental activities are not alternatives: they are complementary approaches. The effectiveness of local collaboration depends on agency support. Success depends on setting meaningful, achievable goals, monitoring progress, and making necessary changes—all of which require agency information and assistance.

In addition, federal regulations can drive collaboration. Many citizen-led collaborative efforts begin in reaction to a threat, e.g., an environmental problem that concerns the public, or as an attempt to set right a past agency action that failed to achieve environmental goals, or in response to a proposed action by a government agency that would impose significant costs on local economic interests. Thus many participants enter into collaborative processes distrustful of state and federal agency policies, practices, and staff. Nonetheless, agencies usually provide the resources needed to make collaboration successful, such as technical information, staff assistance, and funding for the process, as well as administrative discretion and project funding to implement agreements.

Just as "bottom-up" collaboration depends on agency support, effective regulation depends on citizen support. Tighter regulation does not guarantee better environmental performance. Regulations are not self-implementing; they have impact only when regulated parties decide to comply, or when agencies force them to do so. The sources of polluted runoff are numerous and small, and EPA's constitutional and statutory authority over land use is weak. Regulations will be enforceable and politically sustainable only if: citizens insist on compliance; landowners are persuaded they must comply, and are assisted to do so; and other public and nonprofit agencies besides EPA and its state counterparts provide technical and financial support.

In particular, EPA's new TMDL program, requiring states to write and implement plans that would reduce pollution from both regulated and unregulated nonpoint sources, may fail without strong support from citizens, local officials, and states. The SIP process has become confusing, complex, and frustrating to all parties; the TMDL process could be worse. It could evolve over time to address many more kinds of pollution and more locations than SIPs, while lacking the sanctions that make SIPs persuasive to state and local officials and community leaders. On the other hand, strong local collaborative processes may be able to build broad support for effective measures to achieve the goals of the TMDL program.

Finding 4. Congress, EPA, and state environmental agencies have not yet built the necessary infrastructure of information and policies to support strong local collaborative efforts. Good data about local watershed conditions, linked to information about habitat and land use, is essential to focus local collaborative processes on the most important problems. Yet EPA and state environmental agencies have not developed a strong database of water quality. Standards, sampling procedures, and reporting practices vary widely, so comparable data are not available.

A few states—Wisconsin, Oregon, Washington, Massachusetts, and Maryland among them—have invested significant energy and resources in building local institutions at the watershed level, and in focusing state water-quality programs at the watershed level. Several have recently developed tighter regulations for concentrated animal feeding operations. But most state environmental agencies, and EPA regional offices as well, are preoccupied with case-by-case man-

agement of permits for point sources, and have thus devoted less energy to nonpoint sources and other watershed issues.

Congress and EPA have allowed most states to continue operating the 319 nonpoint programs on the basis of annual project-by-project funding for demonstrations, rather than as a multiyear strategic effort to reduce polluted runoff in the most threatened watersheds.

EPA's National Estuary Program has helped some watersheds to develop sound plans, but has over-emphasized planning and scientific research, has provided no support for implementation, and has failed to hold local programs accountable for continued performance.

Congress has provided increased funds for some USDA cost-sharing programs but has not expanded the most targeted programs, e.g., the Environmental Quality Investment Fund, and has cut the staffing of the Natural Resources Conservation Service.

Federal regulatory requirements, including the mandate that states write TMDL plans, could stimulate and help focus collaborative watershed efforts, if EPA were to design and manage the TMDL process properly.

Recommendations

For States:

1. Set watershed-protection goals.

To meet the rising public concern about watershed health, fulfill their constitutional responsibilities for land use, and forestall federal regulation, states must step forward with creative, aggressive watershed-protection programs. As a start, state governors and legislatures should set ambitious goals for watershed protection, and for reduction of polluted runoff. They should also invest sufficient political and financial capital to make those efforts successful. For their parts, state environmental agencies should change their structures to focus on performance goals, and train their staffs to work effectively with local collaborative processes.

2. Strengthen cost-sharing and technical-assistance programs.

Initiating state bond issues for land conservation; encouraging land trusts; regulating concentrated animal feeding operations; targeting of 319, State Revolving Loan, and other cost-sharing programs; and experimenting with nutrient trading programs are all positive steps.

3. Support collaborative watershed processes

Each state environmental agency should custom-design its watershed program to fit local environmental, institutional, and social realities. Agencies should organize internally to provide state staffing support for collaborative watershed activities, arrange their permitting activities to encourage the development of watershed-wide strategies, and ensure creative consideration of broad environmental and economic issues, as well as case-by-case permitting decisions for point sources.

4. Develop adequate data for local, state, and national decisionmaking.

State environmental agencies should work closely with EPA, as well as with local governments and other federal and state agencies, to develop better data about watershed issues. With federal cooperation and support, they should adopt standard national sampling and quality-

control procedures, increase the density of monitoring data, and work with local governments and others to link environmental with land-use and other data.

For Congress and EPA:

1. Improve and fund water-quality data.

Congress should direct EPA to improve data about water quality and provide the agency sufficient resources to do so. EPA should insist that states make major improvements in the quality, coverage, and comparability of data that they gather and submit to the agency.

2. Identify the most cost-effective ways to reduce polluted runoff.

EPA should provide a detailed analysis of how the nation might meet national water-quality goals. The analysis should address the full spectrum of threats to water quality, and should identify the most promising "first steps" in a long-term strategy for improvement. The agency should attempt to quantify the costs and benefits of various cleanup programs, and provide that information for states and local collaborative processes to use in formulating their own goals and strategies.

3. Encourage state experimentation.

EPA should offer explicit opportunities for states and individual watersheds within states to test promising approaches. States should not be merely laboratories for innovation: they should be the factories where innovation is produced. If court decisions and current statutes do not permit such flexibility, EPA should ask Congress and courts for permission to allow experimentation.

4. Negotiate national and state-level goals for cleanup.

After consultation with Congress, EPA should seek to negotiate specific agreements with states about goals and schedules for meeting water-quality standards. Those goals would then guide not just the TMDL process, but also other steps to reduce polluted runoff, including federal cost-sharing programs, local collaborative efforts, the upgrading of water-quality data, allowance-trading programs, and experimentation with other innovative approaches.

CHAPTER 5

Focusing the EPA-State Relationship on Environmental Results

Protecting the environment and public health in the United States is both technically difficult and legally, administratively, and even morally, contentious. Each of the 50 states and the many sovereign Native American tribes has a different set of environmental, social, and political problems and opportunities. This chapter examines the complex interplay of relationships between and among EPA's various national and regional offices and state environmental agencies as they attempt—both individually and collectively—to meet the challenges inherent in those issues.

The chapter focuses on the five-year history of the National Environmental Performance Partnership System (NEPPS), and in particular on three substantive challenges NEPPS catalyzed:

- defining and measuring "environmental" performance
- recasting the federal-state partnership to focus on environmental results
- finding a new role for EPA's regional offices now that states manage most federal programs competently

The Academy commissioned five research teams to explore those issues. Lee Paddock and Suellen Keiner, of the Environmental Law Institute,[206] and Jeanne Herb, Jennifer Sullivan, Mark Stoughten, and Allen White, of the Tellus Institute[207] looked at the implementation of NEPPS agreements in 16 states. Hamilton, Rabinovitz & Alschuler (HR&A) considered the standoff between California and EPA over the state's air-toxics program, a case that illustrates the difficulty of resolving disputes between states and EPA about the relative effectiveness of environmental efforts.[208] William Gormley, of Georgetown University, examined the painfully slow emergence of environmental performance measurement and performance-based management.[209] Jodi Perras, of Perras and Associates, evaluated EPA Region 1's effort to transform itself into "EPA New England" through reorganization, a commitment to encourage innovation, and as sharp a break with EPA's traditional management systems as the regional administrator could sustain.[210]

The researchers' findings parallel those reached in the preceding chapters. Changing the system is hard, frustrating work, particularly without statutory change or sustained leadership.

Making "performance management" work will require much more reliable information about environmental conditions *and* much more technically and politically astute managers. Better environmental data and a better understanding of program effectiveness can make it easier for managers to make choices, but they do not alone guarantee better decisions. Negotiating agreements among EPA regional offices and state agencies can lead to a more effective allocation of responsibilities, but negotiations can break down over truly trivial issues of enforceability or precedent. A focus on environmental results can engage the public, but only if federal and state regulators make an effort to open the doors.

Those problems notwithstanding, the NEPPS process still holds potential as a tool for reconciling state and federal interests in environmental protection in specific places, and this chapter contains the panel's recommendations for making that achievement more likely. The panel does not believe the goals of NEPPS can be met easily. Donald Kettl has said that the attractiveness of performance measures is exceeded only by the difficulty of their design and implementation. That is certainly true in environmental protection.

A true performance-based management system must be fluid, dynamic. Thus many of its elements cannot be predicated on old ways of doing business. Neither, as demonstrated in previous chapters, can predictions or projections always be quantified before the fact: sometimes they cannot be so even after the fact. The challenge to EPA and the states is finding clear, distinctive ways to evaluate performance, and then actually doing so, taking advantage of the promise inherent in NEPPS.

Defining and Measuring Environmental Performance

At one time, responsibility for environmental protection rested with individual states. They could enact and enforce tough regulations or essentially ignore environmental degradation of all kinds. Some states, like California, took a strong stand against pollution. Others, fearful that tough regulation would cost jobs, did not.[211]

The environmental legislation of the 1970s and 1980s, however, explicitly centralized authority in Washington. No longer would the federal role in environmental protection be simply that of providing some funding and technical assistance. The new laws created strong regulatory programs, and described in great detail how they would operate. States could ask EPA to delegate to them the responsibility for day-to-day management of most air- and water-quality programs. To do that, though, they would have to pass legislation and write regulations that paralleled federal laws, and build the administrative capacity to implement those rules. EPA set up 10 regional offices to provide a degree of individual attention to states, and encouraged each of those offices to help "its" states develop strong environmental protection programs.

Today, driven by federal mandates and fueled by EPA funding, most states have assumed the responsibility for managing most EPA programs.[212] State environmental agencies now make more day-to-day decisions about environmental management than does EPA. States write more than 90 percent of all permits, take more than 75 per cent of all enforcement actions, and have far more day-to-day contact with businesses and other sources of pollution than does the federal government.[213] State budgets for pollution control have increased substantially: the average state relies on EPA for only 26 percent of its budget for pollution control. Some states are more dependent on EPA than others. As a group, states probably now spend more than EPA on environmental regulation.[214]

As individual states enhanced their capacity to protect the environment, however, they came to resent their subservience to the federal agency. Thus it came to pass that in 1995, EPA and the elected leaders of the Environmental Council of the States, acting for all 50 states, signed the National Environmental Performance Partnership Agreement, which promised a new relationship between those government entities most responsible for environmental protection. The agreement was a mutual challenge to transform environmental governance, to make it a partnership based on performance.

Many state officials held out high hopes for NEPPS. As the next section demonstrates, however, the old does not always give way gracefully to the new, even when they share common goals.

Determining "Equivalency" of State Programs

To protect and preserve their environments, many states adopt statutes and regulations that either copy or reference federal statutes. But if a state designs its own program, EPA must address the question of equivalency: whether it is as stringent as the corresponding federal program. HR&A's analysis of California's air toxics program illustrates how difficult that judgment can be.

TABLE 5-1: NUMBER OF STATES WITH DELEGATED PROGRAM AUTHORITY

	YES	IN PROCESS	PARTIAL	NO	NA/ND
CLEAN AIR ACT					
New Source Performance Standards	39	1	9	1	0
NESHAPS	38	2	10	0	0
Prevention of Significant Deterioration	45	0	4	1	0
Title V Operating Permits	21	29	0	0	0
New Source Review	46	1	1	0	2
CLEAN WATER ACT					
NPDES	37	0	4	8	1
Pretreatment/POTWs	29	1	0	19	1
State Revolving Fund	48	0	0	2	0
Sludge Management	9	3	0	37	1
Construction Grants	46	0	0	3	1
Wetlands §404	2	0	0	42	6

TABLE 5-1: NUMBER OF STATES WITH DELEGATED PROGRAM AUTHORITY (continued)

	YES	IN PROCESS	PARTIAL	NO	NA/ND
RESOURCE CONSERVATION AND RECOVERY ACT					
Subpart C, Base Program	47	1	0	2	0
Subpart C, Corrective Action	31	3	0	16	0
Subpart C, Mixed Waste	39	1	0	10	0
Subpart C, BIF	19	4	0	27	0
Toxicity Characteristics Revisions	34	3	0	13	0
LDR California Wastes	37	2	0	10	1
LDR 1/3 Wastes	36	3	0	11	0
LDR 2/3 Wastes	21	3	0	26	0
LDR 3/3 Wastes	27	6	0	17	0
Subpart D, Solid Waste	29	1	8	3	9
Underground Storage Tanks	28	2	0	20	0
SDWA					
Public Water System Supervision	48	0	0	2	0
Wellhead Protection Program	36	1	0	4	9
Underground Injection Control §1422	34	0	0	16	0
Underground Injection Control §1425	35	0	1	9	5
FIFRA					
§23(a) State Cooperation, Aid and Training	44	1	1	0	4
§23(b) State Cooperation, Aid and Training	44	1	1	0	4
Endangered Species	24	5	0	9	12
Worker Protection	48	1	1	0	0
Groundwater Protection	29	11	0	4	6

Source: Environmental Council of the States, http://www.sso.org/ecos/delegations/statutes/cwa.

Both EPA and California agree on the fundamental principle of the state's program: to clean up the air. And both require that large sources of air pollution install equipment to reduce air emissions of toxic chemicals. It is in implementation where agreement breaks down. EPA specifies technologies to be used by different industries, but California provides most industries some flexibility to choose among possible technologies. Doing so, the state argues, spurs technological innovation, which should reduce transaction costs.

There are other small but irreducible differences between the programs as well. The state and EPA use somewhat different methods for monitoring, testing, and accounting for emissions. In addition, EPA has slightly more stringent requirements for record keeping, and prefers a tougher approach to enforcement.

For example, EPA requires inspections every six months, but California recommends that a third-party auditor submit an annual report. EPA requires that each permit explicitly incorporate manufacturers' requirements for operating, installing, calibrating, and maintaining equipment used at each site; California permits simply require that equipment be operated consistent with the manufacturers' specifications, which must be kept at the site for reference. If an accidental release has no adverse impact on public health, California establishes a performance and/ or financial penalty proportionate to the scale of the violation. Under the same circumstances, EPA usually requires a financial penalty and a shutdown, even if the facility was operating well below a health-risk standard.

Nonetheless, California officials feel that their program is both more stringent and more performance-based than EPA's. Explicitly, California regulates 244 substances, of which EPA regulates only 189, and it regulates somewhat smaller sources as well. It also mandates that sources inventory their emissions and disclose them to the public if local air-quality districts decide they pose "significant risks." Implicitly, the state relies on a national reputation in air toxic regulation, its technical capacity to ensure adequate protection of public health, and its savvy and well-organized populace. EPA, however, while acknowledging California's pioneer efforts in pollution prevention, is not quite so confident of the state's ability to preserve and protect the environment without substantial agency oversight.

California and EPA have spent seven years comparing the differences between their requirements and approaches. Since 1993, three separate joint committees have worked to compare the two air-toxics programs. They framed the issues, established criteria for comparing the programs, conducted a line-by-line comparison of state and federal regulations, examined how state regulations are implemented, and, finally, narrowed the debate to 24 of 200 differences between the programs.

Unable to reach final agreement with federal officials, though, the state pressed ahead with its own program—without asking EPA to delegate the responsibility for regulating air toxics. Thus as EPA slowly finalizes federal requirements for different industries, California firms will face two somewhat different regulatory systems. Some state officials fear that industry, frustrated by the confusion, may press for state legislation that would weaken California's program, or even move out of the state. It seems certain that the debate will end up in court.

The case illustrates well the fundamental disconnect between the spirit of NEPPS foundation in performance-based management, and the letter of its implementation. A true performance-based system encourages innovation, and constantly defines and refines accountability measures as appropriate. Using those criteria, California's legislation is a close approximation of federal requirements. State officials feel, therefore, that EPA should let them regulate air toxics for some years, monitor their performance closely, and then analyze their results. In a true performance-based system, the state argues, those results would be the deciding factor in

determining state performance. But EPA and the state are still arguing about procedure, not yet considering actual performance.

Monitoring State Management of EPA Programs

As stated earlier, most states adopt statutes and regulations that closely parallel federal requirements. In those situations, EPA oversight focuses on implementation of activities conducted by states and EPA regions. The agency's headquarters staff issues annual guidance for each of the national programs in its media offices—air, water, waste, and toxics—and in the enforcement office. Those documents articulate national policies and specify what different parts of the agency will do to meet those goals. For example, the written documents prepared by the EPA Office of Enforcement and Compliance Assurance cover national priorities for enforcement in particular industrial sectors, compliance assistance priorities, and special requests.

EPA headquarters also prepares consolidated enforcement memoranda of understanding with regions, as well as separate regional work plans for enforcement in each program. Headquarters generally lets EPA regions decide how to frame written agreements that ensure states will comply with the guidance, but the effect of the detailed guidance from Washington is to put great pressure on states to conduct a specified number of activities.

EPA also uses the grants that it makes to state environmental agencies to influence state operations. Traditionally, each EPA program office made large, separate grants to states. In FY 2000, for example, such grants totaled $785 million.

Prior to NEPPS, EPA regional offices used annual work plans to pass their requirements for a specific number of activities on to states. In those plans, states had to document, in great detail, how much effort they would expend on each activity—as specific as 0.1 person-years for issuing notices of violations or 0.03 person-years for issuing administrative orders to specific groups of permittees in New Jersey in 1994.[215]

NEPPS sought to shift "the primary focus of the EPA and state dialogue from 'bean-counting' [of activities] to identification of environmental priorities for each state and the appropriate actions to address these priorities."[216] The agreement that established NEPPS emphasized performance measurement in its guiding principles:

> "Continuous environmental improvements are desirable and achievable throughout the country.
>
> A core level of environmental protection must be maintained for all citizens.
>
> National environmental progress should be reported using indicators that are reflective of environmental conditions, trends, and results.
>
> Joint EPA/ state planning should be based on environmental goals that are adaptable to local conditions while respecting the need for a 'level playing field' across the country . . . "[217]

As part of implementing NEPPS, EPA and states negotiated a set of 30 "core performance measures" to guide EPA oversight. Some of these measures focused on agency activities, but several focused on environmental outcomes.

The agreement on core performance measures was an important step in a new direction for EPA and states. Paddock and Keiner, along with Herb, *et al.*, found that NEPPS did encourage states to pay more attention to data about environmental conditions, and it did encourage some states to invest resources in gathering better information. On the whole, though, NEPPS and

core measures have been only marginally successful in switching the basis of EPA oversight from activities to outcomes.

One reason NEPPS has not succeeded is that it could not change the system of guidance and memoranda of understanding. Instead of a new way of facilitating exchange and trust, it became an overlay on deeply entrenched systems, processes, and attitudes. Some headquarters and regional program managers simply refused to abandon the established practice of negotiating detailed EPA-state agreements about specific activities that states would conduct. Some regional officials did agree to eliminate work plans, but when headquarters asked regions to deliver certain activities, officials passed those requests on to state agencies, making it clear they expected action regardless of what NEPPS documents said.

In insisting on continued close oversight of state activities, EPA officials felt they had a strong case. After all, decisionmakers need both information about environmental conditions and good data about state activities to evaluate a state program. Furthermore, congressional pressure and federal statutes demand that EPA keep close track of state activities. Indeed, while the May 1995 agreement itself clearly envisioned less EPA attention to state activities, it did not discontinue such attention.

Some state officials did their share of resisting as well. Many were not enthusiastic about the prospect of an EPA report with comparable performance measures for all 50 states, for example. Despite the fact that it took almost four years to negotiate an EPA-state agreement on the core performance measures, some states have refused to gather and report all of the measures. State officials claim that the measures do not always address the problems most important in their states, and that the definitions are unclear or inadequate. They also protested that the core measures added to their reporting burdens, and taxed tight budgets.

Faced with such opposition, EPA has backed down. States submit more-or-less complete data to EPA regions, but the agency does not gather the data from the regions into a national compilation of state performance.

The second problem with the core measures is that they developed separately from the measures that EPA uses to report its goals and progress to Congress under GPRA. In concept, GPRA should fit quite neatly with NEPPS. The statute requires that EPA and other federal agencies prepare strategic plans, submit budgets that show how funds will be spent to implement the plans, and report to Congress on results. Thus both GPRA and NEPPS focus on planning, priority setting, and results.

However, GPRA has reinforced the fragmentation of the agency along traditional media lines and discouraged cross-media planning, priority setting, and action. The agency has adopted 10 GPRA goals, some of which explicitly involve multiple agency offices and programs. However, there are also separate goals for air quality, water quality, enforcement, research, and other major programs. Once the agency divided its work into such broad goals and sub-goals, traditional, fragmented patterns of planning and action reestablished themselves. Thus GPRA has discouraged the multimedia planning and activities that were an explicit aim under NEPPS.

EPA recently published a memorandum showing how the core performance measures of NEPPS relate to its GPRA goals, and indeed, there is substantial overlap between the two sets of measures. The Academy's researchers, however, report that states still believe there are significant disconnects between GPRA and NEPPS measures, and that regional office staffs pay more attention to GPRA goals and measures than to goals and measures the EPA regions negotiated with states under NEPPS.

Federal statutes that require full documentation about spending of federal dollars have also been irritants. In accordance with the Financial Management Act of 1996, OMB published accounting standards to establish mechanisms for tracking the expenditure of federal funds.

That same year, EPA began using those standards in its GPRA annual plan and goal-based budget. EPA regional offices were asked to assign state activities and funds to between 30 and 40 codes that the agency developed to track expenditures to meet GPRA goals. Some regional offices made their own guesses about how to allocate funds spent by states, and other regions asked states to supply the information. States protested that the request was tantamount to restoring the old activity-based work plans for separate EPA grants. Furthermore, they objected that they do not gather data that fits the GPRA codes. Thus, states said, much of the data submitted by regions is "bogus, worthless."[218]

The third and more fundamental problem is that EPA and states do not gather adequate data about environmental conditions. Water-quality data are in perhaps the worst condition, as discussed in the previous chapter. But virtually all of the agency's data systems—except for its national network of air-quality monitoring—were developed to track the regulatory process. EPA gathers a great deal of information about permits, enforcement, and emissions, but relatively little about ambient conditions. (EPA's efforts to develop better data are discussed in the following chapter.)

Performance-Based Management in the States

Many states use performance as a basis for various programmatic and budgetary decisions. Gormley studied the efforts of Oregon, Florida, Virginia, and New Hampshire to gather and use information about environmental performance in making decisions. But even though those states are considered leaders in performance-based management, Gormley says their progress has been slow.

Each of the states has taken a different approach to performance measurement. As part of its strategic plan each Oregon state agency must develop benchmarks that focus on problems that cross agency jurisdictions. Gubernatorial biennial plans and budget requests are framed around the benchmarks, and the Oregon Progress Board reports performance as letter grades. The process enjoys strong support: some local officials and nonprofit organizations even use the state benchmarks for planning and budgeting. In Florida, both the governor and the legislature have pushed separately for performance-based budgets and management systems for state agencies. Virginia's performance measurement systems focus on a few key objectives for each agency.

Based on their previous experience with measuring, all four states are making improvements in quantifying environmental performance. For example, Florida has developed measures of "environmental citizenship" such as hours donated to state parks, the average residential consumption of electricity and fresh water, and the average daily vehicle-miles-traveled. Oregon has developed a sophisticated way of blending eight different measures of water quality into an index that is sensitive to sharp deterioration in any single condition. New Hampshire and other Northeastern states have jointly developed 40 measures of pollution prevention. In developing those and other standards, state managers and elected officials paid far more attention to their self-developed measures than to EPA's core measures.

Despite their expertise, however, those four states are facing significant technical barriers to using performance measurement to improve environmental quality. Environmental conditions are influenced not only by compliance with regulations and state agency activities but also by weather, economic activity, accidents, and many other factors.[219] But none of the four states was able to adjust data about environmental quality to take those exogenous factors into ac-

count. All their state environmental agencies still rely heavily on data about *outputs* (activities), have only some information about *outcomes* (emissions and changes in environmental quality), and have virtually no information about *impacts* (how agency activities influence environmental conditions). (See Table 5-2.)

The Oregon Progress Board does report "key" factors that may help explain why specific environmental conditions are changing, but the task of modeling impacts is expensive and fraught with methodological issues and scientific uncertainty. Thus state agencies rarely conduct that analysis except when it is necessary for specific decisions about permitting, regional air quality planning, or similar regulatory processes.

TABLE 5-2: PERCENTAGE OF OUTPUT AND OUTCOME MEASURES OF ENVIRONMENTAL ENFORCEMENT

STATE/PROGRAM	NUMBER OF MEASURES	PERCENTAGE OF OUTPUT MEASURES	PERCENTAGE OF OUTCOME MEASURES
Florida, Dept. of Environmental Protection	162	62%	38%
Oregon Dept. of Environmental Quality (Hazardous Waste)	156	76%	24%
New Hampshire "Indicators of Progress" (Waste)	74	64%	36%
Virginia Dept. of Environmental Quality	5	80%	20%
Oregon Progress Board "Benchmark Project" (Environmental Measures)	15	6.6%	93.4%

Source: William T. Gormley, *Environmental Performance Measures in a Federal System*, 2000.

Nonetheless, agency managers in all four states are beginning to use performance data to make day-to-day management decisions—and in some cases to set broad policies. The following examples are drawn from Gormley's analysis.

Florida. When data showed that petroleum storage tanks in some parts of the state were out of compliance—not detecting leaks properly—the state agency improved its training programs, clarified rules, and launched a major industry education initiative. When problems emerged at shellfish plants, the agency arranged for voluntary training sessions at the plants, and strengthened inspections.

Oregon. When data showed that cars and other mobile sources had become an important source of urban smog, the agency shifted employees from regulating industrial sources into programs for mobile sources.

New Hampshire. When the commissioner learned that the complaint backlog for the waste program was 1600, he hired new staff, transferred some cases to the Department of Justice, and, to cut down on frivolous charges, decided to accept only written complaints in the future.

Virginia. When writing new nutrient management plans fell short of departmental goals, the Department of Conservation diverted resources to those programs.

Gormley found that most state legislators and legislative staff support the concept of measuring results—but almost never use the information to choose a particular course of action. One reason for the reluctance to rely more heavily on performance data is that legislators are well aware of the technical shortcomings of the data, even if they may not understand all of the technical details. In addition, there is a good deal of confusion about performance measurement. Gormley reports that many public officials have the view that programs whose measures go up, e.g., cleaner air or water, should get more money, and those that score poorly should get less because, presumably, they are not doing a good job.[220] Sometimes, popular logic runs the other way as well: if a program is showing good results, decisionmakers may decide that it does not need more money.

Neither of those approaches makes much sense, of course. Reason dictates that one should look at the margin rather than the total: to ask where can a legislature or an agency get the most improvement from additional dollars. That question would focus attention on *impacts*, but unfortunately EPA and the states have little systematic information about them.

Gormley found that performance measurement systems were more robust where top officials liked them and used them to make decisions, not merely to fine-tune policy proposals they have already formulated. The most striking example was in Florida, where the state environmental agency developed a "focus-watch" system. The agency publishes quarterly reports that include both output and outcome measures. Agency leaders review the data and designate certain issues for emergency action or close attention. That helps keep managers and staff focused on the agency's goals, and it also ensures they pay close attention to improving the data. Whatever the state or issue, agencies can use performance measures to get issues in front of the public, as well as to alert managers. Simple reporting formats—like grades from "A" to "F"—make it possible to rely on judgment rather than technical analysis to deal with the difficult issue of impacts, which is especially useful with citizens and elected officials.

Gormley concludes that measuring and managing for performance is more advanced in environmental policy than in some other fields, but significantly behind the situation in education and health policy. For example, at least 43 states now participate in the National Assessment of Educational Progress, which reports test scores by state, even though participation is voluntary. And health maintenance organizations serving 65 percent of national enrollees report performance data on as many as 70 measures[221]

He speculates that there are three reasons why performance measurement in education and health is so far ahead of environmental measurement. One is that there is greater agreement among health and education experts about measures and causation. The second reason is that governors, other influential politicians, and interest groups have supported the development of performance measures in those fields. The third is that independent nonprofit organizations, rather than regulatory agencies, have taken responsibility for developing performance measures.

Re-negotiating the EPA-State Partnership

As well as performance-based management, the May 1995 NEPPS agreement encouraged cross-media efforts to set priorities and manage programs, a newly cooperative relationship between EPA regions and state agencies, one that also called for extensive public participation. The guiding principles of the agreement included:

> " . . . EPA/ state activity plans and commitments should allocate federal and state resources to the highest priority problems across all media and should seek pollution-prevention approaches before management, treatment, disposal, and cleanup.
>
> The new approach to the EPA/ State relationship should facilitate and encourage public understanding of environmental conditions and government activities.
>
> A differential approach to oversight should provide an incentive for State programs to perform well, rewarding strong state programs and freeing up federal resources to address problems where state programs need assistance." [222]

To those ends, EPA replaced its old work plans with negotiated Performance Partnership Agreements (PPAs), which set goals and objectives in terms of environmental performance. Developed in concert with EPA regional office, a PPA describes how both organizations will work together to meet common goals. In addition, NEPPS allows states to combine grants for individual EPA programs into Performance Partnership Grants (PPGs).

Positive, But Limited Impacts

The researchers agree that NEPPS has generally encouraged states to invest their energies in measuring environmental conditions, and in organizing their planning around priorities and strategic goals. They report that NEPPS has had the most impact in states with a strong planning tradition, and where state commissioners and top EPA regional managers were enthusiastic supporters of NEPPS.

For example, when the governors of Massachusetts and Illinois decided that all their state agencies would write strategic plans, the environmental agencies modified PPAs to become state strategic plans. The Oklahoma environmental agency wrote its first strategic plan concurrently with its first PPA. In environmental departments in Missouri, Texas, and Utah, state strategic plans were the basis for their PPAs.

Utah's long tradition of strategic planning proved a particularly good match for NEPPS. Even though the governor was pushing for more autonomy in all state-federal relations, the process of writing a PPA that fit the state's strategic plan was a useful way to work through the differences between state and EPA perspectives. The negotiations revealed a shared concern about the effects of rapid growth in small towns in Southwest Utah. The state brought a regional association of governments into the discussion, and the result was an agreement that county health departments would begin regulating small drinking water systems that were not subject to regulation under federal or state law. The EPA region agreed to provide staff support to get the regulatory process started.

That situation epitomizes the promise of a joint approach to performance-based management. Together, three levels of government defined a problem and worked out a way to address

it effectively. The agreement will help meet EPA's national goal of safe drinking water, and it will tap legal authority and community support at the local level.

The multimedia nature of NEPPS was also very helpful to states like Oklahoma and, at least initially, North Carolina, where commissioners were trying to encourage closer cooperation among agency divisions that operated rather independently. The PPA process also worked well in Minnesota and Massachusetts, which were reorganizing agency programs entirely, eliminating the traditional air-water-waste divisions. A senior Minnesota official observed, "It is hard to imagine how media-specific categorical work plans would have worked given MPCA's new organizational structure."[223]

The researchers also report that NEPPS often provided an opportunity for more dialogue and better understanding between top state and EPA regional officials. EPA regions, for example, are beginning to use PPAs as the basis for oversight. In some states, dialogue between state commissioners and EPA regional administrators led to increased work sharing. In Massachusetts, the NEPPS process helped lead to an agreement that sent three state employees to the EPA regional office to reduce a permit backlog in a program that was important to the state, but not yet delegated. In other states, many EPA officials said that the dialogue of NEPPS led to joint priority setting, but most state officials disagreed. They reported that the dialogue helped them understand each other's priorities, which was helpful, but that neither EPA nor their state changed its position.

NEPPS has reduced some of the paperwork that EPA requires of states. The Texas state agency was able to cut the number of its annual reports to EPA from 250 to 140.[224] NEPPS speeded the process by which Oklahoma and Texas allowed EPA regions to access state databases electronically, eliminating the need for many written reports.

Such anecdotal information illustrates the potential of a performance-based relationship between EPA and states, but does not describe the typical situation. Both research teams report that that NEPPS had a major impact on day-to-day operations in only three or four of the 16 states they studied. In eight states, impacts have been marginal. Two states of the 16 never participated. One other state dropped out of the PPA process, and another dropped both its PPA and PPG.

NEPPS provided an opportunity for better communication and generally better EPA-state relationships at the highest levels, but, at best, resulted in unchanged relationships between EPA and state program managers. It is true that EPA and most states shared information about priorities, but only in New England did a regional office set priorities jointly with states.

At a November 1999 national conference of NEPPS coordinators, several state officials complained that the process was frustrating; that other than the staff who prepare them, few people read NEPPS documents; and that top agency officials were paying little attention. As the initial wave of interest in NEPPS subsided, the researchers report that fewer state officials paid attention to the PPAs. They negotiated with EPA regions outside the NEPPS process issue-by-issue-instead of within the context of a strategic plan.

The researchers conclude that the continued viability of NEPPS is in doubt. It coexists uneasily with traditional management systems, which is an untenable situation.

TABLE 5-3: THE IMPACTS OF NEPPS ON STATES

STATE	RESULTS
UTAH	PPA is based on the state strategic plan and on a comparative risk project. Some disagreement about performance measures for enforcement. Few funds shifted under PPG. A PPA provided the framework for the Southwest Utah Partnership Initiative, a community-based pilot initiative involving three levels of government, formed to address rapid growth in the region. It resulted in several complementary initiatives being undertaken in a short period of time, and has become a model for other areas in the state.
ILLINOIS	PPA was integrated into the first state strategic plan. PPG shifted about six percent of federal funds to pollution prevention and regulatory innovation. Strong public involvement process.
MINNESOTA	NEPPS and state strategic planning were mutually reinforcing, and used to move towards integration of planning, budgeting, evaluation and measurement of results. PPA includes agreements to a dispute resolution process between EPA and the state, and to negotiate enforcement and compliance priorities. An area of concern is that EPA still does program-by-program evaluations, but MPCA does multimedia assessments.
COLORADO	PPA incorporated the goals of the state strategic plan. Five percent of EPA grant funding was reallocated to projects reducing risk. Most recent PPA includes comprehensive plan for stakeholder involvement.
INDIANA	PPA became state agency strategic planning document – although designed around strategic goals and priorities rather than media-specific programs, it was supplanted by political priorities for each division. Second PPA includes accountability measures for enforcement. Section 319 funds were kept separate from the PPG because the requirements didn' t work well with non-point pollution problems. PPG funding still tracked as separate grants because of other accounting needs.
MICHIGAN	State did not participate in NEPPS because of the costs of public participation, of self-assessment, and of other reviews and coordination required, because it did not reduce the workload in other states, and because of lack of EPA flexibility in negotiating core performance measures.
OHIO	Although there is a commitment to joint planning with EPA, in practice, a dual work planning process is taking place because no new planning has occurred. However, NEPPS serves to coordinate the priorities of the regional EPA office with those of the state. PPA links goals to performance strategies.
WISCONSIN	State is piloting the use of performance-based management based on the PPA, but has concerns regarding the core performance measures and also regarding federal and state roles and responsibilities for enforcement.
DELAWARE	PPA development was linked to state strategic plan and allowed individual programs to devote more effort to "whole basin activities." However, to gain the support of program managers, upper management promised that the relative distribution of federal funds would remain the same, thus it created another layer of management. No savings were reported. The PPG was dropped for FY 2000 in favor of a return to categorical workplans.

TABLE 5-3: THE IMPACTS OF NEPPS ON STATES (continued)

MASSACHUSETTS	NEPPS reinforced existing state/federal cooperation on the development of environmental indicators, initiated development of a state strategic plan, and complemented a multimedia reorganization previously undertaken. As a result, NPDES permitting and inspection activities were shifted to a five-year basin schedule, the state and region were able to focus on the NPDES backlog, and the shift to centralized management of grant funds increased upper management control of funding.
MISSOURI	NEPPS was integrated with state strategic plan, simplified the budget and provided flexibility in allocation of state funds. Section 319 funds were shifted into NPDES to handle a backlog, and air program funds were shifted to hazardous waste. Five percent of funds were set aside for agency-wide priorities and crosscutting projects. Administrative work shifted to a higher level rather than reduced.
NORTH CAROLINA	NEPPS provided impetus for aggressive public participation approach, which facilitated communication among different media programs and cross-program planning, because stakeholders view problems in terms of issues rather than programs. A PPG was not pursued because of resistance at the program level.
OKLAHOMA	Development of first PPA was concurrent with development of the first agency strategic plan, and consists of a short framework document that delineates federal and state roles, and commits state to provide real time access to state management and data systems in lieu of program activity reporting. Program commitments are not documented. Enforcement roles are an area of concern. Financial flexibility under the PPG is limited because the DEQ budget is heavily fee-based, thus redirection of federal funds would give the appearance that fee-payers were subsidizing other programs.
TEXAS	PPA based on state strategic plan. Reporting requirements were reduced from 250 items to 140. Residual funds from RCRA were redirected to TMDLs and the NPDES backlog, but led to concerns that the reallocation of funds provided the basis for the subsequent reduction of the RCRA budget. Enforcement problematic because it is seen as adding another layer to existing enforcement programs, because of disagreements on priorities, and because the state took a more multimedia approach.
WASHINGTON	PPA serves as workplan for all covered grants and includes performance measures, which added a layer to existing reporting requirements. Flexibility did not materialize.

Impediments to A Performance-Based State-EPA Relationship

The EPA-state agreement creating NEPPS was ambitious, but one cannot expect a complete transformation of EPA and state agencies in five years. As mentioned earlier, the research teams confirm that the disappointment of many state officials is based in their unrealistic expectations of the discretion that NEPPS would give to states. They hoped that EPA would stop questioning state agencies about their activities, would pay attention only to changes in environmental conditions within a state. Of course, given the unevenness of the available data on environmental conditions, EPA could not have taken that approach. Then, too, one cannot measure performance solely by examining environmental data: such measurement also requires monitoring of agency programs, and analyzing their effect on environmental performance.

NEPPS faced barriers other than unrealistic expectations. EPA officials feared NEPPS would allow states to weaken environmental protection; state program managers were uneasy about cross-media activities. And top EPA officials gave only intermittent, uneven support to NEPPS.

Opposition to NEPPS Inside EPA

Academy researchers report that many EPA officials are "made profoundly uneasy about the granting of flexibility, and the diminution of traditional accountability and leverage mechanisms under NEPPS." [225] As mentioned earlier, many EPA employees insisted that congressional pressure and federal statutes demanded that the agency keep close track of state activities. The comment of one conscientious EPA regional official responsible for NEPPS is typical:

> EPA does not merely have a duty to maintain control of state programs; in many instances it has the legal obligation to do so. In many cases, the states are implementing Federal not state programs. Not acting on statutory mandates can and has resulted in lawsuits and court enforcement of the mandates. Meeting our obligations under law is not a cultural aberration that can be removed by retraining or by Congress providing a "statutory basis for NEPPS." [226]

The Office of Enforcement and Compliance Assurance was particularly vocal in insisting on the importance of EPA oversight of state activities, reflecting deeply entrenched agency support for supervising states. An influential 1991 EPA report, *Enforcement in the 1990s*, conveys a deep distrust of states' willingness to enforce, and our researchers reported that it still accurately represents the views of many OECA employees:

> Many states still do not have strong enforcement programs, and the current oversight system, which monitors how states address specific violations, is necessary to assure that there is adequate enforcement. From OECA's perspective, EPA's vigilance is a key factor in motivating state action, even in those states with relatively strong programs. [227]

Many state officials have argued consistently over the past few years that EPA should not ask them to perform specific numbers of enforcement actions. They consider enforcement a tool, and feel that under NEPPS, EPA agreed to leave the choice of tools up to the states. Some states left enforcement out of their PPAs, handling it by a separate work plan. According to Herb, *et al.*, enforcement issues have been a constant source of acrimony and ill feeling for many years. Until quite recently, the Office of Enforcement and Compliance Assurance prepared its plans for industry sectors and annual priorities with minimal consultation with states, notwithstanding the office's long-standing written commitment to joint planning and evaluation of enforcement activities with states. OECA has begun soliciting state comments on national enforcement priorities, but those initial steps have not alleviated the tension. [228]

Misgivings about NEPPS Inside States

"NEPPS can work only where a state has the vision to take advantage of it," a state environmental commissioner said at a roundtable on the research commissioned for this report. In several states, not only was the vision weak, many state program directors were skeptical about NEPPS, openly opposing any proposal to transfer funds from one program to another through a PPG. They feared a reduction in their control over the programs they managed, and thought they might have fewer resources with which to do their work. Many EPA program directors felt that same skepticism. As a result, both sets of program directors tracked PPG expenditures program-by-program, undercutting the purpose of combining accounts.

In contrast, most commissioners were supportive of NEPPS, feeling that its emphasis on results and on multimedia approaches would give them more leverage over their agencies. Some commissioners used NEPPS to overcome a long tradition of independent divisions within their agencies. Only a few used PPGs to transfer substantial funds, however.[229] Nationally, states consolidated only 30 percent of their grants into PPGs. Since EPA grants cover only some of the total budgets of state environmental programs, only six percent of state spending was affected by PPGs. Thus, while NEPPS did reduce the number of grant applications, saving time and paperwork, its substantive effect in most states was insignificant.

Weak Support From the Top

NEPPS was a compromise between what is necessary to make performance management work and what was politically possible in 1995. Thus the agreement was vague. EPA gave little guidance to regional offices and states about how to implement it, which left the door open for experimentation. And getting the agreement signed was so important that there was no formal review and signoff from the media offices or the Office of Enforcement and Compliance Assurance, which might have delayed the agreement for some time.

The process of writing the agreement also bypassed a public debate that would have solicited input from businesses and environmental groups. Some leaders in the negotiations were reluctant to reach out environmental groups, fearing that they would oppose NEPPS—and thus be able to kill it before it started. Others tried to engage environmentalists but were unable to get much interest. The lack of broader participation in the creation of NEPPS left the door open for exaggerated expectations and fears, leading to a polarization of attitudes.

Almost from the start, EPA leaders seemed divided about the merits of NEPPS. Within six months of the agreement, top EPA officials were speaking to the press about the weakness of state environmental programs. The EPA Office of the Inspector General and some regional offices issued reports highly critical of state enforcement practices. The first of those reports, criticizing enforcement in Pennsylvania, led that state's environmental agency to call off its preparations to participate in NEPPS. While the agency did prepare a strategic plan covering all of its programs, it did not submit it as a PPA.

Shortly thereafter, the most visible advocate for NEPPS in the agency, an associate administrator, resigned. Her job was split between two officials, and the responsibility for EPA-state relations was assigned to a lower-ranking appointee in the Office of Congressional Relations and Intergovernmental Affairs. According to Paddock and Keiner, that decision was critical, since congressional matters are always the first priority for that office.

As time passed, implementation problems occurred as well. EPA did very little formal training of its personnel about NEPPS, or about the broader topic of results-based management.[230] That deprived states and EPA employees of the opportunity to air their hopes and fears about NEPPS, or to learn about successful ways of implementing the program.

PPGs proceeded for three years under regulations that dated to 1983, and were a major impediment to pooling funds from separate programs. Even after EPA published draft regulations in July 1999, Herb, *et al.* and Paddock and Keiner report that many EPA and state officials were not certain how much pooling would be possible. As of July 2000, EPA had not promulgated final regulations for PPGs. Also, the federal statutes that ensure accountability for the use of federal funds are quite prescriptive, and may still be a major constraint on state decisionmaking.

Several other agency management activities were also poorly integrated with NEPPS. The agency announced major initiatives like the Clean Water Action Plan in the middle of the year,

for example, upsetting work on PPAs and PPGs. Not until 1999 did the headquarters media offices publish their annual guidances to regions simultaneously—and early enough to guide state-regional office negotiations about PPAs and PPGs.

Simultaneously with making it difficult for them to participate effectively in the program, EPA headquarters encouraged states—even those with poor records of environmental protection and little competence in results-based management—to sign up for NEPPS. Within two years of the agreement, more than 40 states had signed PPAs and/ or PPGs covering one or more EPA programs. (See Figure 5-1.) To entice so many states to participate, many regions accepted half-hearted state implementation.

Specifically, EPA neglected to push three key features of NEPPS.

First, EPA allowed states to skip the self-assessment of environmental conditions, and of state and EPA programs. Over time, many states found it convenient to dispense with that part of strategic planning: merely writing a short section on the topic in their PPAs, for example.

Second, EPA headquarters split PPGs from PPAs, permitting states to participate in only one part of NEPPS. Thus EPA allowed states to move funds between programs without setting—or even discussing—priorities with regional offices, engaging citizens, or preparing plans. That removed a powerful incentive for preparing a PPA: if a state agency could reallocate funds without writing a PPA, the only benefit from negotiating the agreement was the hope that the negotiations would persuade a region to adjust its activities to help accomplish state goals.

Third, there has been very little public involvement in NEPPS. Although getting the public involved was an explicit purpose of NEPPS, neither EPA nor many of the states did much to advance it. EPA regions allowed states to limits their efforts to perfunctory exercises like holding public hearings or placing notices in newspapers. Some states tried to arouse public interest, but found that self-assessments and PPAs were not particularly good vehicles for discussions with citizens: the documents were too broad and included too much information about routine agency programs.

How NEPPS Could Work

The experience of the few states that did take planning and public involvement seriously suggests how NEPPS might become more effective.

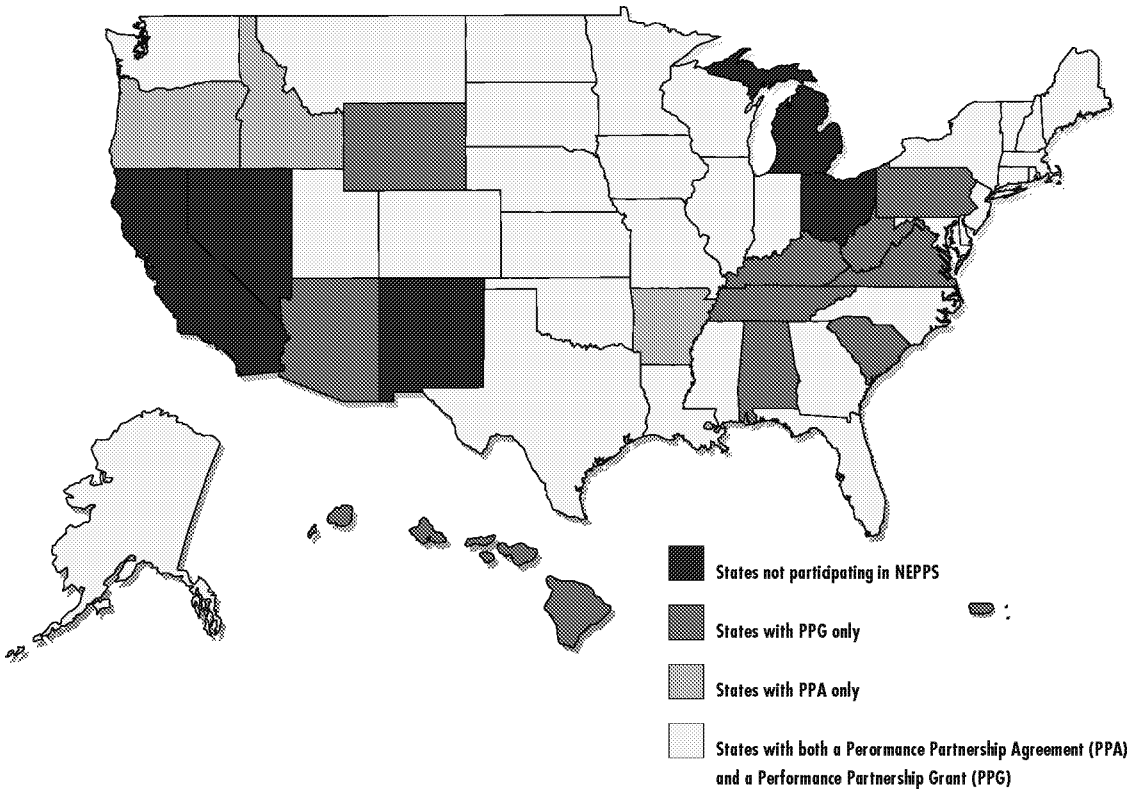
Illinois had significant success in engaging citizens and advocacy groups. It tied the self-assessments that were part of writing PPAs directly to state-of-the-environment reports. Those reports are interesting, accurate, full of clear text and graphics, and widely publicized. The state also got environmentalists and other members of the public actively involved in preparing PPAs. Doing so took careful planning.

In 1996, the state held workshops to get public comments on a state-of-the-environment report. Then it convened meetings to review the second draft of its PPA. By the third PPA, it convened separate focus groups of environmentalists, businesspeople, and local officials to discuss the draft PPA in detail. Environmentalists were quite well organized, offering detailed comments.

Texas and North Carolina have also actively sought public comments on draft PPAs. Minnesota has used its self-assessment in meetings with the state legislature. In addition, some agencies engaged the public actively in developing a state-mandated strategic plan that overlapped with their PPAs. And other states have used a finished PPA as a tool to explain their programs to the public.

Those techniques could be duplicated elsewhere. Self-assessment can be a device to engage the public, as well as to encourage agency staff to consider the successes and shortcomings of current programs. State agencies could ask businesses, local governments, and environmental

FIGURE 5-1: STATES WITH NEPPS AGREEMENTS



advocates to offer their assessments of environmental quality and agency performance. They could conduct customer surveys and commission independent evaluations by outside parties. Each of those steps would help identify the most important environmental issues facing a state agency, and thus the largest opportunities for improved performance.

Even better, the NEPPS process could include an assessment of both state agencies and EPA regional offices. As described above, the working relationships between EPA regions and states have great potential for misunderstandings. NEPPS could shed some public light on the important support that EPA regions give states. And self-assessments of regions could begin to provide answers to the nagging question of why EPA regions employ just as many people after delegating programs to states than they did when they ran the programs themselves.

If robust self-assessment and planning processes involve the public, they might begin to bridge the chasm between the state commissioners' desires for flexibility and EPA staff fears of a downward spiral of lax enforcement and weak performance. Done well, NEPPS processes could offer an opportunity for exploring evidence about whether state activities are having any impact on environmental conditions. Rigorous public self-assessment and planning could place NEPPS on an entirely different foundation, and improve the system substantially in the future.

Of course, none of those measures will work without steady, determined support from leaders in EPA, states, and other organizations. NEPPS is a process; it presents opportunities to

tackle tough issues and make real environmental progress. If EPA and states begin to use NEPPS to bring critical information to the attention of the public and decisionmakers, and if leaders in agencies, environmental groups, the media, and communities decide they would rather address tough issues than ignore them, then NEPPS could transform environmental governance far more rapidly than it has done so far.

Transforming an EPA Regional Office

About one-third of EPA's regional staffers work on agency programs that cannot be delegated to states, e.g., Superfund,[231] or on those that states have chosen to not to run. The other two-thirds work closely with states on delegated programs and other matters of common concern.

Regions hold a pivotal position in EPA-state relations. They are responsible for managing EPA grants to states, oversight of state programs, providing specialized technical support to states, regional and cross-border issues, managing EPA's relationships with local and tribal governments, and for a great deal of EPA's direct contact with the public. In addition, they provide a channel for state and local perspectives to flow to EPA headquarters staff. Regional staff members often participate actively on agency-wide teams to draft new programs and management approaches.

Between late 1993 and 1999, Regional Administrator John DeVillars made EPA's Region 1 office in Boston one of the most dynamic centers of innovation in EPA. Earlier he had been secretary of the environment in Massachusetts, and one of the governor's top aides. But he did not share the view of many state officials that once EPA delegated programs to states, its regional offices should shrink. Instead, he saw regional offices as a force for innovation. He tried to make the regional office "an institution focused on bold change . . . a laboratory for bold experimentation, believing . . . that EPA and other regulatory agencies . . . hadn't kept pace with the times."[232]

DeVillars sought to transform the regional office in four ways. He challenged ingrained habits both by his own leadership style and by reorganizing the office. Second, he directed the new Office of Environmental Stewardship to de-emphasize traditional inspections, and to invest more resources in helping specific industries prevent pollution. Third, he consolidated the media offices of air, water and waste into a new Office of Ecosystem Protection to work directly with citizens in specific communities and with state environmental agencies. And fourth, he sought to focus all of the region's work on results. To symbolize those transformations, DeVillars changed the name of the office from EPA Region 1 to EPA New England. Some officials in headquarters protested, and it was not until January 2000 that EPA Administrator Browner made the new name official.

Jodi Perras reports that those efforts have led to significant change. And thus, although not necessarily the only model for changing the roles of EPA's regional offices, they represent a possible new mission for the regions.

New Structures, Titles, and Ways of Thinking

In 1992, shortly before DeVillars arrived, a management consultant reported that the regional office gave too much attention to crisis management, and lacked systematic planning and goal setting. Managers were set in their ways, and many felt either unchallenged or bored with their work. The average tenure of top managers was 20 years and five months, and a

majority had spent their entire career in one EPA media office. Many of the agency's junior managers believed their supervisors did not care enough to be helpful.

DeVillars shook up the office. He combined separate air, water, waste, and toxics programs into a new Office of Ecosystem Protection and put half in separate multimedia offices for each of the six states in the region.[233] The Office of Environmental Stewardship brought compliance and pollution prevention staff into the same office as enforcers. Many top managers were re-assigned, and many lost their supervisory responsibilities, becoming senior technical advisers. DeVillars pushed staff to rethink their jobs and embrace their new responsibilities. "A lot of us were too bureaucratic," said one regional manager. "John cut through it like a laser sword cutting through butter."[234]

Using Enforcement and Compliance to Prevent Pollution

The region's Office of Environmental Stewardship diverted staff from enforcement to pollution prevention, increasing that group from three to 45 full-time equivalent workers. It disinvested in traditional state oversight inspections. The number of inspections and fines dropped by about 60 per cent in the first six months after the reorganization,[235] which provoked a storm of protest from the Office of Enforcement and Compliance Assurance at EPA headquarters.

Once staff settled into their new responsibilities, those numbers increased somewhat, and the region adopted a tough approach on many enforcement cases. For example, it levied large fines on major industrial firms, and signed a consent agreement for a $350 million cleanup of PCB spills. The region also ordered the Massachusetts Military Reservation to stop training activities that scattered a million pounds of lead bullets a year, along with propellants and other litter, on land over the aquifer for 500,000 people.

But the central thrust of the new office was to use carrots along with sticks—simultaneously experimenting with technical assistance and forbearance and threatening traditional enforcement if performance did not improve. It worked with trade associations, universities, states, environmental groups and other organizations to create new institutions offering technical assistance and less-polluting technologies for key business sectors. For example:

Warning universities about possible enforcement actions. The region levied a $300,000 fine against the University of New Hampshire, announcing the action in a letter to 258 colleges and university presidents, and inviting them to attend a compliance assistance symposium. An overflow crowd responded; and universities and colleges began volunteering to help one another comply.

Voluntary audits by chemical companies. In the two years following OECA's announcement that it would reduce or eliminate penalties on chemical plants that conducted audits and disclosed violations, no New England firm stepped forward. So the region developed a two-year strategy in cooperation with trade associations and state agencies. Firms received letters announcing a two-year series of technical assistance workshops and targeted inspections. Forty-five percent of the 178 chemical plants in the region attended a workshop, and 10 plants from eight companies conducted a self-audit: a good response according to OECA headquarters staff. A confidential survey conducted later by the region and a trade association found that 95 percent of the 31 firms replying said the workshops were helpful, 75 percent were more likely to conduct self-audits, 48 percent had actually conducted an audit, and 19 percent had adopted pollution-prevention measures.

Protecting Special Places

The new regional Office of Ecosystem Protection has teams that work with state and local officials, environmental groups, and businesses in 17 "special places," including rivers, urban areas, and estuaries. Perhaps the highest profile effort is in the Charles River watershed, which includes most of Boston and Cambridge. In 1995, the region made the announcement that while the river had a "D" in water quality, it would earn an "A"—fishable and swimable every day of the year—by 2005.

The Charles River initiative grew out of an enforcement action EPA took against the Massachusetts Water Authority, a regional agency responsible for wastewater treatment in eastern Massachusetts. The authority complained that EPA was ignoring nonpoint sources, primarily stormwater runoff, and poor infrastructure that combined to allow raw sewage to flow into the river. Rather than the traditional one-problem-at-time approach, the water authority wanted EPA to consider more holistic remedies. DeVillars sent letters to all of the facilities in the Charles River watershed that had permits, informing them of a round of upcoming inspections. DeVillars then challenged the heads of several large facilities to form a coalition to undertake voluntary efforts to address the full range of nonpoint and point source problems that stood in the way of meeting water-quality goals for the watershed. A large environmental advocacy group, major universities, and several large employers are members of that coalition, which has a small staff. It operates independently of EPA, but the regional office does coordinate on some projects.

EPA New England also used traditional regulatory tools, pushing local governments to clean up combined sewer overflows. But it assisted those governments as well: by examining maps of city sewer systems to identify outfalls that had never been permitted, for example, and by signing memoranda of understanding detailing compliance plans with each of the towns in the watershed. The regional office also helped organize educational programs and publicity to inform citizens that simply picking up trash and cleaning up after their dogs would go a long way to cleaning up the river. Each day, for example, red or blue flags at key access points along the river tell citizens whether the river is clean that day.

And the river is much cleaner. Its grade rose from "D" to "B" by 1999, and the number of days that the river is swimable and fishable doubled. The river may not get a straight "A" in 2005, but clearly the regional initiative—especially the report card—has increased compliance, supported voluntary efforts by citizens and businesses, forced local governments to take action, and brought the goal within reach.

A New Approach to Oversight

EPA New England also changed its approach to state oversight. All six states in the region have participated in NEPPS since 1997, writing both PPAs and PPGs. Several PPAs include not only quantitative estimates of proposed improvements in environmental conditions, but also specific goals for gathering missing data.

There is little doubt that the reorganization helped encourage that participation. The six-multimedia offices, one for each state, provide a single point of contact that helps make NEPPS work smoothly. The reorganization also encourages regional staff to get into the field more often, improving communications between the region and states. Staff also had to become familiar with a broader range of EPA programs. Some regional staff flourished in the new arrangements, but some had to improve their communication, teamwork, and negotiation

skills. And, of course, some EPA staff felt that the agency had less control over state activities, and openly longed for the old days. Due to the steep learning curve, some staff reluctance, and staff attrition, the region was initially hampered in its ability to provide expert technical advice to state agencies.

The region also changed its approach to oversight of state enforcement programs, embracing a multimedia, after-the-fact approach that is consistent with NEPPS. Prior to 1993, regional enforcement staff had sampled case files, accompanied state inspectors on some visits to facilities, and conducted detailed quantitative reviews of enforcement statistics for individual media programs. Starting in 1994, the region's Office of Environmental Stewardship began multimedia program reviews. The office still studied some individual cases and sent inspectors on some visits, but it also conducted yearlong, program-wide reviews, which included discussions with state managers about enforcement policies, documentation of improvements in state programs, and written reports with specific recommendations. Since 1999, those reviews have covered compliance assistance efforts as well as traditional enforcement.

Unlike any other EPA region, EPA New England used PPAs to work out agreements about state and regional enforcement programs. A committee of state and regional enforcement officials meets regularly. Although states and the region still disagree about penalties, and about the appropriate mix of enforcement and assistance, the working relationships are generally cooperative and amicable.

Although the new approach shifted the focus from individual cases to broad state policies and practices, the region did not shrink from tough criticism. It took some states to task for levying inappropriately small penalties—or none at all—on many violations, and it complained about under-staffing in some states. When a budget cut threatened the Rhode Island agency with a 17 percent reduction in staff, the regional office threatened to withdraw delegation of federal programs. The legislature restored the funds.

Managing for Results

Despite the success of the Charles River initiative, Perras reports that the region has not yet developed a strong culture of goal setting and managing for results.

The goals of the region's enforcement/ compliance reforms were that firms would understand regulatory requirements more fully, conduct self-audits, comply with regulations, and prevent pollution. The region did not develop ways to measure success or failure until OECA objected to the reforms, and it still has difficulty in developing useful measurement information.

The most reliable way to assess compliance and pollution prevention would have been to conduct before-and-after inspections of a random sample of firms. But the region decided it would be a far better investment of inspectors' time to send them to firms that were more likely to have violations. Regional staff developed a confidential survey form to send to firms, but getting approval from the Office of Management and Budget was difficult and time-consuming. Furthermore, OMB directed the region not to regard the survey results as a random sample: presumably firms that replied to the survey were more likely to have attended workshops and improved their practices.

Reorganization efforts have also been complicated by pressure from EPA headquarters to deliver results and numbers that fit the agency's 10 GPRA goals. Even though the region organized 10 teams to try to align the "special place" ecosystem projects with the agency's GPRA planning system, staff found it extraordinarily difficult to fit the region's multimedia efforts into that structure, which is largely built around separate EPA programs. There are a small number

of GPRA sub-goals for distinct sub-national places—e.g., the Great Lakes—but EPA New England's special places had no home in the hierarchy of GPRA goals. Furthermore, since many GPRA measures count activities of separate agency programs rather than changes in emissions or environmental conditions, the pressure for GPRA numbers distracted staff from multimedia work, and from focusing on overall results.

As the region struggled to measure the results of its innovations, it faced pressure to produce other measures of agency activities. One of the most frustrating pressures concerned the Clean Water Act requirement that NPDES permits be reissued every five years. Like many other regions and states, EPA New England developed a large backlog of NPDES permit renewals. In many rivers and lakes, the point sources that obtain those permits are less of a threat to water quality than is polluted runoff. But faced with critical reports by the EPA Inspector General and the General Accounting Office, and criticism from Congress and environmental advocates, the region eventually pulled staff off other work to work down the backlog.

Transformation or Turmoil?

The reorganization of the region was not popular. Changing EPA New England ran into the same opposition as NEPPS did. Program managers in the regional office objected to the multimedia organization, and the Office of Enforcement and Compliance Assurance protested strenuously when DeVillars assigned 20 of the 120 OECA-funded staff to work on pollution prevention instead of traditional enforcement activities. Indeed, OECA and the region were unable to agree on work plans for fiscal years 1998 and 1999.

DeVillars admits he could have handled the reorganization in a better way. For example, although he spent 18 months seeking staff response to his plans, he chose not to follow many of their recommendations. When the reorganization took effect in 1995, both an internal opinion survey and a separate survey by PEER, Public Employees for Environmental Responsibility, showed that a large majority of regional staff opposed the reorganization. Editorials in the Boston press criticized the reorganization, as well as the other changes that the region was making.

Four years later, however, most EPA staff, state officials, and others seem to agree that the reorganization and the reassignment of long-term program managers have changed the culture—the ingrained ways of thinking and acting—of the regional office. (It is quite difficult to quantify such a change, however, and the Academy did not ask Perras to conduct a formal opinion survey.) Many interviewees in the regional office said they had a much broader view of the agency's work, and of their own jobs. State officials reported that regional staff seemed to be more concerned about environmental results. When the *Boston Globe* criticized DeVillars' approach to enforcement in 1999, 22 leaders of major regional environmental groups—including the Conservation Law Foundation, the Massachusetts Public Interest Research Group, and Save the [Narragansett] Bay—sent a letter to the editor that said:

> "... John DeVillars has been a highly effective leader in protecting New England's environment. His enforcement program—combining aggressive, tough actions against violators with effective compliance assistance—is nothing short of outstanding. There is no one in the country that has taken more tough, groundbreaking stands on major environmental issues. [236]

On the other hand, many regional employees remember DeVillars with decidedly mixed emotions, and both regional and headquarters staff complain that the reorganization will not

be truly workable as long as EPA headquarters is organized by media offices. But states like Massachusetts that have also reorganized to disband media offices do seem comfortable. Ultimately, the verdict on the reorganization and on DeVillars' leadership style will depend, in part, on the effectiveness of other aspects of his agenda for change. Initial results are promising in many respects, but as with NEPPS, the process of transformation is far from complete. Both state and regional staff report that the day-to-day work of many front-line regional employees has changed very little over the past five years.

The following chapter addresses this question squarely: is transformation possible? How deep must it run? How might it occur?

Findings

Finding 1. Some states are beginning to use performance-based tools to manage their programs more effectively and efficiently. A small but increasing number of state environmental agencies has invested in performance-based management systems. They have:

gathered better data about changing environmental conditions

published and publicized state-of-the-environment reports

conducted serious self-assessments of whether their activities contribute to environmental protection

thought strategically about how to improvement their performance

engaged the public and state legislators in framing their goals and strategies

used tools like Florida's "focus-watch" system to manage for results

The art of performance management is still at an early stage in environmental policy-behind education, health, and some other policy areas. There are significant technical problems in measuring environmental performance: paucity of solid data; uncertainty about scientific relationships; and a general lack of evaluative information about program effectiveness.

Performance management does not eliminate controversy or give managers simple answers to complex problems; rather it focuses the attention of decisionmakers and the public on results, and thus encourages creative thinking and more effective policies and programs. Because state legislators and other decisionmakers are aware of the technical shortcomings of measures of environmental performance, they rarely use measures alone to choose a particular course of action. In some states, however, they are beginning to use such data to fine-tune proposals and explain them to the public. Thus performance measurement and management may, over time, begin to frame issues and shape public debate.

Performance measurement will improve more rapidly when EPA and state agencies invest their energies in monitoring environmental conditions rather than activities, and when decisionmakers use such data in making decisions. Legislators, environmental advocates, and managers could be using performance measurement far more effectively and creatively than they are currently.

Finding 2. The National Environmental Performance Partnership System sought to transform the EPA-state relationship, encouraging priority setting, multimedia management, and

more effective joint efforts for environmental protection. However, because NEPPS is an overlay on a deeply entrenched culture that focuses on process rather than results, it has had a marginal impact on most states, and its future viability is in doubt.

EPA and most state environmental agencies are still deeply committed to traditional management systems that focus on detailed accounting of the activities of agencies and regulated parties, and discourage broad thinking about environmental performance. Organization, planning and budgeting systems, incentive systems, management styles, and profoundly ingrained procedures and attitudes all reinforce a focus on producing specific activities. The agencies' information systems focus on the regulatory process—permits, emissions, inspections, and enforcement actions—rather than on environmental conditions. And EPA oversight has long concentrated on state processes. That makes it hard for the public to understand and participate effectively in debates about state policies and programs. It also frustrates state officials in their efforts to adapt federal programs to local conditions, and to find more effective ways to address environmental issues. Debates about the strength of state programs often degenerate into arguments about procedural details.

NEPPS encourages states to gather better environmental data and set priorities for environmental protection. But it has had significant impact in only the few states where top agency officials were personally committed to the new approach, or where there was a tradition of strategic planning and management.

NEPPS did create opportunities for closer cooperation between top officials in state agencies and EPA regions, but top EPA officials gave weak and inconsistent support to NEPPS, and program directors in most regional offices and some states resisted it openly. Enforcement was especially controversial, with many state officials maintaining that EPA should judge their performance by results rather than by process, and EPA's enforcement office insisting on detailed accounting of enforcement activities by both EPA regions and states. Conflict was muted in New England, where the regional office combined multimedia, after-the-fact assessment of state enforcement and compliance assistance efforts, along with tough criticism of perceived state shortcomings.

NEPPS promised a two-track system for EPA-state relations, allowing more flexibility to states that achieved outstanding environmental results. States resisted any formal ranking of their performance, so EPA backed down. EPA and ECOS did agree on core measures that might allow comparison of state performance, but many states refused to report all measures, and EPA has decided not to assemble—even at the regional-office level—the data that could make such comparisons possible.

Notwithstanding its shortcomings, there is significant evidence that NEPPS could work. If both states and regions were to conduct serious self-assessments that engaged the public actively, and use those assessments as the foundation for planning and budgeting, the EPA-state partnership could be far more productive.

Finding 3. EPA's 10 regional offices, which employ 8, 753 people—nearly 40 percent of EPA's total staff of 18,967—play the central role in balancing the need for innovation and flexibility with the need to maintain the integrity of EPA's national regulatory system. They also must cope with the inevitable differences between state and federal priorities. They must consider their special responsibilities for cross-border environmental problems, and for handling EPA's relationships with tribal governments and local governments, as well. The regional offices are indeed at the front line of transforming EPA into a performance-driven organization.

Many of the innovative approaches piloted at EPA New England have been quite successful and could be transferred to other regions: the blending of compliance assistance with traditional enforcement; intensive goal-driven work with other agencies in high-profile watersheds and communities; and after-the-fact multimedia oversight of state enforcement and compliance activities. The region has combined toughness towards violators with flexibility in dealing with companies, local governments, and state agencies that sought more efficient, more effective approaches to environmental protection. The EPA New England model is not perfect, not the only way to transform a regional office, and, indeed, may not work in other regions, each of which has unique characteristics and problems.

Recommendations

Despite its potential, NEPPS cannot succeed, or EPA regional offices transform themselves as needed, without substantial changes in EPA as a whole. If NEPPS is to be a tool that focuses national attention on environmental problems, and—perhaps more importantly—lets the country know how well its goals are being met, the agency must change fundamentally its old ways. To prevent NEPPS from being yet another ebbing tide of reform, the agency must allow states—and itself—room to demonstrate further the capacities for innovation and results that exist among federal, state and local government managers, as well as in industry, nongovernmental organizations, and the public itself. The Academy panel thus makes the following recommendations for the agency and its partner states.

1. Renew the commitment to NEPPS.

EPA and states should renew their commitment to transforming the federal-state relationship through NEPPS. In consultation with local governments, national and regional environmental groups and businesses, EPA and the states should reform that partnership program. Congress should provide any necessary statutory authorization for a reformed NEPPS.

EPA and states should agree on a higher floor for participation in NEPPS, including:

a. *Self-assessment.* States should prepare full self-assessments, setting environmental priorities and analyzing progress based on analysis by both agency staff and independent experts. EPA should offer support to states for developing models for such assessments. Regional offices should also complete self-assessments of their own activities and performance.

b. *Public participation.* States and EPA regions should make creative and effective efforts to engage legislators, environmental and business groups, local governments, and the public in framing priorities and assessing progress.

c. *Core performance measures.* All states should compile core performance measures; EPA should gather them and make them publicly available.

d. *Grants.* EPA should make performance partnership grants only to states that have completed performance partnership agreements.

e. *After-the-fact oversight.* Regional offices should not conduct "real-time" oversight of state programs that are participating in NEPPS. Instead, regions should monitor state performance to assure that states are complying with NEPPS agreements, and conduct after-the-fact evaluations of environmental performance as part of negotiating renewed agreements.

EPA should encourage all states to participate in NEPPS. To that end, it should invest in substantial improvements in environmental monitoring, measurement, and evaluation. In addition, regional offices should conduct self-assessments with public participation regardless of whether states participate in NEPPS. But EPA should be satisfied with less-than-universal participation in NEPPS, because not all states have built performance management into their operations sufficiently to enable them to participate fully in NEPPS. No single model is possible for the EPA-state relationship because federal-state relationships are inherently dynamic, state capacities and institutions are diverse, and some conflicts between state and national goals are inevitable.

NEPPS should not include a "two-track" system for states, or provide for a formal process of differential oversight based upon a generic definition of "superior" performance. Instead, EPA should offer substantial additional discretion, including waivers to regulatory requirements for delegation of EPA programs, to states that make firm commitments to achieve specified environmental performance that more efficiently and effectively meets national environmental goals. In addition, EPA should offer such discretion to states for innovative program designs that hold promise for substantially more efficient and more effective environmental performance, such as the implementation of cap-and-trade systems to reduce air pollutants or nutrients in watersheds. EPA should encourage states to ask for such discretion to test "performance track" regulatory systems; other promising ways to address non-point problems; and additional innovative approaches to address top national environmental priorities.

The EPA administrator should give a senior agency manager who is accountable directly to the administrator responsibility for NEPPS, other EPA-state relationships, and the management of EPA's system of regional offices.

2. Revitalize regional offices.

As states assume operational responsibilities for federal programs and develop innovative ways of accomplishing their own and national environmental goals, the role of the EPA regions becomes more important, not less. Regional offices play the pivotal role in balancing flexibility with preservation of the integrity of the national system of environmental regulation. Thus EPA should invigorate its regional offices, and clarify their roles.

Regions should be held accountable for improvements in environmental performance, including effective performance by states under NEPPS, addressing high-priority regional environmental issues, and contributing to the achievement of national environmental goals.

Regional administrators should have the necessary tools to assure effective performance: regular meetings and communication with the administrator and deputy administrator; substantial regional budgetary authority; sufficient and capable staff; and authority to make decisions about state performance plans, proposals for waivers, and approval of innovative state programs.

3. Reform the GPRA planning and budgeting systems.

EPA should accommodate both NEPPS and regional accountability.

a. EPA's GPRA systems should encourage regional and other place-based goals.

b. EPA should encourage states to establish environmental goals, define differences between state and EPA goals, and reconcile the differences to the extent possible.

c. EPA should finalize its Part 35 regulations to allow maximum state flexibility in the use and accounting of expenditures under Performance Partnership Grants. The agency should not request or report state expenditures in greater detail than required in PPG applications. If necessary, EPA should seek regulatory or statutory changes to ensure that accounting rules allow states flexibility in spending their PPGs.

CHAPTER 6

Transforming EPA

None of the innovations discussed in the previous chapters can flourish without major management changes at EPA. Those innovations are not simply new tools that could be dropped into the old tool kit of regulation, permit, inspection, and enforcement. Instead, they transform the use of traditional regulatory tools. Some of the programs allow non-EPA employees to make key decisions about emissions and control technologies, as long as the result is to improve environmental protection by a prescribed amount. They shift EPA's role from making day-to-day decisions—or watching closely as state agencies make decisions—about compliance by individual firms to one of setting rules for decisions, and then evaluating whether programs are achieving promised environmental results. Furthermore, within the innovative programs, EPA employees make decisions based on broad judgments about social costs and program effectiveness, rather than about technical cleanup in individual cases.

This chapter assesses EPA's efforts to build the capacity it needs to maintain the integrity of the nation's regulatory system as its role shifts. It explains how EPA has transformed two of its core programs—Superfund and the Office of Enforcement and Compliance Assurance—over the last decade. This record is encouraging, at least up to a point. Superfund has made substantial progress in embracing a broader more results-oriented vision of its purposes, and OECA has begun to do the same. But the reforms in Superfund and enforcement have not required EPA to surrender day-to-day control of decisions about compliance by individual firms.

The chapter also reviews EPA's efforts to equip its employees with the information, knowledge, and skills they will need in the future: not only do their jobs, but to inform and involve the public as well. Here the story is sobering. With many hesitations and false starts, the agency is just beginning to build the capacity to understand how environmental conditions are changing, as well as whether EPA and state efforts are making any difference. The chapter offers an agenda for the management steps and the program improvements the agency must make to prepare for a world of performance-based management.

Reinventing Superfund

Superfund is "an old program that has learned new tricks," according to Robert Nakamura and Thomas Church of the State University of New York at Albany, who assessed Superfund reforms for the Academy.[237]

Superfund is "command-and-control" from top to bottom. Congress created the program in 1980, when toxic wastes were discovered oozing from the ground at a school at Love Canal, near Niagara Falls. The statute[238] gives EPA extensive authority to manage the cleanup of hazardous waste sites that EPA includes on its National Priority List (NPL). The agency has the responsibility for taking emergency actions to contain wastes and prevent human exposures to toxics, and then to devise a cleanup strategy, usually financed by some or all of the parties responsible for the original contamination. The statute expresses a clear preference for permanent cleanups.

The statute takes an extreme position on the "polluter pays" principle. Any entity that has sent hazardous waste to a Superfund site, has transported such waste, or has owned or operated the site may be liable to pay for any, or all, of the cleanup. Liability is "joint and several," that is, a responsible party is liable for the full cost of cleanup if other responsible parties have gone out of business or cannot afford to pay their share, even if that party contributed only a tiny amount of waste. Liability is also retroactive and strict. Responsible parties must pay for cleanup even if they sent wastes to a site before the law was passed, used the best management practices at the time, or were encouraged to do so by government agencies.

While EPA cannot delegate authority for Superfund sites to the states, some states help work on remediation at those sites. In those cases, EPA staff retains the final authority (subject to court oversight) to make decisions about cleanup standards and means. (In addition, several states have developed their own statutes governing cleanups at hazardous waste sites, the vast majority of which are not on the NPL.)

Sometimes-conflicting pressures once wracked the Superfund program. At most sites, the public pressed for more-extensive cleanups and faster action, whatever the price. Companies and local governments potentially responsible for those cleanups complained that the program was costly and unfair. They also were critical of the fact that different EPA regions ran the program differently, causing substantial inequities in the costs of similar cleanup efforts. In 1986, EPA stated that, contrary to prevailing public opinion, Superfund sites posed relatively little health risk to people.[239] That, of course, made many wonder why such a large percentage of the agency's budget was pouring into unneeded cleanup actions.

Thus by the early 1990s, pressure was building for reform. Even before the Clinton Administration took office, stakeholders from all sides of the issue had convened to try to reach consensus on a set of recommendations for Congress and the agency. Their report became the core of a legislative compromise that did not make it through Congress. The bill's failure only heightened the sense that action was needed.

In the early years of the Clinton Administration, it looked as if Congress and the administration would work together to draft and adopt legislation to make the Superfund program more cost-effective and responsive to community needs. When a coalition in Congress fell apart, however, chances for legislated reform died, and in 1995, EPA announced it would reinvent Superfund to be "faster, fairer, and more efficient."

The Superfund Reforms

The administrative reforms were extensive. Nakumura and Church report they amounted to a "fundamental modification of goals, norms, and operational procedures" for EPA regions.[240]

The agency relaxed its insistence on "polluter pays" by stepping forward to pay for up to 25 percent of the costs of cleanup, assuming the responsibility for "orphan shares" left behind when responsible parties had gone out of business or could not afford to pay. EPA sought to make the program more equitable by having regional offices administer the program more uniformly. In the name of fairness, it modified its interpretation of joint and several liabilities by ceasing the practice of charging big corporations the full cost of cleanup, which had forced them to seek compensation from other responsible parties.

To reduce the overall costs of cleanup, EPA issued "land use" guidance and adopted "presumptive remedies" that allowed staff to consider—before selecting remedies—how sites might reasonably be used in the future. Before the change, EPA tried to achieve a uniform risk-based standard for cleanup that would make each site safe enough for residential development, day care facilities, and schools—regardless of the likelihood of such uses. The reform allowed cleanup standards to be designed for whatever uses are reasonably expected to occur. If a site were not to be used for residences, the agency would often leave some of the contamination in place after ensuring that it was contained and unlikely to cause harm to human health or the environment. That change implicitly relaxed the statute's preference for permanent cleanups.

EPA also relaxed the threat of future liability for owners of contaminated sites identified by states but not yet on the National Priority List. It "archived" three-quarters of those sites and began sending "comfort letters" or writing "prospective purchaser agreements" at other sites, clarifying EPA's intent not to invoke Superfund's tough liability provisions by placing the sites on the NPL[241]

The most popular part of EPA's Superfund reinvention efforts has been its Brownfields program, which is much smaller than Superfund. It has directly financed redevelopment of sites posing a low risk of human exposures to toxics. The program has awarded $65 million in planning grants to 300 communities, and made $40 million available from a revolving loan fund for cleanup and redevelopment at 68 sites.[242]

EPA leaders have proudly proclaimed the success of that reinvention effort. They point to data showing that cleanups had been completed at 50 per cent of all NPL sites by 1999, up from only five per cent in 1991, and that cleanups had begun or were complete at 90 percent of all NPL sites, up 30 percent during those same years[243] The agency now predicts that all current NPL sites, except those at federal facilities, will be cleaned up within five years. The agency also predicts that the policies it instituted in the program's reinvention will cut the costs of cleanup by over $1.3 billion.[244]

The 1995 reinvention, however, should not get all the credit for speeding the pace and cutting the costs of cleanups at NPL and other hazardous waste sites. At many sites, the long years of planning, litigation, and engineering design were coming to fruition anyway: by 1995, many sites were ready for final decision and construction or completion. In addition, some of the cleanup technologies that the program promoted in early years, especially for permanent decontamination of groundwater, were proving to be ineffective and extraordinarily costly. Thus it was perhaps inevitable that the agency would back away from the goal of permanent cleanup and accept containment as a more reasonable "solution" for some kinds of contamination.

Nakamura and Church conclude, however, that the reinvention reforms had a significant impact. They studied closely the implementation of the program in two Northeast regions that manage a third of the NPL sites. They found that regional officials took reinvention seriously, and made major changes in Superfund.

Managing the Reforms

The 1995 reinvention effort was the latest in a series of efforts to reform the program. Congress amended the statute in 1986, and top EPA officials attempted periodically to increase the pace of cleanups, and to make the program more efficient and equitable. Nakamura and Church report that reinvention was far more successful than the earlier efforts they had previously analyzed.[245] In the past, many regional officials had resisted reforms. The emphasis on enforcement, on getting responsible parties to pay as much of the costs of cleanup as possible, and on high standards for remediation were deeply lodged in the statute—and in the management of the program in regional offices.

The 1995 reinvention was more successful than earlier reforms because the agency's reinvention plans drew heavily on ideas that the regional offices themselves had been developing over the years, ideas with which they were comfortable. Furthermore, top EPA managers gave regional staff substantial flexibility in applying the reinvention ideas. And the administration made reinventing Superfund a priority: President Clinton himself called Superfund a "broken" program.

Perhaps the most important reason for Superfund's transformation was that Congress appeared likely to implement its threat to make dramatic changes in the program. In 1993 and 1994, the agency participated in intensive congressional negotiations for statutory reforms that would leave most of the program intact—only to have Congress reject compromise legislation at the last minute. When the Republicans took control of Congress in 1995, they pressed for more dramatic reforms, such as abandoning joint and several liability, and turning management of the program over to states. Although Congress did not pass that legislation either, many Superfund employees recognized that if the program did not change, the legislative assault would continue—and might be successful. Nakamura and Church call the failure of the 1994 legislative proposals and the 1994 elections the "critical event" that made reinvention take hold.[246]

The Results of Reinvention

Nakamura and Church say that the years since 1994 have been the "finest hour" of the Superfund program. But the story is not over.

When EPA accepted containment of contamination as an acceptable alternative to complete cleanup, the agency required "institutional controls" such as zoning or restrictive covenants in deeds. The agency also committed to monitor each of the sites every five years to ensure that remaining contamination would not present significant risks. For a time, EPA was behind schedule in making its five-year monitoring visits. The visits are costly, and rarely found any flaws in the containment systems, so managers began allocating scarce resources to cleanups instead.

Nakamura and Church suggest that the agency permit self-certification by property owners, as in the Massachusetts Environmental Results Program, in lieu of inspections by public employees. The move would, of course, push the cost of the inspections back onto site owners, and require spot inspections by either federal or state governments.

The other continuing issue is the cleanup of as many as 450,000 hazardous waste sites that are not on EPA's lists. Virtually all of those sites are less seriously contaminated than Superfund sites. States and local governments will probably play the central role in cleaning them up, although some EPA regional officials say the competence of regional offices in managing cleanups could be put to good use on other non-federal sites when the Superfund cleanups have finished.

Although the Superfund reinvention was successful by other standards, it did not significantly improve working relationships between EPA and states. Indeed, Nakamura and Church report that the state officials they interviewed knew little about Superfund reinvention, which focused on EPA's own management. EPA-state relationships about hazardous waste sites are complex and vary widely from place to place, but the state and local officials who complained to researchers for this study repeated comments about EPA inflexibility and unreasonableness that their predecessors had made years ago.

In short, the 1995 reinvention of Superfund caused important changes in the Superfund program, which contributed to making the program more efficient and speeding the pace of cleanups. The experience shows how consistent leadership, good management, and congressional pressure—in the absence of actual legislation—can help transform EPA programs.

Enforcement

Over the past eight years, EPA has made two important changes in its enforcement activities. The first was to centralize authority for enforcement in a new Office of Enforcement and Compliance Assurance (OECA). The second has been to develop a broader range of activities to encourage compliance. Reorganization has had a dramatic impact not only on OECA, but also on the entire agency. OECA has become one of the strongest voices within the agency on policy and, as previous chapters have shown, a conservative force on innovation.

But OECA is not a monolith: neither is it impervious to change. EPA built compliance assistance into the design for the newly centralized enforcement office. Over the past five years, OECA has provided funding to trade associations, and business-assistance programs for nine national, sector-specific web- and telephone-based centers that provide "first-stop" shopping about regulatory requirements, pollution prevention, and other information, primarily to small businesses. OECA developed a variety of tools that firms can use to assess their compliance status, including audit protocols, checklists, and in-depth compliance assistance guides. OECA also developed and implemented one of the pilots of StarTrack: the Environmental Leadership Program. And OECA has played an important role in designing the agency's performance track innovations.

In the last few years, OECA has also implemented a strategy it calls "integrated compliance assurance" which is designed to exploit a variety of tools available to the agency to persuade regulated entities to achieve full compliance with the law. Those tools include traditional enforcement, compliance assistance; and compliance incentives, which encourage firms to examine their performance and come into compliance before inspectors arrive.

Moving to Integrated Enforcement

Jeanne Herb, of the Tellus Institute, assessed six integrated enforcement efforts for the Academy.[247] The primary purpose of those efforts was to make EPA enforcement more cost-effective by reaching more facilities, by targeting EPA work on high-priority sectors and issues, and by using less-expensive means to address less-serious violations.

Three integrated enforcement efforts involved applications of EPA's audit disclosure policy. The efforts are "integrated" in the sense that they involve self-evaluation and compliance assistance, as well as traditional regulatory practices.

> EPA Region 5 (Chicago) sent letters to 22 steel mini-mills, suggesting that they conduct self-audits, offering compliance assistance, and notifying them that EPA would inspect

facilities that did not respond. Ten submitted self-audits disclosing 1,200 violations, mostly of paperwork and reporting requirements. EPA resolved those cases without imposing penalties. EPA also inspected the facilities that did not respond—and filed enforcement actions against half.

EPA Region 4 (Atlanta) has enough staff to conduct only one full inspection of publicly owned wastewater treatment facilities (POTWs) per year. The office sent letters inviting 68 POTWs to conduct self-audits, and most did so. The office has not decided how to handle POTWs that do not participate.

In 1996, a major telecommunications firm disclosed to EPA headquarters that it had not met statutory requirements to notify state and local officials about hazardous substances present at more than 300 facilities, and had not prepared required plans concerning management of those substances. EPA fined the firm $52,000 and sent letters to about 30 other firms. Half conducted self-audits, and 13 reported similar violations at more than 6,000 facilities, paying more than $600,000 in penalties. At this writing, EPA had not yet taken action concerning the firms that did not respond.

Herb also studied three other efforts:

In 1992, Congress passed legislation requiring landlords and real estate agents to provide information about any lead-based paint to homebuyers. OECA published regulations for the program in late 1996. Then instead of moving directly to enforce those regulations, as usually happens, EPA offered compliance assistance for one year, including extensive on-site technical assistance. Under a subsequent "interim enforcement response policy," EPA regions invested heavily in public awareness and education, conducted more than 1000 inspections, and issued 517 Notices of Noncompliance. But the agency took enforcement actions only on "egregious" violations. The regions filed 19 civil complaints, asking for about $700,000 in penalties. Now OECA has issued a tougher permanent enforcement policy.

EPA's New England office sent letters to all colleges and universities in the region, notifying them of a major enforcement action against the University of New Hampshire, and inviting them to a conference on regulatory compliance. The region also organized a second conference, consulted with a focus group from colleges, provided compliance assistance, created a website with helpful information, and issued press releases about subsequent enforcement actions. She reports that colleges and universities have increased their efforts to come into compliance: self-disclosing and adopting "best practices" from one another.

The OECA national office trained regional staff about equipment necessary for reducing certain air emissions at oil refineries. Hearing of that, some firms told EPA informally they were installing the equipment, and four firms self-disclosed apparent violations. Meanwhile, agency staff inspected and found violations at 85 percent of 110 refineries—an unusually high percentage.

Herb reports that the integrated approaches probably did increase the overall efficiency of EPA's enforcement effort. They appeared to reach more facilities cheaply, and they did address high-priority issues. OECA has had difficulty measuring benefits, however, partly because it is

still developing reliable information about how many firms are in compliance with agency rules. The agency's data systems measure activities, e.g., inspections, litigation, and fines, rather than compliance *per se*.

Benefits have not come easily. Herb found that integrated enforcement required an unusual degree of flexibility for OECA. It was difficult for the office to apply different tools to different situations, to target sectors, and to re-deploy resources when permittees responded in unexpected ways. (For example, enforcement units in the regions sometimes found it difficult to obtain resources to follow up with firms that submitted self-disclosures.)

The OECA office in Washington found that it had to consult more fully with regions in setting priorities. OECA also discovered it had to work in new ways with the Department of Justice's enforcement staff, industry trade associations, and members of Congress.

States are missing from the list of partners in OECA's integrated enforcement efforts. Although states perform about three-quarters of all enforcement activities, OECA did not work closely with state agencies in any of the six efforts studied. Indeed, Herb notes that state officials report that OECA has resisted integrated enforcement efforts by states. Instead, OECA pressured states to stick to the basics of inspections, citations, fines, and litigation.

At the same time that OECA has begun to reinvent enforcement, the office has emerged as a critic of several other reinvention efforts at EPA, as well as in the states. OECA's assigned role in EPA reinvention, consistent with its responsibilities for assuring compliance with statutes and regulations, has been to raise issues about accountability, transparency to the public, and verifiability of innovations proposed by the states or other EPA offices. Thus EPA's underlying policies and management have caused OECA to become a critic of many reinvention efforts, when it perceived them as threats to the federal government's ability to enforce individual permits.

OECA led opposition to state "audit privilege and immunity" programs, which immunized firms from prosecution for regulatory violations and shielded their internal records, provided the firms disclosed their violations to state agencies. OECA objected that several state programs were too lenient on violators, undercutting enforcement. It insisted that states model their audit programs on EPA's audit policy. It threatened that EPA regional enforcement staff would intervene to enforce federal requirements case-by-case if firms tried to take advantage of weak state rules. In almost all cases, states have backed down, modifying their programs significantly to meet EPA objections.

Controversy about OECA had a partisan tinge. At the same time that the office began to emerge as a force in the agency, Republicans won control of Congress, and made efforts to cut the OECA budget. Many governors—of both parties—declared that OECA was interfering too often in state enforcement efforts; and top political appointees at EPA began criticizing states for lax enforcement.

However, OECA's powerful role within EPA has far deeper roots than the latest twists in partisan politics. Enforcement has been central to EPA's operating ethos since the founding of the agency. Congress—along with the American people—pays close attention to data about enforcement activities at the agency, quickly criticizing any downturns in the number of inspections, fines, and other penalties.

OCEA has defied the conventional wisdom that reorganizing a government agency accomplishes nothing more than disrupting the flow of business as usual. The centralization of enforcement staff in OECA has made a real difference in the evolution of EPA policy and management. EPA provided OECA with enough resources and authority to have a major impact on overall agency policy. On the other hand, the office has been a major constraint on

reinvention efforts in other parts of EPA and in the states. Thus while it has opened the door for some innovation in the agency's enforcement program, it has also strengthened opposition to change within EPA.

Information and Evaluation: Tools for Performance Management

To make the nation's environmental management system work effectively in the information age, the nation needs authoritative information about environmental conditions, and about whether agency efforts have helped improve those conditions.

Two new EPA offices—the Office of Environmental Information and the Office of Policy, Economics, and Innovation—should be able to perform those functions. Indeed, the creation of these two offices was an important step ahead for the agency. But neither has the mandate, the staffing, or the authority it needs.

The Office of Environmental Information

The EPA Administrator announced her intention to create the Office of Environmental Information (OEI) in October 1998. EPA's information office had been a sub-unit of the office that is responsible for administrative functions like human resources, budget, grants, contracts, and facilities management. By moving the responsibility for information out of that office, the agency took an important step toward demonstrating that information is not simply an administrative service to the agency, but, like regulation, market incentives, and community-based collaboration, is a tool for protecting the environment. Along with upgrading information systems, OEI is responsible for operating EPA's website, managing its internal telecommunications systems, and running the Toxic Release Inventory and various smaller programs. The agency's vision for OEI is:

> " . . . to advance the creation, management, and use of data as a strategic resource to advance public health and environmental protection, inform decisionmaking, and improve the public's access to information about environmental conditions." [248]

But the administrator failed to give OEI the mandate, authority, or tools necessary to do that job. The office has started work very slowly, not beginning operations until October 1999. Almost two years after the agency announced its creation, EPA had not appointed a permanent assistant administrator to run OEI. Neither had the office yet begun drafting a strategic plan to guide its activities. It will not even convene an advisory group to develop the framework for such a plan until 2001. In addition, OEI inherited functions that lost staffing and budget in recent years.[249]

Furthermore, in its early months, OEI was under heavy pressure from Congress to address two significant but ancillary issues: the cost and time that businesses and other regulated entities spend gathering information for the agency; and the possible failure of firewalls to protect data systems from disruption, and from public access to confidential business information. Finally, some members of Congress have recently pushed legislation that would prevent EPA from disclosing certain information about the environment, such as regional air-quality data, on the grounds that disclosure undercuts local economic development efforts. Any laws to that effect would further hinder OEI's operations.

In addition to its other problems, OEI has defined its role far too narrowly. The office has interpreted its mandate as increasing access to, and usability of, information contained in the agency's current data systems. That is certainly an important task. EPA's Inspector General, the General Accounting Office, many of EPA's own employees, and several outside experts have for years complained about the fragmented nature of the agency's information systems, as well as the poor quality of the data they contain. Such complaints mirror the structure and history of the agency itself. Each major program built its own data system. For years, each system has its own way of identifying sources of pollution—e.g., by the location of a smokestack, a front gate, or an office, and by the names of parent organizations or a subsidiary. Different information systems have defined certain technical terms in different ways. For many reasons, it is difficult, if not impossible, to link all those systems.

OEI plans to fix those problems by developing an "integrated information infrastructure." OEI will become a data exchange—that is, it will set standards to ensure that the data gathered and posted by each of the media offices is checked for errors, and can be aggregated and analyzed alongside the data from other such offices. By the end of 2000, it plans to have implemented a system for assigning each facility a single identifier, a task that has taken at least five years.

But OEI lacks the authority to accomplish even that narrow, if important, mission. The responsibility to decide what should go into each information system still lies with the media offices and OECA. The assistant administrator of OEI is not the national program manager for the systems, and has no direct authority over the budget or staff that supports the systems. EPA has established the Quality Improvement Council to develop data standards that could integrate the media office's data systems. But agency officials agree that the council operates on consensus and that OEI lacks clout. The council does allocate about $10 million for various special projects, but that is less than its predecessor was able to apportion, and far less than the budgets for the information systems themselves. Thus it is quite clear that the media offices will retain the upper hand. Linking the agency's data systems is an important issue, but EPA has not yet asked the central question: what kind of information does the nation need to address environmental issues? And it is unclear that Congress is ready to ask the question either, despite its immediate relevance to the Government Performance and Results Act.

EPA developed its information systems to provide information about activities and emissions at permitted facilities. States do the day-to-day work of permitting and enforcement at most facilities: they will need to gather detailed information about regulatory processes in order to manage their programs. EPA could encourage them to make much of that information available publicly, a direction in which several are already going. EPA itself does not need information about the current status of permitting processes at all permitted facilities. To determine that states are managing the regulatory process properly, EPA needs information about only a random sample of sites, and, perhaps, about all sites of a particular kind, e.g., for industries or locations where EPA has identified an important multistate, regional, or national problem.

To meet its other oversight responsibilities, plan its own activities, and report to Congress, EPA will need far better information about emissions and environmental conditions than is currently available. As described in Chapter 4, the nation lacks adequate information about water quality. EPA and states do gather somewhat better information about air quality at the level of whole metropolitan regions. Since the mid-1960s, states have built a national system of several hundred air-quality monitoring sites with EPA's financial support and technical guidance. But the agency could also use far-better information about air quality in neighborhoods and along highways of special concern.

At the operational level, states, local governments, and communities also need to be able to link information about air and water quality, as well as about waste management and local contamination, with the information that they use to make decisions about land use and investments in local infrastructure.

Creating an Institutional Base for Data

It would be impossible for any central organization to specify a national information strategy that will work at all times at all locations. Many federal agencies gather data about environmental conditions. Besides EPA, they include: the U.S. Geological Survey and the National Oceanic and Atmospheric Administration; the U.S. Department of Agriculture's Natural Resources Conservation Service and Forest Service; the Weather Bureau; the Fish and Wildlife Service; the National Aeronautics and Space Administration; the Department of Energy; and the Department of Defense. State and local governments have their own information needs and systems. Different communities will need different kinds of information and different levels of resolution.

But some organization in the federal government needs to take the leadership in defining data needs, and in providing sufficient incentives to ensure that states, federal agencies, and other parties do gather information in formats and on schedules that will meet the needs of Congress, agencies, and the public. OEI has established an environmental data standards committee to coordinate with state environmental agencies, which gather most of the data in EPA systems, as well as a great deal of information that is required by state laws and not shared with EPA. But the committee's mission focuses on aligning the technical dimensions of state and EPA information systems, rather than exploring different needs for information. EPA says the committee will "identify those areas where standardization will have the most valuable environmental results, prioritize the areas, and pursue developing data standards to support those areas."[250]

Data standards are centrally important. As the environmental protection system moves to more reliance on state and locally run programs, as well as on self-certification, third-party audits, cap-and-trade systems, and other market-oriented innovations, the role of EPA and state environmental agencies may shift from collecting data to specifying conditions under which other parties collect and make data available. No single entity will house or "control" the data, and data standards will ensure the different parties can access data gathered by others. But OEI has not asked the data standards committee to look beyond data already available.

What kind of organization should lead the process of defining the nation's needs for environmental information, using both carrots and sticks to lead the diverse array of systems that will meet those needs?

In the late 1980s and 1990s, many experts favored the creation of an independent bureau of environmental statistics. Headed by a qualified professional and protected against political influences by an authorizing statute, such a bureau might become a credible source of authoritative information, as the Labor Department's Bureau of Labor Statistics and the Commerce Department's Bureau of Economic Analysis have become for economic data. The National Academy of Public Administration's panels on EPA recommended creation of an independent bureau in 1995, and again in 1997.

Congress almost created the bureau in 1993, as part of a proposal to elevate EPA to a cabinet department. The bill failed primarily because of resistance to elevating EPA, but also because of disagreement about such a bureau's authority. It is not clear how the mission of an

EPA-based bureau would fit into the broader picture of the many federal and state agencies that gather information about environmental conditions.

It is clear, however, that the OEI is inadequate as presently constituted. It is too weak, too narrowly focused, too focused on access to data instead of on the existence and quality of data, too closely linked to political leadership, as well as being insufficiently funded and staffed. EPA, state environmental agencies, the public, Congress, and many other parties need extensive, authoritative information about environmental conditions in order to craft policies and manage programs that protect the environment. Environmental policy is so controversial—and existing data are so insufficient—that there should be a leading agency with broad responsibilities and sufficient autonomy to win the public's trust.

A bureau of environmental statistics, led by a professional appointed by the president and confirmed by the Senate for a fixed term, and with sufficient budget and independence to be insulated from the political process, is mandatory. It may be appropriate to establish a board of experts and highly respected professionals to guide the bureau, rather than having its director report solely to a politically appointed official, especially an official as controversial as an EPA administrator. Such a bureau should have authority not only to work with EPA and state environmental agencies but also closely with other federal agencies, local governments, and other interested parties, including private firms and nonprofit organizations that are beginning to develop information systems that make government data available to the public, as well as to gather data of their own.

The bureau should also have the capacity to hire first-class managers and staff. OEI has had difficulty attracting staff because of low salaries and the slow pace of federal hiring systems. Information specialists also often expect a far more dynamic work environment than EPA offers today. Perhaps the bureau should be constituted as a quasi-governmental organization, free from the organizational constraints of federal bureaucracy, as well as from political influence.

Innovation and Evaluation at EPA

To make decisions to best achieve results, decisionmakers need information about causation as well as about environmental conditions. They need to know whether agency activities—e.g., permitting, technical assistance, enforcement, and education—are responsible for changes in polluting behavior, and ultimately in environmental conditions. They also need to know the effect on the environment of other factors that are far beyond the influence of EPA or state agencies: normal fluctuations in climate or the function of ecosystems, or changes in economic conditions or technology.

EPA and state agencies have even less information about those causal relationships than about environmental conditions. EPA's Office of Research and Development and several other federal agencies do gather information about the scientific causes of changes in ambient environmental conditions. But no agency systematically gathers information about the impacts of regulation and other programs on environmental conditions.

Until 1995, the agency did have a small evaluation division in its Office of Policy, Planning, and Evaluation, which was headed by an assistant administrator. The division was an in-house consultant for program managers. EPA administrators and deputy administrators used OPPE to provide objective written or oral reports about specific problems on request. It also did occasional analyses of crosscutting issues for the administrator. The division's non-confrontational style and low profile attracted few enemies, but also earned little recognition. It did not publish any of its reports, and most of its files were destroyed in 1996 when a broken water pipe flooded its office.

The demise of the evaluation office was a symptom of a pervasive reluctance to submit agency programs to independent, objective evaluation. Many agency managers are wary of commissioning studies because anything in writing could become public, and because anything critical of agency performance could be embarrassing or damaging in the hands of a hostile Congress.

Occasionally managers do fund third-party organizations to do research on problems or program effectiveness. And EPA programs do support many conferences, newsletters, and university-based centers to share ideas, identify best practices, and build interest in and support of EPA and state activities. But very few of those reports are critical, independent evaluations. Neither is there any agency-wide coordination of those research grants or agreements, or a central depository of reports. Indeed, many reports are never published, and thus do not appear on lists of publications, library catalogues, or websites. Occasionally the agency has contracted for evaluations, and then either demanded changes in the analysis and conclusions or simply not published the report. In addition, most programs do not collect baseline data or other statistics that evaluators could use. Indeed, most programs do not establish reasonable objectives for which they could be held accountable.

Of course, EPA is far from the only government agency that has resisted evaluation. But a few federal agencies have built influential, highly professional evaluation offices. The Department of Education has an evaluation office that conducts highly credible research about the effectiveness of federal programs. The House Committee on Education is a primary customer for those studies, using them in periodic reauthorization of the agency's programs. In addition, over the past two decades, Education's evaluation office has helped develop widely used measures for evaluating the success of individual schools across the country in educating students.

The Department of Health and Human Services also has a rich tradition of highly professional evaluation. Congress has directed that a small percentage of the agency's budget be routinely set aside for evaluations, which are conducted either by a central departmental office or by units within individual programs.[251]

There are some signs that parts of EPA are interested in opening themselves to evaluation, or seizing the role for themselves. As the Academy started this project, several managers of small innovative programs in the agency did request that the panel commission independent evaluations of their particular program or innovation; some genuinely hoped to improve the effectiveness of their programs, others hoped that a positive evaluation would get them attention and more resources.

In the last year, EPA's Office of Policy, Economics, and Innovation has begun planning a small but systematic effort to evaluate innovations in the agency. That office is the successor to many of the functions of the disbanded Office of Policy, Planning, and Evaluation. It has a mission to encourage innovation within other parts of EPA, and it manages some reinvention efforts as well. The office has also conducted its own evaluation of the XL program, and organized a small task force of people from other EPA offices that are interested in program evaluation.

The Government Performance and Results Act may also force the agency to conduct systematic self-assessments. The statute requires that the agency attempt to measure the performance of programs in broad terms. EPA's Office of Planning, Analysis, and Accountability is developing the agency's response to GPRA, but at this writing does not plan to do project-specific analysis. The National Environmental Performance Partnership System also could spawn some program evaluation but has not done so yet. As noted in the previous chapter, the self-assessments that states have performed as part of NEPPS have been very broad—

where they have been done at all—and EPA's regional offices have not done any formal self-assessments.

The biggest new claimant for the role of agency evaluator is the EPA Inspector General. In FY 00, the Senate Appropriations Committee added $ 3 million to the IG's budget, partly as seed funds for a new program evaluation office. Congress may well add additional positions and funds in FY 01. The IG is embracing that opportunity, planning to hire as many as 120 front-line evaluators, as well as various managers and supervisors. The IG sees that as an opportunity not just to add an additional service, but a way to provide strategic guidance to the office's current agenda of financial and program auditing.

Many at EPA are skeptical that the IG's office can become a useful source of program evaluation. They point to a lack of experience in program evaluation, and they are suspicious that IG staff will be willing to publish positive, or even sympathetic, analysis of EPA programs, especially since the inspector general reports to Congress, as well as to the EPA administrator. Indeed, with the exception of the IG at the Department of Health and Human Services, few IGs have done much program evaluation in recent years, focusing instead on waste, fraud, and abuse.

EPA's IG could possibly perform program evaluation, however. Certainly it currently has the best chance of getting enough resources to make a major contribution. The office's close link to Congress might turn out to be an advantage, even if the relationships between Congress and the agency remain as distant and as political as has been the case for many years. If the IG can build the capacity for first-class work and a reputation for independence and fairness, that office might provide useful leadership to the continuing process of innovation and learning.

But the IG's office would have to transform itself to be able to do that job. The staff primarily comprises certified public accountants and other auditors, statisticians, and analysts with a strong bent towards careful inspection of the facts. Its culture is to look closely at clearly defined, narrow programs and ask whether the agency followed the rules. The office would have to retrain its staff, encouraging an entirely different approach, as well as a high tolerance for ambiguity. The best approach could be for new staff members to have different skills. Ideally, the office would field teams that included not only staff with traditional accounting and statistical skills, but also management consultants, policy staff from state and local governments, political scientists and sociologists, community development experts, public administration experts, and journalists. The office has already identified 60 vacant positions that could be filled by such new staff members.

Creating an Institutional Base for Assessment

There is room for many different kinds of evaluation of EPA and state programs. Traditional evaluation studies ask hard questions and expect hard answers: was program X implemented as designed? what were the immediate results? has the program added to the overall effectiveness of agency activities? was it cost-effective? In recent years, many evaluators have used formal quasi-experimental designs and emphasized quantitative data to evaluate individual programs.

Those formalistic approaches provide useful information, but if an agency is in the process of fundamental transformation, they will yield answers that are incomplete—and sometimes even misleading. As EPA moves towards pollution prevention, cross-media programs, encouraging collaboration, relying on states and local governments to use their own legal authorities, and using market- and information-based tools, the questions facing evaluators are more com-

plex. Should they look at the way a program functioned traditionally or evaluate how well it is changing to fit the new ways of doing business—exploiting new technological opportunities, building new knowledge, shaping public attitudes and voluntary action? Should they look at individual programs, or must they take a more comprehensive, system-wide approach?

For example, an evaluator looking at the NPDES permit program would notice immediately that EPA and states have not complied with the statutory requirement that those permits be renewed every five years. An analysis of NPDES permittees might quantify how much pollution they were causing and estimate how much pollution would have been avoided if EPA had required permits renewals. That would be interesting information but would miss the real issue. Several EPA regions and states have diverted staff from NPDES to nonpoint problems. Some have invested energy in supporting collaborative watershed processes. Such processes take time in the best of conditions, and work best when the agency can provide solid place-specific data and scientific analysis, when agency staff has the skills to work in collaborative processes, and when there is a credible threat of new regulatory requirements if collaboration and voluntary cleanups are not forthcoming.

In that case, what should evaluators study? The NPDES program over a limited number of years, watershed efforts that are still formative, the agency's water program as a whole, or a broader set of environmental issues? In situations like those, framing the question will require just as much judgment as finding the answer, and clear quantitative results will be hard to locate. Evaluators can bring rigor to studies by explicitly laying out rationales for the questions asked, and for the analytical approach. The managers of an evaluation effort can guard against bias by conducting multiple studies that ask somewhat different questions and make different assumptions about the key factors to be examined. Often that is done best by engaging several different experts to study the same cluster of questions. An individual study will not give unambiguous answers, but a cluster of studies can yield powerful findings that will lead to a clearer understanding of the issues, better decisions, and inevitably to new rounds of more tightly framed investigations.

In short, especially when an agency is in the midst of a transformation process, evaluation should be a learning process for all involved. There is room for many players and many different approaches. All of EPA's offices might do useful work, including confidential analysis for program managers and policymakers, as well as public studies.

Independent experts should play a central role in the overall evaluation picture. The vital evaluation efforts at the federal Departments of Education and of Health and Human Services are part of a much larger community of evaluators and analysts outside government who regularly subject other federal programs to independent scrutiny. The federal government commissions many independent evaluations of federal education, health, and welfare policies, as do many philanthropic foundations. The universe of policy analysts and evaluators who specialize in environmental issues is much smaller, however. Many philanthropic foundations prefer to invest in advocacy—supporting environmental groups or analyzing the shortcomings of the regulatory system—rather than dispassionate scholarship. Compared to the energy invested in evaluating welfare reform or public high schools, the nation's investment in evaluating environmental protection is paltry.

Philanthropic foundations and the agency might invest in independent analysis by environmental advocates, academics, and consultants. Private firms and trade associations also could support credible, independent studies, as some have already done.

EPA and Congress could play a critical catalytic role in building a broad community of independent evaluators. The agency should routinely require peer review for all evaluations

published for the general public, and, in most cases, that independent evaluators conduct them. The agency could work with foundations and universities to develop a network of independent evaluators and an easily accessible electronic library of their studies.

The Management Agenda at EPA

Since its earliest days, EPA has had two important assets: an intelligent, highly motivated staff; and a public that expects the agency to live up to its name, to be truly a protector of the environment. EPA has never had a shortage of good people with good ideas, and most administrators have given staff the freedom to test their ideas about how to improve environmental protection at small scale in demonstration projects, clearinghouses, manuals on best practices, and through innovative "niche" programs.

In the last eight years or more, the agency and states have tested a series of new approaches to environmental protection. The task facing the EPA today is something quite different than demonstrating exciting new ideas, however. The agency, states, businesses, advocates, and nonprofits have now developed enough ideas and enough experience to begin to change the system fundamentally.

EPA's culture, mission, and authority derive primarily from a series of detailed regulatory statutes. Law and regulations are at the core of the agency's identity. But now the agency needs to allow substantially greater discretion to states, private firms, and others—on the condition that they provide better environmental protection cost effectively. And EPA needs to provide authoritative information about the environment, so that it can allow such discretion. Now and into the 21st century, many of the most pressing environmental problems are beyond the direct control of EPA or any other federal regulator. EPA can still provide the compass and the motivation to protect the environment, but to do so it needs a new strategy for driving behavior and a new way of mobilizing its employees. That is the essence of the management challenge facing the agency's top leadership.

The administrator and other senior agency leaders can use several different management tools to meet that challenge. In addition to a adopting a more sharply focused policy agenda and reframing the agency's relationship with states, the administrator should use management tools to transform the agency. The administrator could reorganize, adjust the agency's plans and budgets, reward staff for different kinds of behavior, hire staff with different skills and experience, or try to change the culture of the agency through personal leadership.

EPA's Media-Based Organizational Structure

As earlier Academy panels and many others have noted, EPA is a fragmented agency. The media offices came to EPA from different federal departments in 1970, and still have somewhat different cultures. Each office has its own authorizing statutes, and there is no organic act or other over-arching legislation that sets the mission of the agency and provides criteria for setting priorities and reconciling differences. Many agency employees make their entire careers within one media office, or even in one media program within the same regional office.

Previous Academy reports recommended that Congress and the agency consider reorganizing along functional lines, instead of air-water-waste-toxics-enforcement. The agency might have separate offices for information, writing regulations, compliance, and science, intended to strengthen working partnerships with states and other entities.[252] Several states and two EPA regions have reorganized along those lines in the last five years.

Certainly no organizational structure is perfect, and agency-wide reorganization would consume large amounts of time and energy, as John DeVillars found out in EPA's New England office. Furthermore, reorganizations are seldom effective if they are not well managed, strongly supported by top agency leaders, and animated by a clear and crisply articulated mission, as is obvious from the success of OECA and the painfully slow start of OEI.

The administrator might try to bridge the gaps between the media offices personally. That, however, would require close attention to the day-to-day workings of the agency, and the administrator has other essential duties, like framing a strategic vision, leading public debate about environmental priorities and strategies, and working with Congress, the White House, and other federal agencies.

Occasionally during EPA's history, the deputy administrator has been a hands-on manager of key agency initiatives. That approach might work again; the White House should allow the new administrator to select a deputy who would enjoy the administrator's full confidence and has the interest and skills to be a hands-on manager of the process of transforming EPA.

Additionally, the administrator could assign other key officials clear authority to make final decisions about innovation, subject to review by the administrator or deputy. For example, the administrator might delegate more authority to regional administrators, an approach that would meet the goals outlined above. Or the administrator could give the assistant administrator for policy, economics, and innovation the authority and the staff resources to lead the process of transformation. Another approach would be to name deputies for both operations and policy and planning. The first would supervise front-line operational efforts, including enforcement and regional offices. The second would supervise policy and planning functions, including the regulation-writing activities of the media offices, and the research, budget, and management functions of the agency. That approach might appear to simply add another layer of management. But as the direct supervisor of both enforcement and regional offices, the deputy for operations could ensure quicker decisions about innovation.

Alternatively, the administrator might choose to tackle the fragmented structure of the agency head-on, either by having all regional offices reorganize on a multimedia basis, or by designing and implementing an agency-wide restructuring.

Plans and Budgets

The administrator should also reform the agency's response to the Government Performance and Results Act. As discussed in chapter 5, the legislation should provide the statutory framework for building performance-based management at EPA, a foundation for building a performance-based partnership between EPA and the states, and the format for a new dialogue between the agency and Congress—as well as between the agency and states—about goals, priorities, and budgets. As implemented by EPA, however, the act has reinforced the fragmentation of the agency along traditional media lines, and has impeded innovation.

The agency's GPRA plan and budget nominally cut across all of the major units of the agency. Several offices share responsibility for each GPRA goal, and the budget for each goal is divided among them. A senior leadership group that has representatives from all agency offices supervises the process of writing the plan and budget. On close examination, however, it is clear that GPRA plan has just begun to encourage multi-media planning and action.

The bulk of the budget still flows in four separate streams to the four major media offices: air, water, waste, and toxics. There are two substantive multimedia goals for pollution prevention and for global, cross-border problems. Together they account for 6.8 percent of the agency's

budget and minimal portions of the budgets of the media offices. Four of the 10 GPRA goals focus on the work of one media office. They account for 76 percent of EPA's budget. From 75 percent to 95 percent of the budget for each of those four goals belongs to one media office. The remainder of the budget for the goals flows to a collection of supporting offices, e.g., administration, general counsel, and chief financial officer. No second media office receives any funds, with the exception of 1.2 percent of the budget for waste management. The remaining four goals cover the budgets of the offices of enforcement and compliance assurance, information, research and development, and administration; the media offices have only minimal budget responsibilities for those goals.

That budget and goal structure inhibits agency-wide action. Ironically, the primary vehicle that Congress has established to encourage focusing on results is reducing incentives for the divisions within EPA to work together on important problems.

In addition, the GPRA system is impeding flexibility. The agency aligned its GPRA plan tightly with the budget: every line corresponds to a specific goal and objective. Thus the agency cannot quickly change its plan without also changing its budget structure, a complex and difficult process. The administrator could reform the GPRA plan, loosening the links between the plan and budget so that the plan would focus on top priorities and cover less than the total of the budget, while the budget would correspond to the organizational structure of the agency.[253]

Staffing the Agency

In the next several years, EPA will have another important opportunity to change the culture of the agency. A large portion of the Senior Executive Service and other high-ranking staff will become eligible for retirement soon. The administrator could use that as an opportunity to establish the policies of rotating staff among media offices and between headquarters and regions; recruiting strong, dedicated managers from state and local government; systematically promoting staff who have the skills necessary to function in a performance-driven organization; and rewarding innovation and prudent risk-taking. In addition, the agency will need to hire more economists, communicators, managers, computer experts, and geneticists, and proportionately fewer engineers.

Leading and Making Decisions

As this report has documented, the agency has often had difficulty making decisions about whether or not to allow innovative demonstration projects to move forward. For more than a decade, the agency has approached interoffice issues by emphasizing the need for teamwork. Total Quality Management, partnership, and consensus have been the key themes of EPA management.

That approach has strengths: it can open the door to fresh ideas from the "bottom-up," iron out differences and thus strengthen agency decisions, and build greater staff understanding and support of decisions. But EPA has an institutional culture that is highly risk-averse, an outgrowth of the agency's early commitment to tough enforcement, as well as to decades of political controversy surrounding its decisions. That culture, together with the emphasis on consensus, has been a recipe for interminable internal debate, delay, and deadlock about innovation.

The pressure for consensus has encouraged many dedicated and talented EPA employees to speak their minds freely and, in many cases, to become active promoters of particular approaches

to environmental protection, trying to persuade others to follow suit. The agency is full of policy and program entrepreneurs, honestly looking for the best way to contribute to environmental protection. As a result, the agency has a large number of small, independently minded offices, none of which can mobilize enough support to win the agency over to its ideas.

Certainly an EPA administrator must build broad support for his or her decisions, both outside the agency and inside. But to transform the agency, to move beyond another round of interesting but marginal innovations, the administrator must give clear direction and focus to the agency's work.

In 2001, a new EPA administrator could break with the past, taking giant steps to set the agency on a course that will earn it more respect, more influence, and more effective environmental protection. As the incoming administrator examines her or his responsibilities, she or he must consider carefully how internal reforms will be viewed by Congress, the White House, other federal agencies, and environmental and business groups, as well as by important constituencies inside the agency.

One step would be to establish a powerful bureau of environmental information and assessment, just as in 1993 Carol Browner established a powerhouse at OECA. Another would be to revive NEPPS. A third would be to establish an independent entity with the responsibility for independent assessment of state and EPA innovations.

Findings

Finding 1. Some successful innovation at EPA is taking place within individual agency programs. The agency finds it easiest to innovate when it retains control over the management of programs.

EPA has been able to break the logjam in its Superfund program, sharply increasing the pace of cleanup at Superfund sites and moving effectively to encourage cleanup and redevelopment at other sites. Driven by the threat that Congress might dismantle key portions of the Superfund program in the mid-1990s and supported by the president and the EPA administrator, agency managers implemented changes that had been developed and tested over the years in the agency's regional offices. While it did not surrender control over site-by-site decisions about Superfund cleanups, EPA did offer some landowners assurances that their sites would not be listed as Superfund sites. It also helped many local communities plan and finance cleanup and redevelopment of Brownfield sites that were not listed. EPA's Office of Enforcement and Compliance Assurance has also begun to experiment with more voluntary approaches such as compliance assistance, self-disclosure, and public pressure. However, OECA still focuses most of its attention on traditional enforcement activities, and its criticism of innovation programs led by states or other parts of the agency has been a powerful block to new approaches to environmental protection.

Finding 2. EPA's efforts to build the infrastructure for multimedia, performance-based management are still in their infancy. Efforts to transform processes that cut across the fragmented organization of the agency have had little success. The new information office has the responsibility for integrating the agencies many information systems, but it lacks the clout to do so. The agency's information systems are still under the control of its fragmented regulatory programs, and the design of the systems is still directed towards tracking all the program activities, rather than addressing the underlying issue: what information do the agency, Congress, states, and the public need? EPA has never had much capacity to assess the impact of its work

on environmental conditions, and it has disbanded its evaluation program. Within the agency some units are just beginning to build evaluation capacity.

Recommendations

In 2001, the new EPA administrator will have the opportunity to set the agency firmly on a new path, building on a rising tide of innovation and intellectual progress. A few key decisions can begin the fundamental transformation of the agency, equipping it to provide stronger, more authoritative leadership to state environmental agencies and the nation, and focusing the agency on the most important to the environment and the biggest opportunities for environmental protection. To provide national leadership in setting environmental goals and priorities, the new EPA administrator should:

1. Build a strong, independent office of environmental information.

EPA needs the capacity to provide authoritative information about environmental conditions and analysis of how best to protect the environment. A new office should define the data that the nation needs about changing environmental conditions. It should also define the data that Congress, EPA, and the public need to have confidence that federal regulatory programs are being managed effectively by the agency or by states. The office should work closely with states to gather such data in the most cost-effective, least burdensome and least intrusive manner possible. The new office should have sufficient independence from political pressures and the policymaking process to become a credible, authoritative source of information and analysis.

2. Create an independent capacity for assessment.

EPA should finance a series of independent, authoritative assessments of how well state and federal regulatory programs, market-incentives, voluntary and collaborative efforts, and other activities help protect the environment. Studies published by the agency should be peer-reviewed, and should be held to the highest standards of objectivity and independence. EPA should also work with private foundations, corporations, state governments, universities and others that can support such studies, to build a vibrant, independent capacity for continued learning about ways to protect the environment.

3. Foster a management culture of prompt decisionmaking and action.

The administrator should use the full array of management tools—personal leadership, clear delegation of responsibilities, reorganization, and human resource management—to transform the values, norms, and behavior of the organization. While EPA must retain its strong commitment to environmental protection, the administrator should encourage timely decisionmaking, prudent risk-taking, and a focus on environmental results rather than on process.

The agency also needs to transform its working partnership with state environmental agencies. Thus EPA's regional offices are in many ways at the crux of institutional changes the agency needs. Some of the regions have already reorganized along multimedia lines and have become powerful forces for innovation and organizational change. The administrator needs to find ways of continuing the process of regional transformation.

CHAPTER 7

Transforming Environmental Governance

The nation's environmental management "system" is so rich and complex that no one institution—not Congress, not EPA, not the states or Wall Street, or even the myriad NGOs and private companies—controls the system. Yet each of those institutions, acting separately, *can* change the system. Indeed, each *has* changed the system. The innovations described in this report have originated and propagated within EPA, state agencies, communities, and companies.[254] Because promising practices for dealing with the 21st Century's outstanding environmental problems emerge at many points in the system, EPA and Congress must redefine their leadership roles to foster broad innovation. In fact, the nation will meet its environmental and social goals only if Congress and EPA deploy new policy tools to better mobilize the nation's resources. This chapter lays out a strategy for EPA, Congress, businesses and NGOs, to achieve that *transformation* of environmental governance.

In 1995, an Academy panel found that the nation's system for protecting the environment was "broken"—in the sense that it was not addressing high-risk problems, was not responding to environmental problems that crossed environmental media, and was failing to draw on the problem-solving capacity of states, cities, and the private-sector firms it was regulating.[255] In each of those respects, the system is still broken. High-risk problems, including non-point water pollution, smog, and the emission of greenhouse gases, are not responsive to traditional federal or state pollution-control programs. The innovations examined in this report demonstrate practical ways to correct the system's failings, to transform environmental governance as a whole.

Each of the previous chapters of this report focused on one part of the nation's environmental management system: the relationships between regulators and businesses; the marketplace; watersheds; the interface between EPA and the states; and strategies for organizational change. Each chapter described promising innovations, documented how some had been frustrated by business as usual at EPA (and in some cases in state environmental agencies, businesses, and NGOs as well), and called for renewed, more effective efforts to make change. Together those chapters present a case for the transformation of EPA, state environmental agencies, and the system within which they operate.

The Academy Panel summarizes that case in the findings listed below. The section following the findings reprises the scenarios that opened this report and draws from them a strategy to

tune the nation's environmental protection system to the problems and opportunities of the 21st Century in America. The chapter closes with the panel's recommendations to the next EPA administrator, the next Congress, and those businesses and NGOs that must help lead the transformation. Those recommendations synthesize and expand upon the recommendations at the end of the previous chapters.

Summary Findings

Finding 1: The United States needs—and will continue to need—a strong national environmental regulatory agency.

EPA must have the capacity to set national environmental goals and regulatory standards, particularly for problems that cross state or national borders, or that pose risks to future generations. Congress must provide EPA and other federal environmental agencies the capacity to identify and manage environmental problems of national and global significance. The system in which the agency operates must give states and municipalities latitude to set their own environmental goals as well. It should encourage technological innovation, civic engagement, and the spread of knowledge. EPA and Congress must set the direction and assess the performance of the entire system.

Vigorous enforcement by EPA and states has been the foundation of the nation's regulatory system and will continue to be indispensable. The status quo, however, will not deliver the environmental quality Americans want. As the nation addresses other problems besides pollution by large, highly visible facilities, and encourages businesses to redesign their products, services, and production processes to reduce negative impacts on the environment, EPA and states need to develop additional information about market-based tools, and to develop integrated strategies that balance those new tools with traditional regulation. They must also determine ways to make the most of civic capacity and public opinion.

Finding 2: EPA and the states have demonstrated the potential and challenge of performance-based management.

Federal and state regulators have made serious efforts to incorporate more environmental information into their decisions. Those efforts have shown that redefining success in environmental terms makes sense to agency officials, businesses, and the public. They have also demonstrated that environmental measures alone are insufficient for agency management. The states have not done enough to make "core performance measures" work and EPA has not encouraged them to do better. State commissioners and EPA need to renew their efforts to define measures that each will use to set priorities, measure success, and improve the environment.

Neither EPA nor most of the states has made the changes necessary to realize the full potential of the National Environmental Performance Partnership System. The fundamental principles of NEPPS are sound: that EPA's regional offices and the states should negotiate performance objectives based on thorough analyses of the environmental and management problems they face. The states should acknowledge that it is fair and appropriate for EPA to compare their programs' performance using some form of "core performance mea-

sures." EPA's program offices and regional offices should acknowledge that EPA's oversight of states that are doing their jobs should focus at the program level, not at the activity level or on individual permits.

Finding 3: EPA's statutory framework and its conservative culture inhibit innovation both within the agency and in the states.

Pilot projects have demonstrated the potential of new policies and tools to improve the environment. For a number of years, EPA, states, businesses, nonprofits, and other entities have developed and tested new tools in a series of innovative efforts. Several of those—cap-and-trade systems, and collaborative approaches, for example—have proved that they can deliver environmental improvements more effectively or efficiently than traditional tools.

Neither EPA nor its state counterparts has transformed its core programs to use new tools to address effectively or efficiently some of the most serious environmental problems facing America. Innovation at EPA and the states is still of marginal significance. There is no system to identify and sustain the most productive innovations.

EPA's successful innovations and management reforms have been those it could carry out within a single national program office. Most efforts to innovate across programs have failed. The agency made a significant improvement in the management of the Superfund program, in OECA's use of its audit policy and "integrated enforcement" tools, and in the development of trading systems in air pollutants. The agency's efforts to coordinate its national program offices through Project XL, priority setting through NEPPS or GPRA, the Common Sense Initiative, or ecosystem protection, however, have demonstrated that EPA's media-based organizations remain fundamentally unable to work together.

Finding 4: Reducing the damage to surface waters and estuaries caused by nutrient runoff is within reach.

A shift to TMDLs and standards based on ambient water-quality poses particular challenges and opportunities. Implementing TMDLs is most likely to succeed in places where civic institutions are strong, extensive environmental data are available, and citizens have a relatively sophisticated understanding of environmental problems and management. In such locations, TMDLs should yield environmental benefits far superior to those that could be achieved by traditional regulation of point sources alone.

Optimal approaches will vary by watershed, so EPA and other federal agencies will need an exceptionally flexible approach. Cap-and-trade systems, and even open-market trading systems, will work in some areas. In others, state and federal agencies may need to target public funds to produce the largest possible gains.

Finding 5: The federal government must be a source of credible, authoritative, and useful environmental data.

Information technologies may fundamentally change how federal and state governments regulate or hold firms accountable for meeting environmental requirements. Information-rich "environmental management systems" at the facility level can help plant managers identify problems and opportunities for waste-reduction. More facility-level caps, whole-facility regulation,

and cap-and-trade systems within airsheds or watersheds are possible in part because of better monitoring systems to hold firms accountable to the public and one other. Such trading systems provide incentives for firms to find their own best ways to reduce environmental harm at the lowest possible cost. Those attributes may make cap-and-trade systems an essential component of any national effort to reduce greenhouse gas emissions.

No institution will be able to control the information on "the green web," and a diversity of sources will probably strengthen environmental awareness. Nevertheless, Americans and American policymakers will need a source of credible, comparable environmental information they can trust and use. The government should be that source.

EPA's Office of Environmental Information lacks the authority it needs to achieve its mission. As it exists today, the office suffers from the same organizational weakness that has impaired Project XL, NEPPS, and the Common Sense Initiative: the office needs the authority to reshape and integrate the agency's media-based data systems.

Finding 6: Environmental policy and direct action must continue to flow from Americans' individual and collective values and goals. Civic involvement in environmental protection is important, particularly in addressing problems at the local level. Collaborative watershed-management projects demonstrate the potential for locally driven action. The challenge of reducing environmental threats to large interstate bodies of water illustrates the need for state and federal action as well.

For the 21st Century

The nation's economy, technical capacity, and environmental conditions have changed dramatically in the three decades since Congress passed most of the laws that have framed environmental governance. Although they have served the nation well, today their inadequacies manifest themselves in the numerous ways identified in the previous chapters. Adopting legislation—or adapting institutions—for the economy, technology, and environment of 2020 or 2030, however, remains a difficult task. To help readers imagine how a new system of environmental governance might evolve over the next two or three decades, the Academy Panel framed three scenarios of the future: the Green Web, Old Glory, and Local Option. They illustrated how choices made by Congress, EPA, states, businesses, and ultimately, by American voters and consumers, could influence the future of the nation's entire environmental protection efforts.

The Green Web imagined a world where businesses, consumers, and NGOs used the power of the Internet to generate environmental gains. The highly desirable features of the scenario—its reliance on information and individual choice—were tempered by the lack of a stabilizing rudder: EPA had lost much of its authority, both as a regulator and as a provider of reliable information. The resulting system was so volatile that it appeared at risk of degenerating: information could become mere noise; individual choice could become anarchy. Without a strong national regulatory program, environmental protection would be a game of chance.

Old Glory described a world in which Americans vested their trust and authority in federal institutions. Those institutions had developed sophisticated tools to maximize their capacity to achieve public purposes with minimal direct control. Instead of inflexible technical standards

and complex regulations, EPA relied more on financial incentives, market drivers, and the power of information to ensure that individuals, companies, and communities did their part to protect the environment. The scenario described a world less chaotic than the Green Web, but also one less connected to the American people, the real source of national authority. The scenario described a technocracy—well meaning and effective—but at increasing risk of losing its public mandate by creating a citizenry without the environmental understanding it would need to respond to a crisis.

Local Option presented America as a nation of committed citizens acting through local and state institutions—both public and private. Communities of interests fought for their values, which were increasingly measured in environmental terms. Some communities and states achieved their environmental and economic goals and celebrated their ability to use local democracy to connect people, action, and results; others, however, remained victims of circumstance: of depleted natural resources, cross-border pollution, and a downward cycle of poverty. The federal government provided a valuable service—good information and research—but it neither sought nor assumed a national consensus on environmental quality. National NGOs focused their actions locally as well. Some businesses flourished in those conditions; others found it difficult to manage national operations under such varied circumstances.

Three visions of the future of environmental governance: three worlds somewhere between utopia and dystopia. The panel's preferred vision of the future diverges from each of those scenarios, however. The strategy outlined below is intended to foster an environmental protection system that can address environmental problems—including those caused by many small sources—effectively and at the lowest possible cost to society, one that can exploit the power of new information technologies, particularly in ways that will help strengthen informed connections among voters, the environment, government agencies, and businesses.

In the panel's vision, which we might call *environment.gov*, EPA or another federal agency will be a trusted and reliable source of information about the environment, enabling citizens, companies, and public agencies to make informed choices about the environment. EPA will remain a strong regulatory force, the agency that guides nationwide action on problems of national or global significance. The agency will be using a broader range of tools to mobilize action than it uses today, however. Market-based mechanisms, such as allowance-trading systems, will drive companies, communities, and individuals to innovate, to find their own best ways to meet the public's environmental targets. States with aggressive, successful environmental programs will lead the way in many areas, and EPA will respond with appropriate technical support, even working for change on the states' behalf in Congress when authorizing statutes inhibit state innovation. In *environment.gov*, systems are in place to monitor the impacts of experimental efforts, and to modify them if they fail to work as planned. Thus experimentation and change will not be forced to wait for "consensus" among bureaucrats or stakeholders.

The environmental protection system evolves toward one based on performance, on achieving improvements in environmental quality and related social goals. The panel's vision, like environmental protection, will not "just happen." Rather, the next administrator must act strategically to *make* it happen, building on initiatives already underway in states, companies, and in the agency itself, and challenging entrenched constituencies to do more, to take risks to achieve environmental goals.

The next EPA administrator should be America's chief advocate for environmental protection, the definer of EPA's national purpose. Part of the administrator's leadership challenge will be to keep reminding Americans of the work that the nation—the American people—still needs to do to protect the environment. Another part will be to listen to Americans and build a pragmatic political agenda

that moves the nation forward. The administrator's success will ultimately depend on his or her ability to work with Congress, the states, and individuals to define national environmental goals, and to focus the nation's energy on achieving them. A truly gifted administrator will accomplish that without acting as if he or she is at the pinnacle of the only institution concerned with environmental protection. On many issues, after all, activists in NGOs, communities and the private sector and any number of state and local agencies will be ahead of EPA.

The administrator should focus the nation's attention on a small number of significant environmental problems that are not being addressed by the current regulatory system. The panel has recommended that those include smog, nonpoint water pollution, and greenhouse gases, though other problems that resist end-of-pipe solutions certainly fit on that list. Because addressing such problems will require immense institutional change, the list should be small enough to enable the administrator to stay focused. Of course, EPA will have to continue most of its conventional work even as the administrator helps it adjust to new ways of doing business. As the agency develops strategies to reduce nonpoint pollution or climate change or smog, however, its personnel will discover more effective ways to manage the old problems as well.

The administrator should use the new tools of environmental protection to address those problems. The administrator should help the nation adopt the most effective management strategies available, even when doing so will require new authorization from Congress, new relationships with the states and regulated entities, and new attitudes and activities within the environmental protection system. Generally, the new environmental agenda will require an increased use of:

information: better measurement of environmental conditions and trends to help define problems, maintain accountability, and measure the success or failure of innovations;

market tools and other approaches that create strong incentives for states, companies, and individuals to find the cheapest ways to reduce pollution;

place-based management strategies encouraging multimedia problem solving.

To make progress in reducing nutrient runoff into surface waters, for example, the administrator should: encourage states or regions to implement dynamic trading systems among point and nonpoint sources, strengthen the water-monitoring network among the states and raise the quality of data used for decision-making. He or she should work with the regional offices to find the most effective management structures in each region to work with other federal agencies, states, communities, and watershed councils in addressing the runoff problems in specific places. The administrator should ensure that innovative approaches are evaluated as they unfold, providing decisionmakers and the public with the information they need to keep improving programs. In places where local institutions or state agencies are already making significant headway, the administrator should ensure that the agency provides technical and political support—and captures lessons for others to learn.

The administrator should develop a comprehensive strategy for change. The innovations discussed in this report illustrate the complexity of the administrator's challenge: the system of environmental governance in America is so complex and so rooted in statutes and relationships that it seems actively to resist change. The next administrator will need a strategy to overcome that inertia. The strategy must include ways in which the administrator will allow the agency to mobilize its talents, and will infuse its culture with an appreciation of what EPA and others could accomplish with the new tools. The strategy must include a means of cooperating with Congress on the statutory reforms and financial resources that will be necessary to more effec-

tive and efficient environmental protection. The strategy must also involve the states, or at least those states that are firmly committed to environmental protection and prepared to invest the time and resources necessary for testing new ideas. The administrator should also support alliances of environmental organizations and business groups as they recognize mutual advantages in securing the nation's environmental future.

A strategy to tackle nonpoint pollution, for example, might start with approvals of state initiatives to create allowance-trading systems in the Upper Midwest. The agency might encourage those states to institute trading ratios favoring credits verifiable through some kind of direct monitoring system, thus creating incentives for the private sector to develop better technologies to detect changes in nonpoint runoff and water quality. The plan should include a significant partnership with the Department of Agriculture, as well as bipartisan coalition building among the members of congressional committees handling agricultural and transportation issues. The focus of the congressional action would be authorization to EPA and the states to implement more sweeping allowance-trading programs, funding for the development of new monitoring technologies, funding for data-gathering and reporting, as well as for farm subsidies to secure nonpoint reductions in the absence of allowance-trading systems.

Continuing the nonpoint example, the administrator's internal-management strategy would need to reward personnel from the Office of Water, OECA, the Office of Policy, Economics, and Innovation, and the regional offices that prove themselves able to work together with states and watershed councils to solve problems expeditiously. The strategy should strengthen the capacity of the agency's traditional programs to address place-based problems, while also testing new organizational models at the regional offices and headquarters. The strategy should ensure that the agency's personnel office is hiring new staff capable of working in communities, with market systems, with advanced data communication technologies, and with some of the uncertainty that will accompany the transition to market-based and information-rich approaches to environmental protection.

At the heart of the nonpoint strategy, however, would be a public commitment to reduce nutrient runoff, to improve water quality and reverse the damage to fisheries and ecosystems in rivers, lakes, and estuaries. The administrator should carefully frame that national goal, and build public legitimacy for it, then ensure that the nation's and the agency's progress is measured and reported, that particular efforts are evaluated for their efficacy and cost-effectiveness, and that all the myriad actors in the drive for cleaner water have access to reliable, up-to-date information. Simultaneously, local and state leaders should frame goals for their own watersheds. EPA and the states should reconcile their goals, responsibilities, and work plans through a robust negotiation structured as part of the National Environmental Performance Partnership System.

In the 21st Century, the U.S. Environmental Protection Agency must be capable of responding rapidly to changing economic and environmental conditions, regardless of the particular problems it tackles. The agency must be able to adapt its policies and programs over time and for particular places. It must have a relationship with Congress—and a statutory base—that fosters innovation and adaptation. And EPA must help create the systems that will encourage each state, each company, each farm, to be equally dynamic, inventive, and motivated to find the best, least-expensive way to fulfill its social and environmental obligations. The agency and Congress must replace the nation's traditional emphasis on compliance with a focus on performance.

Summary Recommendations

The Academy panel offers the following recommendations with the hope that readers will see them as a summary of this volume and the recommendations that conclude Chapters 2 through 6. Indeed, the following recommendations build on and reaffirm the work of the Academy panels that published *Setting Priorities, Getting Results* in 1995 and *Resolving the Paradox of Environmental Protection* in 1997. Because this report is being published during the transition to a new administration in Washington, the panel addresses its first recommendations to EPA's new administrator. In a broader sense, though, all its recommendations are intended for the entire community of Americans that shapes environmental policy through their jobs, their civic engagement, and their passions.

The next EPA administrator should:

1. Tackle the big environmental problems

a. Select two or three of the most difficult remaining environmental challenges and engage the nation and Congress in developing strategies to address them. By necessity, such an undertaking will require the administrator to adopt innovative tools to address those problems. The panel suggests three environmental issues as worthy of a national commitment of energy, resources, and innovation:

   reducing nutrients in watersheds

   reducing smog

   preparing to reverse the accumulation of greenhouse gases

b. Define the challenges in terms of measurable environmental improvements.

c. Commit the agency to deploy the most cost-effective tools to achieve those results.

d. Build the nation's familiarity with the market-based tools that will eventually reduce greenhouse gas emissions.

e. Encourage states to experiment with bold forms of regulatory and non-regulatory management, such as facility-wide permits, performance-based management contracts, cap-and-trade systems, pollution taxes or fees, information requirements, collaborative approaches to setting goals and designing strategies for protecting watersheds, and compliance-assistance tools of various kinds.

f. Work with Congress to secure the authority and appropriations necessary to make those innovations work. The administrator should seek explicit congressional authorization to use cap-and-trade systems to reduce nutrients in watersheds and the components of smog in air. That authorization should enable EPA to issue group permits in airsheds and watersheds where states or EPA regions are capping pollution allowances, and using trading systems rather than traditional permits.

2. Invest in information and assessment

a. The administrator should work with Congress to create an independent, well-funded bureau of environmental information. In the meantime, the administrator should strengthen the existing Office of Environmental Information by leading efforts to integrate and rationalize the data systems of the media programs, and to develop other objective data of high quality. In addition, the administrator should strongly support the office's efforts to work with the states to create a cooperative federal-state data system based on uniform definitions and comparable scientific methods.

b. The administrator should invest money and political capital in building a credible and comprehensive system to monitor the quality of the nation's surface waters. That could be done by insisting that all the states have delegated authority to implement federal water-quality standards, and that they bring their monitoring networks and report protocols up to high, consistent standards that would provide sufficiently detailed water-quality data to make sound management decisions.

c. The administrator should *use* environmental data in decisionmaking at the national level, and when negotiating with states on National Environmental Performance Partnership System (NEPPS) agreements. The administrator should hold political and career managers accountable for achieving measurable environmental improvements.

d. The administrator should build the agency's capacity to improve federal and state programs by investing in an external, peer-reviewed evaluation network.

3. Hold states accountable for results

a. The administrator should redefine EPA's expectations of states in terms of environmental results, rather than only of process.

b. The administrator and the state commissioners should revitalize NEPPS, requiring that states and regional offices base priorities and work plans on serious self-assessments informed by public participation. EPA should provide to those states with effective environmental programs substantial discretion in how they manage and deploy those programs. Regional offices should audit the effectiveness of such state programs, rather than review individual permits or activities.

c. The administrator should also complete the transfer of routine regulatory functions from regional offices to the states.

4. Use all the tools available to change management cultures and practices to focus on achieving critical environmental goals

a. Revamp EPA's planning and budgeting systems to move the agency towards strategic, performance-based management consistent with the intent of the Government Performance and Results Act (GPRA), eliminating those practices that reinforce fragmented programs and relationships.

b. Develop and implement a strategy for addressing the outdated organizational structure of the agency, starting with reorganization of the regional offices. If necessary, EPA should seek statutory changes to allow reorganization that would end the fragmentation of the agency into separate media offices. In the meantime, the administrator should delegate more decisionmaking authority and management flexibility to those offices, while holding regional administrators responsible for achieving environmental progress. The administrator should give regional administrators budget-implementation authority to facilitate regional accountability and flexibility.

c. Delegate decisionmaking authority clearly and demand expeditious, thoughtful decisions. Ensure that disagreements among program offices or among regions and headquarters are identified promptly and resolved. Replace the agency's casual demand for "consensus" with an explicit bias for action. Make certain, however, that actions are coupled with evaluation and accountability.

d. Build EPA's management skills now to avoid a crisis as senior employees retire. The next cadre of managers will need new skills: expertise in place-based, cross-media management; economics and business; information technologies and communication; biotechnology; and international trade.

Congress should:

5. Authorize EPA and the states to use the tools they need to tackle the big problems

a. Authorize EPA and the states to implement allowance-trading systems to reduce pollution in air and water, explicitly liberating such systems from the constraints of traditional facility-based permitting, provided that trades would not result in unacceptable risks in local areas.

b. Empower EPA to let states try new approaches to address water quality and related problems in watersheds, including alternatives to total maximum daily loads (TMDLs) where those alternatives appear likely to improve the environment more effectively or efficiently than TMDLs could.

c. Authorize and encourage state experiments with performance-track systems that replace traditional permits with whole-facility agreements or "beyond-compliance" strategies.

d. Work with the administrator to create a statutory basis for continued experimentation and innovation in the nation's environmental system. Support innovation through the appropriations process.

6. Invest in information

a. Appropriate sufficient funds for major improvements in environmental data and in program assessments.

b. Authorize establishment of an independent bureau of environmental information and assessment.

c. Direct EPA to redesign its implementation of GPRA to provide more information about the nation's overall progress toward meeting critical environmental goals.

7. Put aside partisanship because America wants Congress to solve serious problems.

a. Members should use the environment to demonstrate that political parties can come together to set aggressive public-policy goals and provide the means to achieve them.

b. Share with EPA a willingness to try new approaches that hold promise of better performance, and must refrain from unfair criticism of EPA if some innovations fail.

c. Become an environmental leader. Members of Congress should join the administrator and the state commissioners in explaining to Americans why action on the big environmental problems is necessary and why innovation is essential in making progress. Members should help business leaders, environmental advocates, and governors find common ground on approaches that will achieve the nation's environmental goals at the lowest possible social cost.

State regulators and legislatures should:

8. Challenge EPA, Congress, and one another to transform environmental governance

a. Continue to develop and deploy approaches to environmental protection that can deliver measurable results more effectively or efficiently, and be models for implementation across the nation. States should build evaluation into the design of innovative programs.

b. Commit to environmental improvement, reject a rollback of environmental standards, and increase the political pressure on one another to deliver environmental results as well as efficient programs. Accept the challenge of reporting on a meaningful set of core performance measures, and being judged in relation to comparable states.

c. Commit to build adequate environmental monitoring systems.

d. Make the next iteration of NEPPS work by investing in better self-assessments, expanding public participation in setting priorities, and vigorously negotiating roles and responsibilities with the regional offices, particularly on problems of interstate significance.

e. Equip communities and regions within the states with the tools and incentives to make land-use decisions that protect or enhance environmental values.

Business leaders, NGOs, and foundations should:

9. Embrace more effective and efficient policies for environmental protection

a. Reject calls for a rollback in environmental protection at the state or federal level.

b. Work with EPA and states on trading networks; building credible environmental management systems (EMSs) and International Organization for Standards (ISO) 14001 registration.

10. Help build a national system for gathering, disseminating, and using environmental information.

a. Provide better information about firms' environmental performance to the public: both local communities and regulatory agencies.

b. Nongovernmental organizations (NGOs) and foundations should support efforts to use environmental data and to evaluate environmental programs.

c. The leaders in the information-technology revolution should lend their support and resources to help EPA and the nation build a dynamic information system. Their technical, financial, and political support could accelerate the transformation of EPA by a decade.

The next EPA administrator will have much good work to build on within the agency and among the states. Individuals, companies, communities, NGOs, and states have been testing new methods for making environmental progress. They are ready—even eager—for thoughtful, committed, consistent leadership to help them make even more progress.

APPENDIX A

The Research Papers

Innovations in Regulation

Evaluation of the Massachusetts Environmental Results Program
by Susan April and Tim Greiner

ISO 14001 and EPA Region I's Star Track Program: Assessing their Potential as Tools in Environmental Protection
by Jennifer Nash and John Ehrenfeld

The Potential and Pitfalls of Innovative Permits: Learning from New Jersey's Facility-Wide Permitting Program
by Susan Helms, Jennifer Sullivan, and Allen White

Green Permits and Cooperative Environmental Agreements: A Report on Oregon's and Wisconsin's Regulatory Innovation Programs
by Jerry Speir

Trading Systems to Reduce Air and Water Pollution

Analysis of Volatile-Organic-Compound Air Pollution Trading Systems
by Eric Ruder and Michael Hix

Crosscutting Analysis of Trading Programs: Case Studies in Air, Water, and Wetland Mitigation Trading
by Robert Kerr, John Jaksch and Steve Anderson

Governance in Watersheds

The Watershed Approach—An Empirical Assessment of Innovation in Environmental Management
by Stephen M. Born and Kenneth D. Genskow

Environmental Governance in Watersheds: The Importance of Collaboration to Institutional Performance
by Mark T. Imperial and Timothy Hennessey

The Navesink Watershed Management Effort
by Caron Chess and Ginger Gibson

Changing the Federal/ State Relationship

Compliance Assurance and Superfund: Reforms at EPA

APPENDIX B

A Guide to EPA's Statutes

Several major statutes form the legal basis for the programs of the Environmental Protection Agency.

The **Pollution Prevention Act** seeks to prevent pollution through reduced generation of pollutants at their points of origin.

The **Clean Air Act** and its amendments require EPA to set mobile-source limits, ambient air-quality standards, hazardous air pollutant emission standards, standards for new pollution sources, and significant deterioration requirements. The act also authorizes a market-based emissions trading system to control acid rain, the review of State Implementation Plans, the issuing of permits for new sources in non-attainment areas, and implementation of international agreements to protect stratospheric ozone.

The **Clean Water Act** establishes the sewage treatment construction grants program and a regulatory and enforcement program for discharges of wastes into U.S. waters from point sources. It also requires that EPA approve Total Maximum Daily Loads prepared by states for nonpoint source pollutants for impaired water bodies, and to write TMDLs if states do not do so adequately. Wetlands are regulated under Section 404, which requires that permits be issued for discharge of dredge and fill material.

The **Safe Drinking Water Act** establishes primary drinking water standards, regulates underground injection disposal practices, and establishes a groundwater control program.

The **Solid Waste Disposal Act** and the **Resource Conservation and Recovery Act** authorize regulation of solid and hazardous waste, while the **Comprehensive Environmental Response, Compensation, and Liability Act** (CERCLA or Superfund) establishes a fee-maintained fund to clean up abandoned hazardous waste sites.

The **Emergency Planning and Community Right-to-Know Act** requires reporting of toxic releases and encourages responses for chemical releases.

The **Toxic Substances Control Act** regulates the testing and use of chemicals, and the **Federal Insecticide, Fungicide, and Rodenticide Act** governs pesticide products and their use.

The **Environmental Research and Development Demonstration Act** authorizes all EPA research programs.

The **National Environmental Policy Act** requires, in part, that EPA review environmental impact statements.

Some statutes important to EPA's mission are administered by other agencies. Among them: the **Farm Bill**, administered by USDA, which provides the majority of funding for nonpoint source pollution control; **the Transportation Act for the 21st Century**, administered by the Department of Transportation; the **Endangered Species Act**, administered primarily by the Department of the Interior; and the **Costal Zone Management Act**, which is primarily administered by the Department of Commerce.

Note: More information and full texts of laws administered by EPA are available at: http:// www.epa.gov/ epahome/ lawreg.

APPENDIX C

Glossary

BACT	Best available control technology
BLM	Bureau of Land Management, U. S. Department of the Interior
BMP	Best management practice
CAA	Clean Air Act
CAFO	Concentrated animal feeding operations
CCMP	Comprehensive Conservation Management Plan
CEM	Continuous emissions monitors
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
CZM	Costal Zone Management
DOE	U. S. Department of Energy
EPA	U.S. Environmental Protection Agency
ECOS	Environmental Council of the States
EIP	Economic Incentive Program
EMAS	Eco-Management and Audit Scheme
EMS	Environmental management system
ERP	Environmental Results Program (Massachusetts)
FWP	Facility-wide permit
GAO	General Accounting Office
GEMS	Green Environmental Management System (Oregon)
GPRA	Government Performance and Results Act
GIS	Geographic information systems
GPRA	Government Performance and Results Act
GPS	Global positioning system
HCP	Habitat Conservation Plans

ISO	International Standards Organization
ISTEA	Intermodal Surface Transportation Act
MACT	Maximum achievable control technology
MOA	Memorandum of agreement
MPO	Metropolitan planning organization
MSWG	Multi-State Working Group on Environmental Management Systems
NAAQS	National Ambient Air Quality Standards
NCRS	National Resources Conservation Service, U.S. Department of Agriculture
NEP	National Estuary Program
NEPPS	National Environmental Performance Partnership System
NESHAP	National Emission Standards for Hazardous Air Pollutants
NGO	Nongovernmental organization
NO_x	Nitrogen oxide
NPDES	National Pollution Discharge Elimination System
NPS	Nonpoint pollution source
OECA	Office of Enforcement and Compliance Assurance
OMB	Office of Management and Budget
P2	Pollution prevention
P4	Pollution Prevention in Permitting Project
POTW	Publicly owned treatment works
PPA	Performance Partnership Agreement
PPG	Performance Partnership Grant
RACT	Reasonably achievable control technology
RCRA	Resource Conservation and Recovery Act
SAMP	Special Area Management Plan
SDWA	Safe Drinking Water Act
SIP	State Implementation Plan
SO_2	Sulphur dioxide
SO_x	Sulphur oxide
TEA21	Transportation Equity Act for the 21st Century
TIP	Transportation Implementation Plan
TMDL	Total maximum daily load
TRI	Toxic Release Inventory
USDA	United State Department of Agriculture
VOC	Volatile organic compound

APPENDIX D

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Endnotes

1 Appendix B contains a brief guide to EPA's statutes.

2 EPA established the Toxics Release Inventory in 1988; it requires more than 21,000 U.S. facilities to report to EPA annually on their releases and transfers of more than 600 toxic chemicals. EPA reviews the data and publishes them electronically and in print. The Environmental Defense "Scorecard" is an online source of information about facilities' emissions and their relative toxicity.

3 Of the 18,967 EPA employees, 8,753 work in regional offices, 6,727 at headquarters, and 3,487 in the field. (U.S. Environmental Protection Agency, "EPA's Budget and Workforce, 1970-2001," http:/ / www.epa.gov/ history/ org/ resources/ budget.)

4 National Academy of Public Administration, *Resolving the Paradox of Environmental Protection,* 1997.

5 See www.napawash.org/ innovationspapers.

6 National Academy of Public Administration. *Setting Priorities, Getting Results: A New Direction for EPA,* 1995.

7 See *supra* note 4.

8 House, Conference Report On H.R. 2158, Departments Of Veterans Affairs And Housing And Urban Development, And Independent Agencies Appropriations Act, 1998. October 6, 1997, H8323

9 A summary of that discussion is available on-line at www.napawash.org\ innovationspapers.

10 This report uses the word "firm" loosely to refer to any organization subject to environmental regulation or engaged in the implementation of an environmental management system.

11 *Pollution Control in the United States: Evaluating the System,* a 1998 review of the effectiveness and efficiency of environmental regulation in the United States by J. Clarence Davies and Janice V. Mazurek, finds that those regulations have led to significant reductions in conventional pollutants from large point sources. However, emissions of nitrogen dioxide and ozone, two of the six major air pollutants associated with energy consumption, have not been reduced. The authors document the lack of information needed to determine the extent of environmental improvement.

12 U.S. EPA, *Reinventing Environmental Protection: 1998 Annual Report* EPA, 1999. http:/ / www.epa.gov/ reinvent/ annual98/ 98report.pdf.

13 See Environmental Accounting Project of the Office of Pollution Prevention and Toxic Substances, http:/ / www.epa.gov/ opptintr/ acctg/ .

14 See http:/ / www.scorecard.org/

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16 Susan April and Tim Greiner, " "Evaluation of the Massachusetts Environmental Results Program," 2000.

17 Susan C. Helms, Jennifer A. Sullivan, and Allen L. White, "The Potential and Pitfalls of Innovative Permits: Learning from New Jersey's Facility-Wide Permitting Program, 2000. (*hereinafter* Helms, *et al.*)

18 Jennifer Nash, John Ehrenfeld, Jeffrey MacDonagh-Dumler, and Pascal Thorens, "ISO 14001 and EPA Region 1's StarTrack Program: Assessing Their Potential as Tools in Environmental Protection," 2000. (*hereinafter* Nash and Ehrenfeld, 2000.)

19 Jerry Speir, "Green Permits and Cooperative Environmental Agreements: A Report on Oregon and Wisconsin's Regulatory Innovation Programs," 2000.

20 See Appendix C of April and Greiner for a sample certification document.

21 *Ibid.*, 24.

22 *Ibid.*, 26.

23 *Ibid.*, 27-30.

24 Personal communication, Susan April, July 2000.

25 April and Greiner, *op cit*, 43-44.

26 *Ibid.*, 18-19.

27 *Ibid.*, 41-43.

28 *Ibid.*, 35-36.

29 For more on Project XL, see Helms, *et al.*; and *The Paradox of Environmental Protection, op. cit.*

30 Helms, *et al.*, 39.

31 Pam Parry, *The Bottom Line: How to Build a Business Case for ISO 1400*, 2000, 3.

32 Jennifer Nash and John Ehrenfeld, "Environmental Management Systems and their Roles in Environmental Policy," Multi-State Working Group Research Summit on Environmental Management Systems, November 2-3, 1999.

33 Nash and Ehrenfeld, 2000

34 Organizations of all sizes and types may adopt an EMS: large corporations may implement a corporate-wide system, or individual facilities within a corporation—and even individual processes within those facilities—may adopt their own EMSs. Likewise, public organizations, such as a state's department of transportation or an individual wastewater treatment plant, may adopt an EMS. To simplify the nomenclature, this report generally refers to an adopting entity as a "firm," regardless of its size or status.

35 *The Environmental Management Report*, January 2000.

36 See, for example, Pacific Institute, *Managing a Better Environment: Opportunities and Obstacles for ISO 14001 in Public Policy and Commerce*, March 2000.

37 The best-known European standard is EMAS, the Eco-Management and Audit Scheme.

38 Parry, 6.

39 Ford and GM press releases are available at www.MSWG.org

40 Nash and Ehrenfeld, 2000, 19, 28-29.

41 *Ibid.*

42 University of North Carolina at Chapel Hill and the Environmental Law Institute, "National Database on Environmental Management Systems: The Effects of Environmental Management Systems on the Environmental and Economic Performance of Facilities," June 2000, at www.MSWG.org.

43 Multi-State Working Group on Environmental Management Systems, "EMSs, Environmental Performance, and Compliance, Final Draft," December 1999, at www.MSWG.org,

44 U.S. EPA Region I, "StarTrack Program: Program Guidance Document 1998," August 1998.

45 StarTrack allows firms to hire their own EMS consultants to serve as the third-party auditor; ISO 14001 does not.

46 Nash and Ehrenfeld, 2000, 19, 45.

47 *Ibid,* 66-67.

48 *Ibid,* 59-60.

49 *Ibid.*, 70.

50 *Ibid.*, 68.

51 U.S. EPA, *Aiming for Excellence: Actions to Encourage Stewardship and Accelerate Environmental Progress* , July 1999, 13-15.

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53 Jeff Smoller of the Wisconsin Department of Natural Resources uses those phrases frequently in public remarks.

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55 Available at http:/ / www.pca.state.mn.us/ programs/ projectxl/ xl-leg.pdf

56 The statute is available at http:/ / www.pca.state.mn.us/ programs/ projectxl/ la-bill.pdf

57 A description of the program is available at http:/ / www.epa.state.il.us/ iso14001/ summary.html

58 Wisconsin Statutes Annotated 299.80.

59 "Interested person" is defined by the statute as "a person who is or may be affected by the activities at a facility that is covered or proposed to be covered by a cooperative agreement or a representative of such a person." WSA 299.80(1)(f).

60 Speir, *op. cit.*, 6-17.

61 Speir, 17.

62 See Speir for detailed descriptions of each proposal.

63 OAR 340-014-0135, in Speir, 34.

64 Speir, 35

65 See Case Study 1, in *Resolving the Paradox of Environmental Protection,* for a discussion of Intel's "P4" permit at its Aloha facility.

66 Speir, 36.

67 *Ibid.*.

68 As of February 2000, 12 of the 18 participating firms had approved FWPs; four more permits were pending approval; and two firms had dropped out of the program. (Helms, *et al.*, *op cit,* 22.)

69 *Ibid.*, 52.

70 *Ibid.*, 55-56.

71 *Ibid.*, 49.

72 *Ibid.*, 51.

73 *Ibid.*, 53.

74 *Ibid.*, 54-55.

75 *Ibid.*, 52-53.

76 *Ibid.*, 68.

77 *Ibid.*

78 *Ibid.*, 64.

79 *Ibid.*, 65.

80 *Ibid.* 78.

81 *Ibid.*, 73.

82 See Appendix A, *Resolving the Paradox of Environmental Protection.*

83 Personal communication, Timothy Mohin, manager, corporate environmental affairs, Intel Corporation, January 11, 2000.

84 Natural Resources Defense Council, The Dow Chemical Company, *et al.*, *Preventing Industrial Pollution at its Source,* 1999.

85 Forest L. Reinhardt, *Down to Earth: Applying Business Principles to Environmental Management,* 2000. (Footnotes omitted.)

86 Michael Hix, Eric Ruder, and David Sugarman, "Analysis of Volatile Organic Compound Air Pollution Trading Systems," 2000; and Robert Kerr, Steve Anderson, and John Jaksch, "Crosscutting Analysis of Trading Programs: Case Studies in Air, Water and Wetland Mitigation Trading Systems," 2000, *hereinafter,* Kerr, *et al.*

87 Curtis Carlson, Dallas Burtraw, Maureen Cropper, and Karen Palmer, "Sulfur Dioxide Control by Electric Utilities: What are the Gains from Trade?" 1998; Dallas Burtraw. *Cost Savings, Market Performance, and Economic Benefits of the U.S. Acid Rain Program,* 1998, 3-5.

88 Title IV of the Clean Air Act Amendments of 1990.

89 Paul Faeth. *Fertile Ground: Nutrient Trading's Potential to Cost-Effectively Improve Water Quality,* 2000.

90 Faeth, 7; S. R. Carpenter, N.F Caraco, D.L. Correll, R.W. Howarth, A.N. Sharpley, and V.H. Smith, *Nonpoint Pollution of Surface Waters with Phosphorus and Nitrogen, Issues in Ecology,* 1998.

91 Faeth, 16; U.S. EPA, Office of Water and Office of Policy, Planning and Evaluation, "Incentive Analysis for Clean Water Act Reauthorization: Point/ Nonpoint Trading for Nutrient Discharge Reductions," 2000.

92 Faeth, 17; U.S. EPA, Office of Water, "President Clinton's Clean Water Initiative: Analysis of Costs and Benefits," 1994.

93 Faeth, 30.

94 *Ibid.*, 33.

95 Wisconsin Department of Natural Resources, "Second Progress Report on the Trading of Water Pollution Credits," September 1999.

96 "The Tar-Pamlico point source control program cannot be described in any other way but as an economic and environmental success," conclude Kurt Stephenson, Leonard Shabman, and William

Shobe, in comments submitted to U.S. EPA. See "Comments to the Proposed NPDES Interim Permitting Rule: Implications for Watershed-based Allowance Trading." January 17, 2000.

97 Kurt Stephenson, Leonard Shabman, and L. Leon Geyer, "Toward An Effective Watershed-Based Effluent Allowance Trading System: Identifying the Statutory and Regulatory Barriers to Implementation," in *The Environmental Lawyer*, at footnote 175. June 1999.

98 *Ibid.* 804.

99 Kerr *et al.* 28-30.

100 *Ibid.*, 31.

101 National Academy of Public Administration, "The Future of Water Quality Monitoring," in *Remembering the Future: Applying Foresight Techniques to Research Planning at EPA*, 1990, 179-180.

102 Kerr describes the allocation rules on 25-27.

103 Kerr *et al.* 27.

104 U.S. EPA, "EPA Asks Court to Lift Stay on NO_x SIP Call: Fact Sheet," April 11, 2000, at www.epa.gov/ airlinks/ finalsip.pdf

105 EPA issues a "SIP call" when it directs states to revise their state implementation plans for implementing Clean Air Act regulations. EPA must approve each state's SIP.

106 Bill Miller, "Court Lets EPA Enforce Clean-Air Rule," *Washington Post*, June 24, 2000. The new rule will apply to 19 of the 22 states included in the original SIP call.

107 Byron Swift, "Grandfathering, New Source Review and NOx: Making Sense of a Flawed System," Environmental Law Institute draft, May 31, 2000, 3.

108 *Ibid.*, 7.

109 U.S. EPA, Office of Air and Radiation, Clean Air Markets Division, "1999 OTC NO_x Budget Program Compliance Report," March 27, 2000. The participating states were Connecticut, Delaware, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, and Rhode Island.

110 Swift, 5 (references omitted).

111 Stephenson *et al.*, 803.

112 Hix, Ruder, and Sugarman,*op.cit.*, 51-52.

113 *Ibid.*, 52.

114 Hix, Ruder, and Sugarman show that in four offset trading areas in New York and Texas, trading ratios have retired less than one percent of total regional inventory of VOCs from point sources, 37

115 Kerr, *et al.*, 8-59.

116 *Ibid.*, 40-41.

117 Kerr, *et al.*, 41-42.

118 Kurt Stephenson, Leonard Shabman, and William Shobe, "Comments to the Proposed TMDL Rule: Implications for Watershed-based Allowance Trading," January 17, 2000.

119 HR 3313 (106th Congress).

120 Kerr, *et al.*, 44.

121 U.S. EPA, Draft Economic Incentive Program Guidance, September 1999.

122 U.S. EPA, Economic Incentive Program Rules, Final Rule and Guidance, April 7, 1994.

123 Hix, Ruder, and Sugarman. 41 (references omitted).

124 Kerr, *et al.*, 67-69.

125 Robert W. Adler, Michele Straube, and Heather Green, "Lessons from Large Watershed Programs," 2000, 9-10.

126 *Ibid.* 42-49.

127 National Academy of Public Administration, *Remembering the Future, op cit.*

128 *Ibid.*

129 Stephenson, Shabman, and Geyer, 798.

130 *Ibid.* 802.

131 *Ibid.* 803.

132 *Ibid.* 811.

133 U.S. EPA. Office of Water. Draft Framework for Watershed-Based Trading, May 1996; and at www.epa.gov/ owow/ watershed/ summary.html.

134 *Ibid.*

135 Stephenson, Shabman, and Shobe.

136 Hix, Ruder, and Sugarman, 59-63.

137 EPA comments on a draft research document, on file with the National Academy of Public Administration.

138 Quoted in Stephen M. Born and Kenneth D. Genskow, "The Watershed Approach: An Empirical Assessment of Innovation in Environmental Management," 2000, 58.

139 National Pollution Discharge Elimination System (NPDES) permits.

140 U.S. Environmental Protection Agency, Office of Water: An Overview, 3; http:// www.epa.gov/ OW/ owintro2.html.

141 The EPA faces similar dilemma under the Clean Air Act: a lack of authority to address directly the underlying causes of air pollution. Most of the progress towards cleaner air has come from EPA's regulatory controls on utilities, factories, vehicle emissions, and certain kinds of small businesses, as well as from requirements that automobile manufacturers sell cars with high gas mileage. But as those controls took hold, cities grew into the countryside, and the use of automobiles grew. The increase in vehicle-miles traveled causes more pollution, which almost offsets reductions in emissions from regulated sources.

142 *Enforceable State Mechanisms for the Control of Nonpoint Source Water Pollution*, Environmental Law Institute, 1997, ii, iii.

143 *Putting the Pieces Together: State Nonpoint Source Enforceable Mechanisms in Context*, Environmental Law Institute, 2000, 60.

144 *Ibid.*, p. 5.

145 In *The Clean Water Act TMDL Program: Law Policy, and Implementation*, Oliver Houck writes "House staff saw section 303 [including TMDLs] as providing 'a game plan for the next generation'. The Senate was less sanguine: in the words of one Senate staff member, 'We didn't take it seriously and thought it

would be foolish for the EPA to waste time and money to implement it'. Senator Muskie, principal author of the Senate bill and chair of its Public Works Committee, was equally direct, telling the EPA Administrator to 'assign secondary priority' to section 303 when it came to allocation of resources in the years ahead.." 24.

146 See Total Maximum Daily Loads Under the Clean Water Act, 43 Federal Register 42303 quoted in Houck, 50-51. EPA also stated in 43 Federal Register 60664 that it sought to "ensure" that "current State water quality management programs will not be disrupted" by TMDLs.

147 Houck, 5.

148 USC 1313, § 303(d)(1)(A).

149 USC 1313, §303(d)(C).

150 Kurt Stephenson, Patricia Norris, and Leonard Shabman, "Watershed-Based Effluent Trading: The Nonpoint Source Challenge," *Contemporary Economic Policy* 412, 1998; James Boyd, *The New Face of the Clean Water Act: A Critical Review of the EPA's Proposed TMDL Rules*, 2000.

151 Robert W. Adler, "Integrated Approaches to the Water Pollution Problem: Lessons from the Clean Air Act," *Harvard Environmental Law Review*, 1995. This section of the Academy's report draws heavily on that article, though the panel comes to somewhat different conclusions. The recommendations in Adler's article center on changes in the Clean Water Act that would avoid the difficulties that have arisen in the SIP process, whereas our analysis suggests ways to design and manage the TMDL process. Adler's article was written before recent court decisions about TMDLs, and long before EPA began drafting regulations for the TMDL program.

152 William H. Rodgers Jr., *Environmental Law*, 1994, 148.

153 After 25 years of work, and some improvement in regional air quality, there is not a SIP that describes how the Los Angeles-South Coast region can come into full attainment of air-quality standards. The Clean Air Act Amendments of 1990 postponed the deadline for the South Coast SIP again, to 2010. Adler, *Harvard Law Review*, 1995. See also Rodgers, *Environmental Law Review*, 70. He quotes the Senate Committee on Environment and Public Works Report 1101-288 on the Clean Air Act Amendments of 1989, 1st session: "The reasons 'for the failure to achieve healthy air are many. Among them are the understatement of emissions in inventories submitted by the States and approved by EPA; inadequacies in models used to predict ambient air quality; failure of some States to implement some of the controls they had committed to in their SIPs; failure of some of the controls to achieve the projected emission reductions; and the failure of EPA or the States to require additional controls when it became evident that the attainment deadlines would not be met.' A statutory failure is no reason not to try again, and Congress in 1990 attacked the intransigent non-attainment problems with the same set of tools that had been tried and found wanting earlier: a revised redesignation authority, new deadlines, harsh SIP and permit provisions, and stiff sanctions. The most conspicuous feature of the new package, though, is that it looks a great deal like the old, with the ruffles and flourishes of 20 years' experience."

154 EPA estimates that the costs of writing TMDLs will be substantial, but far less than the costs of writing SIPs. Fourteen case studies conducted by EPA show a range from $4,039 to $1,023,531 depending on the size of the watershed, the complexity of the model, the types of pollutants, and whether they are point or nonpoint sources. EPA estimates of the cost of TMDL development will average from $33,000 for the 40 percent of TMDLs considered to be relatively simple, to $63,500 for the 35 percent considered to be of medium complexity, and $112,000 for those of high complexity (25 percent). Those numbers do not include estuaries, for which TMDLs are expected to be more costly. (The EPA Office of Water and Watersheds provided the figures to Academy staff.) States and other critics of the TMDL regulations claim much higher costs. See the Association of State and Interstate Water Pollution Control Administrators, the Environmental Council of the States, and the Coastal States Organization, "Comments and Recommendations on the Proposed Revisions to The Water Quality Planning and Management Regulation (40 CFR Part 130) and the National Pollutant

Discharge Elimination System Program and Federal Antidegradation Policy," January 20, 2000, at http:/ / www.iwpextra.com.

155 *Putting the Pieces Together*, 91.

156 See http:/ / waterquality.deq.state; or.us/ wq/ TMDLs/ TMDLs.htm

157 Federal funds for highway safety and for transit and other projects that would improve regional air quality are not covered.

158 The requirement was retained from TEA21's predecessor, the Intermodel Surface Transportation Act (ISTEA).

159 Arnold Howitt and Elizabeth Moore, *Linking Transportation and Air Quality Planning: Implementation of the Transportation Conformity Regulations in 15 Non-attainment Regions*, prepared for the Environmental Protection Agency and the Federal Highway Administration, March 1999, xii.

160 *Ibid.*, xiii.

161 *Ibid.*, xiii-xiv.

162 *Ibid.*, xiv.

163 Environmental Law Institute, *Enforceable State Mechanisms for Control of Nonpoint Source Water Pollution, op.cit.*, iv-v.

164 Robert W. Adler, "Addressing Barriers to Watershed Protection," *Environmental Law* 25:4, 1995.

165 The Great Lakes program also included Canada, which has signed treaties with the United States calling for joint action to "restore and maintain the chemical, physical, and biological integrity of the Great Lakes Basin Ecosystem". See Theo Colborn *et al.*, *Great Lakes, Great Legacy?* 1990; and Tim Horton and Bill Eischbaum, *Turning the Tide, Saving the Chesapeake Bay*, 1991.

166 See Upper Clark Fork case study in *Resolving the Paradox of Environmental Protection*. For information about other collaborative processes in the West, see Douglas Kenney, *Resource Management at the Watershed Level: An Assessment of the Changing Federal Role in the Emerging Era of Community-Based Watershed Management*, University of Colorado School of Law, Boulder, Colorado, 1997; Jane Braxton Little, "A quiet victory in Quincy," *High Country News*, November 9, 1998; Ed Marston, "We may be seeing the devolution of the environmental movement," *High Country News*, September 29, 1997; Steven L. Yaffee, Ali F. Phillips, Irene C. Frentz, Paul W. Hardy, Susanne M. Maleki, and Barbara E. Thorpe, *Ecosystem Management in the United States: An Assessment of Current Experience*, 1996, 87-88.

167 Caron Chess and Ginger Gibson, "The Navesink Watershed Management Effort," 2000, 9, 27-29, 40.

168 Born and Genskow, *op cit.*

169 Mark T. Imperial and Timothy Hennessey, "Environmental Governance in Watersheds: The Importance of Collaboration to Environmental Governance," 2000.

170 There is an extensive literature on collaborative processes. See Roger Fisher and William Ury, *Getting to Yes: Negotiating Agreement Without Giving In*, 1991; Case Study 2, National Academy of Public Administration, *Resolving the Paradox of Environmental Protection*; Ortwin Renn, Thomas Webler and Peter Wiedemann eds, *Fairness and Competence in Citizen Participation*, 1995; Elinor Ostrom, *Governing the Commons: The Evolution of Institutions for Collective Action*, 1990; and Elinor Ostrom, Roy Gardner and James Walker, *Rules, Games and Common Pool Resources*, 1994.

171 Stephen S. Light, Lance Gunderson, and C.S. Holling, *The Everglades: Evolution of Management in a Turbulent Ecosystem*, 1995, 147-151; and DeWitt John, *Civic Environmentalism: Alternatives to Regulation in States and Communities*, 1994, 125.

172 Chess and Gibson, 43-44.

173 Born and Genskow, C-15.

174 *Ibid.*, F-13.

175 Imperial and Hennessey, 25.

176 Imperial and Hennessey, 51.

177 *Ibid.*, 15.

178 Born and Genskow, 52.

179 *Ibid.*, E-14.

180 Imperial and Hennessey, vii.

181 Among other factors, warmer waters are probably also shallower: and they are shallow because they are full of sediments that cover the gravel beds where salmon spawn.

182 Imperial and Hennessey, 11.

183 *Ibid.*, 38.

184 Adler, Straube, and Green, *op. cit.*, 97.

185 The project is the result of successful litigation to protect the Everglades National Park as well as a federal wildlife refuge from nutrient-enriched waters. The nutrients come from large farms and developed areas far to the north. The problem is made worse by the diversion of large amounts of water to the ocean in order to protect coastal cities from destructive floods. The U.S. Army Corps of Engineers and its cooperating federal and state agency partners have proposed constructing artificial wetlands and rebuilding an extensive system of drainage canals. The Corps seeks to restore both the rate and the timing of the "sheet flow" of water down the river of grass that is the Everglades of south-central Florida. It has multiple objectives, including protection of threatened and endangered species, prevention of saltwater intrusion, supply of adequate drinking water for coastal cities, flood control, and water quality.

186 Adler, Straube and Green, 106.

187 See Alliance for the Chesapeake Bay, Citizen Monitoring Program at http://www.acb-online.org/citmon.htm.

188 Connie A. Loper and Ryan C. Davis, "A Snapshot of Stream Environmental Quality in the Little Conestoga Creek Basin, Lancaster County, Pennsylvania: A Cooperative Project between the Residents of Lancaster County, the Alliance for the Chesapeake Bay, and the U.S. Geological Survey." Water-Resources Investigations Report 98-4173, available at http://www.pa.water.usgs.gov/reports/wrir.

189 Chess and Gibson, 72.

190 The reasons for the inaccuracy are unknown but may have to do with errors in data input. Adler, Straube and Green, 69.

191 *Ibid.*, 75.

192 *Ibid.*, 93.

193 *Ibid.*, 101.

194 Chess and Gibson, 42.

195 Born and Genskow, 54-55.

196 Quoted in Chess and Gibson, 27

197 Imperial and Hennessey, 91

198 *Ibid,* 45; Chess and Gibson, 86.

199 Imperial and Hennessey, 9-12

200 *Ibid.,* 95.

201 U.S. General Accounting Office, "Water Quality: Federal Role in Addressing—and Contributing to—Nonpoint Source Pollution," 1999, 33-34.

202 See Clayton Ogg, "Benefits from Managing Farm Produced Nutrients," *Journal of the American Water Resources Association,* October 1999, 1019-1020.

203 *Ibid.,* 92.

204 On file with the National Academy of Public Administration.

205 See the Land Trust Alliance website, http:/ / www.lta.org/ whatlt.html.

206 Lee Paddock and Suellen Keiner, "Mixing Management Metaphors: The Complexities of Introducing a Performance-Based State/ EPA Partnership System into an Activity-Based Management Culture," 2000.

207 Jeanne Herb, Jennifer A. Sullivan, Mark Stoughton, and Allen L. White, "The National Environmental Performance Partnership System: Making Good on its Promise?" 2000. (*hereinafter,* Herb, *et al.*)

208 Hamilton, Rabinovitz & Alschuler, "Learning from Innovations in Environmental Protection: Three California Perspectives," 2000. (*hereinafter,* HR&A.)

209 Gormley, *op cit.*

210 Jodi Perras, "Reinventing EPA New England: An EPA Regional Office Tests Innovative Approaches to Environmental Protection," 2000.

211 See James Fallows, *The Water Lords: Ralph Nader's Study Group Report on Industry and Environmental Crisis in Savannah, Georgia,* 1971.

212 The Superfund program and several small programs work somewhat differently; statutes do not allow EPA to delegate authority for these programs to states. However, several states have passed legislation concerning cleanup of hazardous waste sites, including in a few cases cleanup of Superfund sites under agreements with EPA. Under memoranda of understanding with EPA, those states do much of the analysis and negotiation necessary to design and implement cleanup plans, but EPA regional offices retain the final authority for approval, and often negotiate financial arrangements with corporations and other parties responsible for cleanup.

213 The figure for permits is from Environmental Protection Agency, *Enforcement in the 1990s Project,* 2-15. Staff of the Environmental Council of the States gave the estimate of enforcement actions in interviews with Paddock and Keiner. See also Paddock and Keiner, 124.

214 Gormley's figures are preliminary estimates. He reports that most of the states that rely heavily on EPA are less populous, and are in the West or South; whereas many large, industrialized states, but not all, spend more on pollution control. Thus EPA grants to states amounted to about $744 million in FY 96, whereas state spending on pollution control was slightly over $8 billion. The Environmental Council of the States reports slightly different figures. ECOS says that that federal funds fell from 58

percent to 20 percent of state spending on between 1986 and 1996, and.that state budgets for environmental protection and natural resources increased by 140 percent during that period. It is quite difficult to compare EPA and state spending., because as well as environmental protection agencies, many state departments of health and agriculture operate EPA programs. Furthermore, public works expenditures for waste cleanup, wastewater treatment, and drinking water systems comprise more than half of EPA's budget, while state spending for those purposes falls under many different agencies.

215 The figures are from a 1994 New Jersey work plan for regulation of surface water quality, quoted in *Resolving the Paradox of Environmental Protection*, 144.

216 Joint Commitment to Reform Oversight and Create a National Performance Partnership System, May 17, 1995.

217 *Ibid.*

218 Herb, *et al.*, 63

219 Gormley, 16.

220 *Ibid*, 24.

221 *Ibid.*, 39.

222 Joint Commitment to Reform Oversight and Create a National Performance Partnership System, May 17, 1995.

223 Quoted in Paddock and Keiner, 28.

224 Herb, *et al.*, 34.

225 Herb, *et al.*, 69.

226 Comment provided by an EPA official to the draft report by Paddock and Keiner.

227 EPA Office of Enforcement, *Enforcement in the 1990s*, 1991, 2-2. Paddock and Keiner report that OECA's views do not seem to have changed in the interim, 57.

228 Paddock and Kreiner, 54-55.

229 For example, Texas reprogrammed almost $1.6 million to hire a contractor to reduce a backlog of permit renewal applications. Illinois set aside 6 percent of its PPG for pollution prevention and crosscutting initiatives. And, since the funds are more fragmented, several states used PPGs to transfer or realign funds for water programs.

230 There were frequent meetings of NEPPS coordinators in EPA regions and states, but no training of staff in the different media offices.

231 EPA projects that most Superfund sites will complete cleanups by 2005, so unless Congress authorizes aggressive new cleanup programs—perhaps remediation of contaminated sediments or of sites that are less contaminated that Superfund sites—it is possible that regional offices may need less staff for cleanups. Since the Superfund program pays for a large share of overhead activities—administration, general management—a cutback in Superfund staff could shrink the regions substantially.

232 Transcript of remarks by John DeVillars to the Quinnipiac River Symposium at Yale University, November 23, 1998, quoted in Perras, 5.

233 Superfund staff remained in a separate office.

234 Quoted in Perras, 16.

235 *Ibid.*

236 James R. Gomes and Douglas I. Foy, Letter to the Editor, *Boston Globe*, November 17, 1999. Quoted in Perras, 63.

237 Robert Nakamura and Thomas Church, "Reinventing Superfund: An Assessment of EPA's Administrative Reforms, "2000.

238 The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).

239 U.S. EPA, *Unfinished Business*, 1986.

240 Nakamura and Church, 2000, 17.

241 EPA maintains a list of almost 42,000 sites on its Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS). It had archived more than 31,000 as of FY 98 and had sent 300 comfort letters and written 90 prospective purchaser agreements as of FY 00 and FY 98, respectively. The 1200 sites on the National Priority List are more polluted than those other sites. Nakamura and Church, 2000, 28-29.

242 *Ibid.*, 30.

243 In addition, the rate of completing cleanups jumped by more than 35 per cent between FYs 93 through 96 and FY 97-98. Few new sites were added to the NPL. If one accepts the GAO estimate that somewhat more than 230 sites are likely to be added to the NPL eventually, the portion of sites completed or under construction drops from 90 per cent to 70 per cent. Nakamura and Church, 2000, 45.

244 *Ibid.*, 25

245 Robert Nakamura and Thomas Church, *Cleaning up the Mess*, 1993.

246 Nakamura and Church, 2000, 48.

247 Jeanne Herb, "Toward Integrated Approaches to Compliance Assurance," 2000.

248 EPA handout, "The Office of Environmental Information", n.d.

249 EPA's Office of Information Resources Management, the predecessor to OEI, reported that after adjustments to reflect shifts in responsibilities from one office to another, its staff had been cut by 11.1 percent between FY 92 and FY 99, while EPA's total staff had increased by 9.9 percent during that period. The OIRM budget, adjusted, had fallen from $19.1 million to $13.3 million (30 percent). EPA Office of Information Resources and Management, *Charting a New Course*, June 1999, 13-14.

250 EPA Office of Environmental Information, *Standard Update*, Vol. 2, No. 1, Spring 2000. Available at http:/ / www.epa.gov.edr/ .

251 EPA Office of Environmental Information, *Standard Update*, Vol. 2, No. 1, Spring 2000. Available at http:/ / www.epa.gov.edr/ .

252 National Academy of Public Administration, *Setting Priorities, Getting Results, op. cit,* 127-131.

253 Before 1997, planning and budgeting were in different offices and did not work together closely. The Academy recommended that EPA bring both functions into the same office. EPA has taken that step, but has welded the two functions together too rigidly.

254 For example, The State of Massachusetts started a self-certification program; a group of business leaders set in motion the ISO 14001 standard; Environmental Defense and a group of farm districts in California made a cap-and-trade system work for selenium; managers within the U.S. Bureau of Reclamation promoted the idea of soliciting bids for salinity-reduction projects; Michigan and states in the Upper Midwest initiated plans for trading nutrient runoff and created the Great Lakes Trading Network; EPA helped state agency employees and others create networks of practitioners in indicator

development, environmental management systems, and watershed management; and Congress established the Government Performance and Results Act and authorized states to consolidate and redirect EPA's categorical grants for higher priority or cross-media work. Market forces, shaped by information, consumer demand, and government actions—taxes, regulations, spending—have generated some of the new technologies that will lead to a healthier environment.

255 National Academy of Public Administration, *Setting Priorities, Getting Results*, 6.