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## Management-Based Strategies

### An Emerging Approach to Environmental Protection

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For decades, policymakers in the United States have required firms either to install specific pollution-control technologies or to ensure that emissions from their smoke stacks or drain pipes stay within specific limits. This two-pronged approach of environmental technology requirements and emissions limits has succeeded in reducing certain types of environmental problems. Yet this approach, which forms the backbone of the nation's environmental protection system, has for the most part ignored what goes on inside the firms and facilities that actually generate pollution. As long as companies deployed the appropriate technologies or met the specified emissions targets, how they managed their facilities and what systems they used to monitor their environmental performance mattered to no one other than the company managers themselves, and perhaps their corporate boards and shareholders. Policymakers and others interested in environmental protection treated the firm itself as a black box (Salzman and Thompson 2003, 182).

The tendency to ignore what goes on inside the firm is beginning to change. As environmental problems persist, even after decades of conventional regulation, policymakers, trade associations, and nongovernmental organizations are searching for alternative solutions. Among the most innovative alternatives are strategies that focus directly on how companies manage their internal operations. Previously overlooked in the literature on environmental protection, these management-based strategies are distinctive in that they seek to penetrate and shape what goes on inside private sector firms. What had previously been treated as a black box—the firm itself and its internal management—is now being exposed as a direct and explicit target of government regulators and others who seek to induce firms to improve their environmental performance.

For example, even though the extensive amendments Congress made to the Clean Air Act in 1990 contained numerous conventional regulatory provisions, they also included a new regulatory program that targeted the internal management of large chemical facilities in an attempt to reduce the risk of catastrophic accidents. During the 1980s, U.S. chemical facilities had experienced over a dozen accidents that could have potentially resulted in disastrous outcomes like those in Bhopal, India, in 1984, where thousands of people died (*Congressional Record* 1989). In response, members of Congress sought to improve what they perceived as a critical variable contributing to these accidents—internal management. Under Section 112(r) of the revised Act, chemical facilities managers must now undertake a three-step management process. They must (1) inventory the amounts and types of hazardous chemicals used, (2) develop scenarios about potential catastrophic accidents, and (3) write and implement an accident prevention plan.<sup>1</sup>

Government policymakers have not been the only ones to target firms' internal management in an attempt to improve private sector environmental performance. Around the same time that Congress deliberated over amending the Clean Air Act, representatives of the Chemical Manufacturers Association, a major industry trade association, met across the Potomac River in Northern Virginia to develop their own private sector solution to the problem of chemical accidents (Lodge and Rayport 1991).<sup>2</sup> The result of their efforts, known as the Responsible Care initiative, has much in common with what Congress eventually mandated in Section 112(r) of the Clean Air Act. Responsible Care requires all trade association members to identify those aspects of their operations that could cause chemical accidents and to work with employees and members of local communities to develop and implement accident-prevention plans. Responsible Care does not require the adoption of any particular accident-prevention technologies, nor does it specify a level of performance that chemical facilities must meet. Instead, this trade association program requires that managers of chemical facilities assess potential accident risks, develop a written emergency response plan, establish a training program for employees, and institute a strategy for communicating risks and plans to the surrounding community (American Chemistry Council 2004).

Both Section 112(r) of the Clean Air Act and the chemical industry's Responsible Care initiative focus directly on changing the internal management of firms. They are both examples of what we call *management-based strategies*. Similar to the planning requirements that the National Environmental Policy Act many years ago imposed on government agencies,<sup>3</sup> management-based strategies are increasingly being used to require or encourage private businesses to adopt specific planning or other management practices aimed at achieving broader social objectives.

Despite growing interest in and use of management-based strategies by policymakers and business leaders in the United States as well as elsewhere in the

world, research and policy analysis has tended to lag behind. To be sure, some important work has focused on selected examples of management-based strategies in a variety of policy contexts (Bardach and Kagan 1982; Braithwaite 1982; Rees 1988; Orts 1995; Gunningham 1996; Parker 2002; Coglianese and Lazer 2003). Yet surprisingly little effort has been made to synthesize the results from the relatively few empirical studies that have been done, or even to characterize management-based strategies as a distinct policy approach deserving of its own serious analysis and consideration. The collection of empirical and theoretical analyses contained in this book therefore brings much-needed focus and attention to management-based strategies. It does so not only by chronicling the emergence of management-based strategies and showing the variation such strategies can take, but by explicitly considering what these strategies can—and cannot—achieve in terms of protecting the environment from the negative effects of business activity.

## **Management-Based Strategies: A New Approach**

Traditional environmental regulation has gone far toward addressing a wide range of environmental problems in the United States (Bok 1996; Davies and Mazurek 1998; Portney and Stavins 2000). Since the 1970s, overall levels of air quality have improved steadily even while economic activity and vehicle miles traveled have increased dramatically (U.S. EPA 2003a).<sup>4</sup> The number of polluted rivers, streams, and lakes has declined, and swimming, fishing, and boating are now possible in waters that once functioned essentially as open sewers (U.S. EPA 2003a). Abandoned hazardous waste sites have been cleaned up and contaminated land has been restored to productive use (U.S. EPA 2003a).<sup>5</sup> Due in part to traditional environmental regulation, many large and obvious environmental problems have been greatly reduced, if not eliminated altogether (Coglianese 2001a).

Notwithstanding the overall improvement in various environmental conditions in the United States, many pressing and complex environmental problems remain, and new problems loom. Air pollution from motor vehicles, electric power plants, and other sources continues to raise concern about unhealthy air quality in metropolitan areas, degradation of the protective ozone layer, and global climate change. Many lakes and rivers remain polluted, especially from runoff of excess pesticides from agricultural land and toxic contaminants from other diffuse, non-point sources. Rapid development and expanding urbanization threaten biodiversity and ecosystem resilience. The acknowledged sources of environmental degradation have expanded beyond large industrial operations to include retail establishments, universities, hospitals, farms, and even office buildings where government and other service professionals work.

To respond both to lingering and emerging environmental challenges,

management-based strategies appear to have an important role to play in the future of environmental protection (Elliott 1997). Because they focus on what goes on inside organizations, management-based strategies can be adapted to a variety of circumstances and appear well suited to the particular challenges characteristic of many of today's remaining environmental problems.

Many of the most intractable environmental problems have diffuse origins. Often there is no smokestack or discharge pipe where a pollution control device can be mandated or installed (Kettl 2002). Furthermore, some of the most significant remaining sources of pollution today are more heterogeneous than the sources of the past, compounding the information burden on government if it is to rely on conventional regulatory tools. In addition, some of today's most serious environmental problems grow out of complex organizational and technological interactions that can be directly affected by management (Perrow 1984).

Management-based strategies are appealing because they can give firms the flexibility to develop their own solutions and plans, a considerable advantage given the complex, heterogeneous causes of various environmental problems. Unlike technology-based standards that can be directed at the problems of entire industry sectors, management-based strategies are adaptable to a wide variety of individual settings, regardless of the size, age, or operational type of facilities. Management-based strategies can leverage the informational advantage of managers within business organizations, enlisting them to identify ways to solve the specific problems created by their facilities' operations (Coglianese and Lazer 2003).

Consider the environmental problems created by the nation's vast network of university and industry research laboratories. These laboratories generate diverse chemical wastes left over from the many different experiments run by faculty and student researchers, and they pose an array of risks of spills and accidents. Crafting technology- or performance-based standards to address pollution from a vast and diverse network of laboratories would require an enormous amount of fine-grained—and ever-changing—information. It may be far better to have those who operate these facilities develop management systems that address the unique hazards created by their operations (U.S. EPA 2002).

Policymakers and business leaders increasingly recognize that what goes on inside the black box of the organization is of critical importance for overall environmental quality. The size of a regulated entity's environmental footprint is neither necessarily nor completely determined by the raw materials it uses or the products or services it produces. An organization's impact on the environment is also based on the actions of its managers: the information they collect and share, the goals they develop and articulate, the types of issues to which they give attention, the reporting structures they establish, the kind of professionals they include in key meetings, the aspects of performance they monitor, and the way they factor environmental performance into employee rewards and penalties.

## Management-Based Strategies and the Policy Toolbox

Given the challenging nature of contemporary environmental problems, it is not surprising that government policymakers are taking increasing interest in management-based strategies. In addition to the examples already mentioned and discussed elsewhere in this book, anyone who reviews the *Federal Register* carefully will find a variety of other ways that environmental regulators are working to affect the management of organizations. For example, to reduce contaminated runoff from farms where large numbers of animals are concentrated, the U.S. Environmental Protection Agency (EPA) requires that farm operators develop nutrient management plans that detail how manure will be stored, transported, and used so as to protect clean water sources (U.S. EPA 2003b). A recent EPA proposal to reduce the foul odors and other impacts associated with sewage sludge would encourage municipalities to implement environmental management systems and use third parties to audit their management practices (U.S. EPA 2003c).

The emergence of these and other similar proposals should lead scholars and policy analysts to consider what role management-based strategies should play in the overall environmental policy toolbox. Yet, at least until now, management-based strategies have received remarkably scant consideration in the environmental policy literature. The question of what regulatory instrument to use is usually posed as a choice between technology- and performance-based standards (Breyer 1982; Viscusi 1983). Technology standards, also sometimes called “design” or “specification” standards (Bohm and Russell 1985; U.S. Congress 1995), specify a particular *means* that firms must use to control pollution. Performance standards, also sometimes called “harm-based standards” (U.S. Congress 1995), specify a particular *end* that firms must achieve in their environmental programs (Project on Alternative Regulatory Approaches 1981; Coglianesi et al. 2003). Together, technology and performance standards constitute most of traditional environmental regulation, and they have generated considerable discussion within the legal and policy literature (U.S. EPA 1990; Callan and Thomas 1996; Blackman and Harrington 1998; Driesen 1998; Wagner 2000; Morag-Levine 2003).

Market-based environmental policy instruments also play an important role in the policymaker’s toolbox and have received substantial attention in the scholarly literature (Ackerman and Stewart 1985; Hahn and Hester 1989; Stavins 1998, 2003). Market-based instruments establish explicit or implicit prices on environmental pollution (Blackman and Harrington 1998). They attempt to structure incentives so that private sector managers internalize the costs of their environmental impacts in more socially optimal ways. Examples of market-based instruments include emissions fees that require firms to pay when they emit pollution (Dales 1968; Rose-Ackerman 1973; Majone 1976; DOE 1989; Hahn 1989; U.S. EPA 1990; U.S. Congress 1995), input taxes that

charge firms for the volume of materials or chemicals they use in their production (Stahr 1971; Baumol and Oates 1979; Hahn 1989; Blackman and Harrington 1998), and marketable permits that allow firms to trade or sell emissions credits with others (Bohm and Russell 1985; Hahn 1989; U.S. EPA 1990; Stavins 1991; Hahn and Stavins 1992; Schmalensee et al. 1998; Ellerman et al. 2000; Stavins 2003).

In addition to traditional and market-based regulation, a few other tools in the environmental policy toolkit have received attention in the legal and policy literature. These include the direct expenditure of government dollars to achieve policy goals (Stahr 1971), such as government spending to construct water treatment plants (Blackman and Harrington 1998) or to preserve or restore endangered ecosystems (Bohm and Russel 1985). Information disclosure programs—such as the Toxics Release Inventory (TRI)—have also received considerable discussion in the literature (Hamilton 1995; Kleindorfer and Orts 1998; Sunstein 1999; Karkkainen 2001; Graham 2002; Hamilton 2005; Fung et al. 2006). Finally, as federal and state governments have launched dozens of voluntary environmental programs to encourage energy-efficient lighting, promote waste reduction, and foster water conservation, among other goals, a substantial literature has developed around the establishment of these voluntary programs (Arora and Cason 1996; Mazurek 1998; Delmas and Terlaak 2001; Khanna 2001; Prakash 2001; Potoski and Prakash 2002; de Bruijn and Norberg-Bohm 2005).

Although all policy instruments or strategies can have an impact on the internal management of firms, any such effects are only indirect. For example, when Congress in 1986 required firms to report publicly their releases of toxic substances, the main purpose of this requirement was to inform employees and the public, and then at best indirectly to catalyze external forces to bring pressure on firms' internal management to reduce toxic emissions (Karkannien 2001). After the release of the first required reports, some private sector managers were shocked to learn that their company's releases put them at or near the top of EPA's list of polluters. In these managers' firms, information disclosure triggered intense management attention, goal-setting, training, information collection, and monitoring (Graham 2000). Yet this was only a side effect of the TRI law, albeit a positive one; it was not the law's main purpose. In fact, none of the instruments discussed in the general environmental policy literature aim *directly* at influencing specific *management* practices.<sup>6</sup>

The closest parallel to management-based strategies can be found in the so-called reflexive environmental policies discussed in the legal literature (Teubner et al. 1994; Orts 1995; Fiorino 1999).<sup>7</sup> Rather than impose direct controls on behavior, reflexive strategies enlist "intermediary institutions" (Orts 1995, 1264) such as companies, trade associations, and standards organizations "to encourage thinking and behavior in the right direction" (Orts 1995, 1264; see also Ayres and Braithwaite 1992). Reflexive law recognizes that the complexity of

environmental problems limits the ability of regulators to design and implement effective policies. Government therefore should foster conditions that encourage managers of regulated entities to identify and pursue environmental improvement opportunities.

The idea of reflexive law originated in Europe, and its most prominent application is the European Eco-Management and Audit Scheme (EMAS). EMAS is a voluntary standard established by the European Union to recognize facilities that comply with environmental laws, implement environmental management systems, and publish independently verified reports on their environmental performance (European Commission 2005). EMAS encourages managers to adopt a critical approach to their environmental conduct through environmental management planning, review, and disclosure (Orts 1995).

In our view, EMAS is also an excellent example of a management-based strategy, since it aims directly to shape firms' environmental management. We believe such management-based strategies merit their own place in the U.S. policy lexicon as they may prove to be, at least in certain important cases, valuable tools for environmental protection. Yet management-based strategies themselves can take different forms and can be deployed by different kinds of institutions. To analyze their role in the policy toolkit, it is helpful to consider four major types of management-based strategies.

## Types of Management-Based Strategies

Both *governmental* and *nongovernmental* institutions can deploy management-based strategies. These strategies can also either *mandate* management practices or simply *encourage* them. Consider the following four examples of management-based strategies in use today.

### *Massachusetts' Toxic Use Reduction Act*

Since 1989, the Commonwealth of Massachusetts has addressed the risks from toxic chemicals with a management-based regulation known as the Toxics Use Reduction Act. The origins of this law can be traced to a cluster of childhood leukemia cases found in Woburn, Massachusetts, that emerged during the early 1980s and that many residents attributed to toxic contamination. The ensuing public concern about environmental degradation, and hazardous wastes in particular, bolstered environmental activists in the state, including the Massachusetts Public Interest Research Group (MassPIRG). By the late 1980s, it appeared likely that MassPIRG would use its clout to gain passage of a law banning or phasing out a broad range of toxic chemicals.

To stave off the imposition of chemical bans, industry entered into negotiations with MassPIRG. These negotiations resulted in the unanimous approval

by the legislature of a management-based regulation requiring firms to analyze the use and flow of toxic chemicals throughout their facilities, develop plans to reduce their use of these chemicals, and submit reports of their planning to the state. Adopted in 1989, the Toxics Use Reduction Act (TURA) also requires a state-authorized pollution-prevention planner to certify that each plan has met the criteria in TURA for a rigorous toxics use reduction plan. TURA does not, however, require firms to comply with their own internal plans, nor does it require them to meet any individual performance targets. The law simply asks managers to study their use of toxic chemicals and engage in a planning process designed to identify possible strategies for pollution prevention. Today, 14 states have laws similar to TURA that encourage the prevention of toxic pollution through required management efforts.

### ***Ford Motor Company's ISO 14001 Supplier Requirement***

Major corporations seeking to improve the environmental performance of their operations face enormous challenges in overseeing diverse and geographically disparate manufacturing facilities. Before the mid-1990s, Ford Motor Company, like many large manufacturing organizations, functioned as a loose federation of facilities that operated mostly independently. By the late 1990s, however, Ford had become a global organization with all of its national facilities operating under a single umbrella. Coordinating the environmental performance of all of these plants represented a major challenge, as the Ford organization included 140 manufacturing sites operating under the regulatory regimes in 26 countries (O'Brien 2001).

Rather than attempt to establish a uniform set of pollution control technologies or environmental performance standards at all plants, Ford's corporate headquarters chose a new approach that had been gaining acceptance, particularly in Europe and Asia. Ford decided to impose a uniform set of environmental management practices at all of its plants. By focusing on management, Ford was able to establish a common, disciplined approach to environmental protection while respecting local differences that might call for different control technologies or performance standards.

In 1999, Ford's corporate offices decided to take its mandate for disciplined environmental management one step further. Beginning in 2003, its "first-tier" suppliers of tires, seats, pedals, wiring, spark plugs, switches, mufflers, and many other parts used in Ford vehicles would need to adopt the same environmental management practices Ford required of its own plants. Ford did not require these suppliers to use particular environmental control technologies or achieve a particular level of environmental performance. Instead, it required them to adopt management practices that met the criteria set forth in ISO 14001, an international environmental management system standard (Ford Motor Company 1999; Wilson 2001).



Other major companies have taken similar steps to improve the environmental management of their facilities and suppliers. For example, on the same day that Ford announced it was imposing environmental management requirements on its suppliers, General Motors Corporation issued a similar requirement for standardized environmental management for its first-tier suppliers (General Motors Corporation 1999).<sup>8</sup>

### ***Federal and State Performance Track Programs***

As with major corporations, federal, state, and local governments in the United States also face a challenge in trying to see that the thousands of industrial facilities in their jurisdictions reduce their impact on the environment. For decades, the strategies governments used were regulatory, but in recent years many state and federal agencies have initiated programs offering recognition and other incentives in an attempt to encourage firms to achieve voluntary environmental improvements. Perhaps the best example of such a program is the National Environmental Performance Track, initiated by EPA in 2000. Facilities that participate in Performance Track have their names posted on EPA's Web site, are invited to meetings with high-ranking EPA officials, and receive exemptions from routine agency inspections and certain regulatory requirements.

To qualify for entry into Performance Track, a facility must comply with all environmental laws and demonstrate a record of environmental accomplishments that go beyond what the law requires. The facility must show that it has an environmental management system in place and that this system has been verified by an independent third party. It must also show that it is open to engagement with the community and that it has made a commitment to improve environmental performance in four areas.<sup>9</sup> Although EPA provides guidance to managers about the types of commitments it expects—for example, water or energy conservation—managers may improve at their own pace, in their own ways. The important factor for EPA is that managers commit somehow to reducing their ecological footprint and that they develop a management system for achieving those reductions.

State regulatory agencies, including those in Michigan, Texas, Virginia, and Wisconsin, have adopted programs similar to Performance Track that offer recognition and other incentives to facilities with strong environmental management programs. All of these programs encourage, but do not require, firms to adopt management systems that may help them reduce environmental impacts further than the levels mandated by conventional environmental regulation.

### ***Portland Cement Association's Sustainability Program***

Like large firms and government environmental agencies, trade associations also have an interest in promoting strong environmental performance. A well-

publicized environmental problem at one firm can drag down the reputation of an entire industry and prompt government to adopt further environmental regulation of the industry. Many trade associations have attempted to promote strong environmental performance by establishing codes of practices for their members. Rather than establish performance- or technology-based standards, these codes often tend to focus on members' management activities.

Portland Cement Association's Sustainability Program is a case in point. In 1991, the trade association's board of directors adopted seven principles that call on member companies to promote overall safety and health, manage wastes responsibly, and improve energy efficiency. The trade association did not advocate any specific technologies or performance standards for its members, but rather encouraged members to develop their own performance measures and chart progress toward their achievement (PCA 2004a).

In 2004, the trade association's executive committee went a step further, encouraging members to adopt formal environmental management systems. PCA promoted the benefits of environmental management systems (EMSs) in its publications and offered EMS training. It established a goal of having verifiable EMSs in place at 90 percent of U.S. cement plants by the end of 2020. It pledged to recognize firms that implemented environmental management systems through an awards program. In addition, the trade association now collects information about members' environmental performance and plans to develop benchmarks for energy consumption and other performance measures so that managers can compare their performance with the industry norm (PCA 2004b).

## **A Typology of Management-Based Strategies**

As these examples show, management-based strategies can take a variety of forms and can be adopted by a variety of organizations, including government agencies, private firms, and trade associations. Although each is different, these four examples share a clear focus on management itself. The strategies all directly seek to influence the attention, information, authority, and financial resources of managers toward the achievement of environmental improvements. The strategies do not necessarily require managers to achieve any specific outcomes, but they do allow them the flexibility to choose their own measures to reduce their environmental impacts.

Each of the examples illustrates a different type of management-based strategy. The Massachusetts TURA and similar state laws exemplify management-based regulation. These laws are nondiscretionary imperatives that firms implement specified management practices. Another example of a government-imposed requirement for management-based practices is the risk management planning requirement detailed in Section 112(r) of the federal

Clean Air Act. Firms operating in particular chemical manufacturing and distribution sectors, and which have more than a specified number of employees, are required to undertake the planning and other management practices called for in Section 112(r).

Just as government has required management-based activities under TURA and the federal risk management rule, Ford Motor Company has mandated a set of management practices. Ford requires its suppliers to develop an environmental policy, assess the environmental impacts of their operations, set goals, assign responsibility, train workers, and document progress, as described in ISO 14001. The penalty for failing to adopt an ISO 14001 system is the potential of being dropped from Ford's list of preferred suppliers.<sup>10</sup> Ford's actions to require management activities are not unique. The American Chemistry Council (ACC) (formerly the Chemical Manufacturers Association) has similarly required environmental management practices of its member firms under its Responsible Care program. The ACC now requires that chemical firms implement a "Responsible Care Management System" as a condition for membership in the trade association (ACC 2005). In both the Ford and ACC cases, the management-based regulator is a private organization, not the government. We therefore refer to such private sector requirements as management-based *mandates*, to distinguish them from government-imposed management-based *regulation*.

Mandatory management-based strategies stand in contrast to efforts that simply encourage improved environmental management. EPA's National Environmental Performance Track and similar state programs, such as the Clean Texas Program run by the Texas Natural Resource Conservation Commission, offer incentives to facilities to implement environmental management practices. With these programs, facilities can base their decision of whether to participate on their assessment of the costs and benefits of implementing the management practices government seeks to encourage. We refer to governmental efforts to encourage, but not require, improved environmental management as management-based *incentives*.

The Portland Cement Association's EMS program is also voluntary. Unlike Responsible Care in the chemicals sector, adoption is not a requirement for membership in the cement trade association, even though it is strongly encouraged. The International Organization for Standardization (ISO) is another private organization that exerts some modest pressure on firms to improve environmental management. ISO convenes the process whereby representatives from various countries, private sector firms, and nongovernmental organizations develop and revise environmental management system standards. ISO does not require any firms to comply with its standards, but by bringing parties together to draft management standards it enables and encourages their use (ISO 2005). We refer to such nongovernmental efforts to encourage improvements in environmental management as management-based *pressures*.

	Governmental User	Nongovernmental User
Management Required	<p><i>Management-based regulations</i></p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Risk management planning required under Clean Air Act Section 112(r)</li> <li>• Massachusetts Toxics Use Reduction Act</li> </ul>	<p><i>Management-based mandates</i></p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• American Chemistry Council's Responsible Care Program</li> <li>• Ford Motor Company's requirement that suppliers become certified to ISO 14001</li> </ul>
Management Encouraged	<p><i>Management-based incentives</i></p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• U.S. EPA's National Environmental Performance Track</li> <li>• Texas Natural Resource Conservation Commission's Clean Texas Program</li> </ul>	<p><i>Management-based pressures</i></p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Portland Cement Association's Cement Manufacturing Sustainability Program</li> <li>• International Organization for Standardization's (ISO) 14001 Standard</li> </ul>

FIGURE 1-1. Types of Management-Based Strategies

Figure 1-1 summarizes the major differences in management-based strategies. It distinguishes four strategies—regulations, mandates, incentives, and pressures—based on the type of institution that deploys the strategy and whether the specified management practices are mandated or encouraged.

## Management-Based Strategies and Environmental Management Systems

Management-based strategies are related to another emerging environmental practice: the adoption of environmental management systems (EMSs). During the past two decades, thousands of organizations in the United States, Europe, and Asia have adopted EMSs, and the number keeps growing (Coglianese and Nash 2001; Delmas 2002). What we mean by management-based strategies, however, is both broader than and, in important ways, different from EMSs.

EMSs are the internal rules and organizational structures managers use to routinize behavior in order to satisfy their organization's environmental goals. Although the specific features of these systems vary across organizations, under

almost any EMS managers establish an environmental policy or plan; implement the resulting plan by assigning responsibility, providing resources, and training workers; check progress through systematic auditing; and report results to top managers.<sup>11</sup> EMSs are effectively “regulatory” structures that arise from within organizations (Coglianese and Nash 2001, 1).

Management-based *strategies*, in contrast, are used by those who are *outside* an organization to change the management practices and behaviors of those on the *inside*. A major distinction between management-based strategies and EMSs therefore lies in who is requiring or encouraging the improved environmental management. When managers within individual companies devise EMSs for use in their own facilities, they are changing their own behavior or seeking to change the behavior of those individuals whom they oversee within their organization. When government agencies, major customers, or trade associations encourage or require companies to develop EMSs, they are outsiders deploying a management-based strategy.

In an earlier volume, *Regulating from the Inside*, we called attention to the implications of the growing use of environmental management systems for public policy (Coglianese and Nash 2001). Describing the potential for a “management-based environmental policy,” we examined an array of policy options for promoting the adoption of EMSs. Specifically, we analyzed the potential for government or private sector firms or trade associations to mandate EMS adoption. We also noted that governments might increase the benefits of EMS adoption through public recognition, enforcement forbearance, and regulatory flexibility; or they might lower the costs of EMS adoption through education, technical assistance, subsidies or tax credits, and audit protection (Coglianese 2001b). All are examples of different management-based strategies.

In the years since the publication of *Regulating from the Inside*, federal and state agencies, trade associations, and private firms have, to varying degrees, pursued each of the policies we identified (Coglianese and Nash 2002). In April 2002, the White House Council on Environmental Quality (CEQ) and Office of Management and Budget (OMB) sent a memorandum to all federal agency heads urging them to comply with Executive Order 13148, which mandates that federal agencies implement EMSs by the end of 2005 (CEQ 2002). In April 2003, the ACC revamped its Responsible Care program to require all trade association members to adopt EMSs that include performance metrics and that are certified by external third parties (Yosie 2003). That year the Coalition for Environmentally Responsible Economies (CERES) launched its Facility Reporting Program to gather information about facility-level environmental management (CERES 2005). In April 2004, EPA issued a new Strategy for Determining the Role of Environmental Management Systems in Regulatory Programs that calls for careful experimentation with using EMSs in regulatory programs (U.S. EPA 2004). EPA has also funded projects in nine states, at a cost of more than \$1.5 million, to explore the role of EMSs in permitting and related

issues (U.S. EPA 2005c). Finally, EPA's Sector Strategies Program, working in partnership with trade associations, has developed EMS implementation guides for five sectors: agri-business, metal casting, metal finishing, shipbuilding and repair, and specialty-batch chemicals (U.S. EPA 2005e).

What is the likely impact of these strategies? While management-based strategies differ from EMSs with respect to who initiates the effort to change environmentally detrimental behavior, they do share a common focus on management activities. They are both premised on the belief that improvement in environmental management will lead to improvements in environmental outcomes. Just as many managers have implemented EMSs specifically to improve their firm's environmental performance (Nash et al. 1999; Andrews et al. 2001; Florida and Davison 2001), governments, trade associations, and other organizations that deploy management-based strategies do so in order to generate improvement in environment conditions.

To understand the potential of management-based strategies, then, it helps to consider what we know about how EMSs affect the environmental performance of facilities that use them. If the adoption of EMSs leads to an improvement in firms' environmental performance, then perhaps management-based strategies could be an effective means of improving environmental performance too.

A growing body of case study evidence suggests that in many instances EMSs have had positive effects on environmental outcomes. EPA's EMS Web site includes about a dozen case studies of firms that have improved their environmental performance by implementing an EMS. The achievements firms have realized include, among other things, increased recycling, improved water conservation, reduced releases of toxic chemicals, and reduced consumption of material inputs (U.S. EPA 2005b). For example, an Alcoa subsidiary in South Carolina cut waste generation in half after implementing an EMS (Rondinelli and Vastag 2000). EMS adoption helped a Louisiana Pacific wood products plant find a way to recycle wood chips, reducing waste and saving money (Coglianese and Nash 2001).

Although case studies can show that EMSs might improve environmental performance in some firms, they tell us little about how EMSs will work in general. Generalizing from individual case studies is difficult because these studies do not distinguish between the role of the EMS and the role of other factors that might also contribute to improvements in environmental performance. Louisiana Pacific, for example, introduced its EMS after EPA filed suit against the company for unlawful air releases (Coglianese and Nash 2001). Was the EMS the causal factor leading the company to improve environment outcomes? Or was the government's criminal enforcement action the key cause of both the decision to adopt an EMS and to improve environmental outcomes? In the wake of such an enforcement action, Louisiana Pacific's overall heightened commitment to making environmental improvements, rather than

its EMS, may have been the critical factor in instituting new, environmentally beneficial practices.

In an effort to overcome the limitations of individual case studies, some researchers have conducted large-scale studies of the impacts of EMSs. Some of the studies suggest that EMS adoption has little discernable impact on environmental performance. Automotive assembly plants that implemented EMSs reportedly have had no better environmental performance in terms of toxic releases, criteria air pollutant emissions, RCRA hazardous wastes, and instances of noncompliance with regulations than those that did not (Matthews 2001; Matthews et al. 2004). British facilities that adopted environmental management systems had no fewer accidents or regulatory enforcement actions than similar facilities without EMSs, although they achieved higher levels of procedural performance such as record keeping and worker training (Dahlstrom et al. 2003).

However, increasingly, the weight of the evidence suggests that EMSs are positively correlated with improvements in environmental performance. Managers of manufacturing plants in Pennsylvania that had implemented EMSs reported greater reductions in air pollution, electricity use, and solid waste than their non-EMS peers (Florida and Davison 2001). Managers of Mexican manufacturing firms reported that their environmental performance improved as they completed more steps toward ISO 14001 adoption (Dasgupta et al. 2000). Electronics facilities with EMSs had somewhat lower releases of toxic emissions than comparable plants that had not adopted formal environmental management systems (Russo 2001). In a sample of Fortune 500 firms, EMS adoption correlated with lower toxic emissions per unit of output, particularly in firms with large toxic releases relative to their size (Anton et al. 2004). Among manufacturing facilities in the United States, the adoption of elements of an EMS is associated with relatively greater reductions in releases of toxic chemicals (King et al. 2005). U.S. facilities that have developed EMSs certified to meet the ISO 14001 standard have tended to reduce harmful air emissions to a greater extent than those that have not (Potoski and Prakash 2005a) and they comply more fully with the Clean Air Act (Potoski and Prakash 2005b). European firms with certified EMSs reportedly undertake more environmental initiatives than those without such systems (Johnstone 2001).

## Key Questions about Management-Based Strategies

The accumulated research showing an association between environmental management systems and improved environmental performance strengthens the rationale for analyzing management-based strategies. If EMSs matter, then strategies that aim directly at improving firms' environmental management deserve more systematic attention than they have received to date. How should

such an inquiry into management-based strategies proceed? We believe that to understand the appropriate role for management-based strategies and the conditions under which they are appropriate calls for careful assessment of at least five main questions.

### *The Importance of Management*

The first question focuses on the importance of a firm's management to its environmental performance. As we have just noted, many studies of EMS adoption suggest that firms can improve their environmental performance by making management improvements. Yet improvements are by no means certain for all firms under all conditions (Andrews et al. 2001; Coglianese and Nash 2001; Nash and Ehrenfeld 2001; Speir 2001). Since management-based strategies seek to influence management, they will be appropriate only if and when management itself is an important factor causally related to resource consumption, waste production, and other factors that degrade the environment. To make the most of management-based strategies, the relationship between a firm's environmental performance and its management (independent of regulatory, economic, and social factors) still needs to be better understood (Gunningham et al. 2003).

### *The Impact of Management-Based Strategies*

Assuming that management is a key factor affecting certain environmental outcomes, the second question is whether management-based strategies actually change what managers do. Do management-based strategies—that is, actions taken by outsiders to influence firms' internal management—successfully permeate the black box of the firm and influence organizational structure and decisionmaking in a positive way? Or do managers mostly ignore these strategies or game outsiders with symbolic gestures that lack substantive results? For example, when Ford Motor Company mandated that its suppliers implement ISO 14001, did this requirement actually lead to significant changes in suppliers' practices? Or did suppliers simply go through the motions, establishing management plans that looked good on paper but did not result in genuine change?

### *Strategic Design*

A third question to ask about management-based strategies is whether some strategies are more effective than others. Presumably some do work better than others, at least in certain circumstances. If so, then we need to identify which types of strategies yield the most successful outcomes under which conditions, and we need to understand why. Management-based strategies can vary in the



incentives they offer, the amount of direction they provide, and the oversight mechanisms they deploy. What types of incentives work to motivate improvements in management practices?

Government agencies have already tried a variety of incentives, including public recognition, inspection forbearance, and regulatory flexibility. Participants in these programs have advocated for still greater incentives, such as expedited permitting, streamlined reporting, and green investment ratings to motivate facilities to participate (ECOS 2005). Are these additional incentives necessary?

How much discretion should outsiders give to insiders? For example, some management-based regulations call for firms to do little more than adopt “appropriate” management plans, while others require plans that meet detailed and extensive criteria. Which approach works better?

Similarly, different management-based efforts encourage or require different oversight mechanisms. Many management-based strategies include a requirement that firms engage with external constituencies (ACC 2004; MSWG 2004; U.S. EPA 2005a). Others require the firm to have its management system certified by a third party. Still others require the collection and public disclosure of information (Metzenbaum 2001). How, if at all, do these differences in oversight mechanisms shape firms’ environmental management and their overall performance? By observing the impacts of management-based strategies with different methods of oversight, along with other variations in design, we will be able to learn how to deploy management-based strategies more effectively.

### *Management-Based Strategies and Conventional Regulation*

A fourth question centers on the relationships between management-based strategies and existing environmental regulation. Some research suggests that management-based strategies can help firms come into greater compliance with existing regulations through better planning and auditing (U.S. EPA 2005d). Are management-based strategies merely complements to other strategies, strengthening conventional regulation but not providing a substitute for it? Or do management-based strategies offer a third way of achieving environmental protection that is truly independent? As Andrews, Hutson, and Edwards point out in Chapter 5, management-based strategies may lead companies to reduce environmental impacts not currently addressed by government regulation. On the other hand, the existence of extensive government regulation may well constrain the full impact of management-based strategies, because firms would be compelled to follow the law even if the government-mandated action is less effective than alternative ways of managing and reducing their environmental impacts.

### *Evaluating Management-Based Strategies*

The fifth question focuses on how to define and measure the effectiveness of

management-based strategies. “Management” by itself is probably too broad a concept for evaluative purposes. Progress in assessing the correlation between management and environmental performance requires researchers to define management in concrete terms using observable characteristics. Without such measures, researchers may continue to conflate managers’ commitment or values with their management actions, even though these are likely to be separate factors affecting environmental performance (Coglianese and Nash 2001). If managers’ commitment is what matters most in affecting firms’ environmental performance, then requiring or encouraging them to implement specific management actions may well not lead to expected performance improvements. Researchers evaluating management-based strategies should be mindful of all the different factors affecting firms’ management and develop measures to control for them as much as feasible.

## Road Map of the Book

These five questions about management-based strategies form the foundation for this book as much as they map out an agenda for future research. They are also five crucial questions for public policy because, although management-based approaches seem intuitively appealing, we know relatively little about the conditions under which they work, which designs are most effective, and how these approaches fit within a larger environmental policy toolbox. The only way to answer these questions is by conducting empirical research. Toward that end, we have commissioned leading scholars from a variety of disciplinary backgrounds to examine these questions in the light of prominent examples of management-based strategies being used in the public and private sector today. The research these scholars produced, and which is collected in this book, promises the most comprehensive effort to date to define, explain, and evaluate the role of management-based strategies in environmental protection.

Part I of this book focuses on the question of whether management is the right place to look for improvements in environmental performance. Chapter 2, written by political scientist Robert A. Kagan, explores the complex role that management plays in explaining variation in firms’ environmental performance. Based on findings from a study of pulp and paper mills in the United States, Canada, Australia, and New Zealand, Kagan suggests that “management style” does influence environmental performance, particularly in shaping how organizational decisionmakers interpret regulatory, market, and community signals. His answer to the initial question of whether management matters is therefore decidedly “yes,” even if internal management does not completely determine a firm’s actions with respect to the environment.

In Part II, we consider the role of public and private sector mandates to adopt management-based approaches. In Chapter 3, economist Lori Snyder

Benbear reports results from an empirical evaluation of state laws requiring managers to develop pollution prevention plans. In Chapter 4, economist Paul R. Kleindorfer presents findings from a study of EPA's requirement that chemical plants develop risk management plans. In Chapter 5, political scientist Richard N. L. Andrews and his coauthors share findings from a study of management-based mandates imposed by industrial customers on their suppliers. These researchers suggest that requiring specific management practices can indeed motivate performance, but their work also cautions that such mandates by no means guarantee improvements across the board. And in Chapter 6, Howard Kunreuther, Shelley H. Metzenbaum, and Peter Schmeidler provide an analysis of a different and novel kind of mandate—mandatory insurance—as a potential driver for motivating improved environmental management. They postulate that this approach may have great success in motivating effective environmental management.

In Part III, we examine the effectiveness of nonmandatory management-based incentives and pressures. In Chapter 7, Jason Scott Johnston, a lawyer and economist, reports results from an empirical study of the effectiveness of EPA's Strategic Goals Program, a management-based voluntary program established between EPA and the metal-finishing industry in 1998. In Chapter 8, economists Tapas K. Ray and Kathleen Segerson document the impact of an EPA management-based effort called the Clean Charles Initiative, through which government served as the standard-bearer of an ecosystemwide performance management initiative. In Chapter 9, Andrew A. King, an expert on management and organizational behavior, explores the value of management-based strategies to environmental organizations seeking to promote innovative industrial practices. Together, the research in Part III suggests a less sanguine view of management-based strategies, at least those that lack sufficient incentives behind them. The cases examined here are by no means exhaustive, but they do appear to support the view that such strategies are insufficient substitutes for more compulsory efforts to achieve environmental protection.

The research in this book begins to answer the critical questions about the impact of management-based approaches, the effectiveness of different designs, the relationship between management-based strategies and traditional environmental regulation, and the best ways to evaluate these approaches. Some management-based strategies can yield positive results for environmental protection, especially in inducing firms to make improvements in areas that are difficult for government to regulate or that involve complex interactions between people and industrial processes. Yet the results from management-based strategies will not always be dramatic, particularly when programs are designed to encourage rather than require improved environmental management. Management-based strategies are certainly not appropriate for all problems. In many cases, they will serve best to complement, rather than substitute for, other environmental protection strategies.

While we should have no illusions that management-based strategies will become the mainstay of society's approach to environmental protection, this book shows quite well that they can offer measurable and positive societal benefits. Management-based strategies have made a difference in some cases and represent an important approach that government, the private sector, and non-governmental organizations increasingly use, especially when attempting to address some of the most intractable kinds of environmental problems. Those trying to protect the environment would therefore do well to consider more carefully strategies that seek to leverage private sector management to benefit the overall public welfare.

## Notes

1. For background on the development of the risk management planning rule under the 1990 Clean Air Act Amendments, see Makris (1998).
2. Subsequently, the Chemical Manufacturers Association changed its name to the American Chemistry Council.
3. The National Environmental Policy Act of 1969, 42 U.S. Code Section 4321–4347. See Caldwell (1998), Karkkainen (2002), and Connaughton (2003).
4. However, this is not to say that all of the reported declines in ambient air pollution can properly be attributed to environmental regulation. For a recent program evaluation of the Clean Air Act analyzing the impact of ambient air quality standards, see Greenstone (2004).
5. This is not to say that the nation's hazardous waste laws are without any problems. For in-depth assessments of Superfund, see Revesz and Stewart (1995), Hamilton and Viscusi (1999), and Probst et al. (2001).
6. In a comprehensive article on environmental policy tools, for example, Kenneth Richards (2000) reviewed 15 major studies on instrument choice, none of which included anything like the management-based strategies we address in this book.
7. In addition, several scholars have also called attention to enforced or mandated self-regulation, which also are closely related to management-based regulation (Bardach and Kagan 1982; Ayres and Braithwaite 1992; Hutter 2001).
8. In Chapter 5, Richard N. L. Andrews and co-authors discuss the environmental performance of automotive suppliers subject to automakers' ISO 14001 requirements.
9. Under existing program guidelines, small facilities may commit to improve in two areas instead of four.
10. See Hutson (2004) for a discussion of Ford's enforcement of this requirement.
11. Committees convened under the auspices of the International Organization for Standardization have drafted ISO 14001, an international standard for environmental management systems. Many firms have used this standard as the template for the design and operation of their own EMSs.

## References

- ACC (American Chemistry Council). 2004. *Community Awareness and Emergency Response Code of Management Practices*. RCMS Implementation Guidance Appendices, Appendix F: Responsible Care Codes of Management Practices. Washington, DC: American Chemistry Council.
- . 2005. *Responsible Care: The Chemical Industry's Performance*. <http://www-responsiblecare-us.com/about.asp> (accessed October 11, 2005).
- Ackerman, Bruce, and Richard Stewart. 1985. Reforming Environmental Law. *Stanford Law Review* 37: 1333–65.
- Andrews, Richard N. L., Nicole Darnall, Deborah Rigling Gallagher, Suellen Terrill Keiner, Eric Feldman, Matthew L. Mitchell, Deborah Amaral, and Jessica D. Jacoby. 2001. Environmental Management Systems: History, Theory, and Implementation Research. In *Regulating from the Inside: Can Environmental Management Systems Achieve Policy Goals?*, edited by Cary Coglianese and Jennifer Nash. Washington, DC: Resources for the Future Press, 31–60.
- Anton, Wilma Rose Q., George Deltas, and Madhu Khanna. 2004. Incentives for Environmental Self-Regulation and Implications for Toxic Releases. *Journal of Environmental Economics and Management* 48 (1): 632–54.
- Arora, Seema, and Timothy N. Cason. 1996. Why do Firms Volunteer to Exceed Environmental Regulation? Understanding Participation in EPA's 33/50 Program. *Land Economics* 72 (4): 413–32.
- Ayres, Ian, and John Braithwaite. 1992. *Responsive Regulation: Transcending the Deregulation Debate*. New York: Oxford UP.
- Bardach, Eugene, and Robert Kagan. 1982. *Going by the Book: The Problem of Regulatory Unreasonableness*. Philadelphia: Temple UP.
- Baumol, William J., and Wallace E. Oates. 1979. *Economics, Environmental Policy, and the Quality of Life*. Englewood Cliffs, NJ: Prentice-Hall.
- Blackman, Allen, and Winston Harrington. 1998. Using Alternative Regulatory Instruments to Control Fixed Point Air Pollution in Developing Countries: Lessons from International Experience. Discussion paper 98-21. Washington, DC: Resources for the Future.
- Bohm, Peter, and Clifford S. Russell. 1985. Comparative Analysis of Alternative Policy Instruments. In *Handbook of Natural Resource and Energy Economics*, edited by Allen V. Kneese and James L. Sweeney. New York: North Holland, 395–460.
- Bok, Derek Curtis. 1996. *The State of the Nation: Government and the Quest for a Better Society*. Cambridge, MA: Harvard UP.
- Braithwaite, John. 1982. Enforced Self-Regulation: A New Strategy for Corporate Crime Control. *Michigan Law Review* 80: 1466–507.
- Breyer, Stephen G. 1982. *Regulation and its Reform*. Cambridge, MA: Harvard UP.
- Caldwell, Lynton Keith. 1998. *The National Environmental Policy Act: An Agenda for the Future*. Bloomington: Indiana UP.
- Callan, Scott J., and Janet M. Thomas. 1996. *Environmental Economics and Management: Theory, Policy, and Applications*. Chicago: Irwin.
- CEQ (Council on Environmental Quality). 2002. Memoranda. <http://www.whitehouse.gov/ceq/ems.html> (accessed August 9, 2005).

- CERES (Coalition for Environmentally Responsible Economies). 2005. Facility Reporting Project. <http://www.ceres.org/sustreporting/frp.php> (accessed November 16, 2005).
- Coglianese, Cary. 2001a. Social Movements, Law, and Society: The Institutionalization of the Environmental Movement. *University of Pennsylvania Law Review* 150: 85–118.
- . 2001b. Policies to Promote Systematic Environmental Management. In *Regulating from the Inside: Can Environmental Management Systems Achieve Policy Goals?* edited by Cary Coglianese and Jennifer Nash. Washington, DC: Resources for the Future Press, 181–97.
- Coglianese, Cary, and David Lazer. 2003. Management-Based Regulation: Prescribing Private Management to Achieve Public Goals. *Law and Society Review* 37 (4): 691–730.
- Coglianese, Cary, and Jennifer Nash. 2001. *Regulating from the Inside: Can Environmental Management Systems Achieve Policy Goals?*, Washington, DC: Resources for the Future Press.
- . 2002. Policy Options for Improving Environmental Management. *Environment* 44(9): 13–22.
- Coglianese, Cary, Jennifer Nash, and Todd Olmstead. 2003. Performance-Based Regulation: Prospects and Limitations in Health, Safety, and Environmental Protection. *Administrative Law Review* 55(4): 705–30.
- Congressional Record. 1989. 101st Cong., 1st sess., vol. 135, pt. 75. Introduction of the Air Toxics Control Act of 1989.
- Connaughton, James L. 2003. Modernizing the National Environmental Policy Act: Back to the Future. *New York University Environmental Law Journal* 12(1): 1–17.
- Dahlstrom, Kristina, Chris Howes, Paul Leinster, and Jim Skea. 2003. Environmental Management Systems and Company Performance: Assessing the Case for Extending Risk-Based Regulation. *European Environment* 13: 187–203.
- Dales, John H. 1968. *Pollution, Property and Prices*. Toronto: University of Toronto Press.
- Dasgupta, Susmita, Hemamala Hettige, and David Wheeler. 2000. What Improves Environmental Performance? Evidence from Mexican Industry. *Journal of Environmental Economics and Management* 39(1): 39–66.
- Davies, J. Clarence, and Jan Mazurek. 1998. *Pollution Control in the United States: Evaluating the System*. Washington, DC: Resources for the Future Press.
- de Bruijn, Theo, and Vicki Norberg-Bohm (eds.). 2005. *Industrial Transformation: Environmental Policy Innovation in the United States and Europe*. Cambridge, MA: MIT Press.
- Delmas, Magali A. 2002. The Diffusion of Environmental Management Standards in Europe and in the United States: An Institutional Perspective. *Policy Sciences* 35(1): 1–119.
- Delmas, Magali A., and Ann K. Terlaak. 2001. A Framework for Analyzing Environmental Voluntary Agreements. *California Management Review* 43 (3): 44–66.
- DOE (Department of Energy). 1989. A Compendium of Options for Government Policy to Encourage Private Sector Responses to Potential Climate Changes: Methodological Justification and Generic Policy Instruments. Rep. No. DOE/EH-

0103. Washington, DC: U.S. Department of Energy.
- Driesen, David M. 1998. Is Emissions Trading an Economic Incentive Program?: Replacing the Command and Control/Economic Incentive Dichotomy. *Washington & Lee Law Review* 55(2): 289–350.
- ECOS (Environmental Council of the States). 2005. Survey of State Support for Performance-Based Environmental Programs and Recommendations for Improved Effectiveness. [http://www.epa.gov/performance-track/downloads/ECOS\\_Report\\_Final\\_01-13-05.pdf](http://www.epa.gov/performance-track/downloads/ECOS_Report_Final_01-13-05.pdf) (accessed June 28, 2005).
- Ellerman, A. Denny, Paul L. Joskow, Richard Schmalensee, Juan-Pablo Monterro, and Elizabeth M. Bailey. 2000. *Markets for Clean Air: The U.S. Acid Rain Program*. Cambridge, UK: Cambridge UP.
- Elliott, E. Donald. 1997. Toward Ecological Law and Policy. In *Thinking Ecologically: The Next Generation of Environmental Policy*, edited by Marian R. Chertow and Daniel C. Esty. New Haven: Yale UP, 170–88.
- European Commission. 2005. EMAS – The Eco-Management and Audit Scheme. [http://www.europa.eu.int/comm/environment/emas/about/summary\\_en.htm](http://www.europa.eu.int/comm/environment/emas/about/summary_en.htm) (accessed August 4, 2005).
- Fiorino, Daniel J. 1999. Rethinking Environmental Regulation: Perspectives on Law and Governance. *Harvard Environmental Law Review* 23: 441–69.
- Florida, Richard, and Derek Davison. 2001. Why Do Firms Adopt Advanced Environmental Practices (And Do They Make a Difference?). In *Regulating from the Inside: Can Environmental Management Systems Achieve Policy Goals?*, edited by Cary Coglianese and Jennifer Nash. Washington, DC: Resources for the Future Press, 82–104.
- Ford Motor Company. 1999. Ford Becomes First U.S. Automaker to Require Suppliers to Achieve ISO 14001 Certification. Sept. 21, 1999. Press release.
- Fung, Archon, David Weil, Mary Graham, and Elena Fagota. 2006. The Effectiveness of Regulatory Disclosure Policies. *Journal of Policy Analysis and Management* 25: 155.
- General Motors Corporation. 1999. General Motors Sets New Level of Environmental Performance for Suppliers (Sept. 21). Press release.
- Graham, Mary. 2000. Regulation by Shaming. *Atlantic Monthly* 285(4): 36–40.
- . 2002. *Democracy by Disclosure: The Rise of Technopopulism*. Washington, DC: Brookings Institution Press.
- Greenstone, Michael. 2004. Did the Clean Air Act Cause the Remarkable Decline in Sulfur Dioxide Concentrations? *Journal of Environmental Economics and Management*. 47: 585–611.
- Gunningham, Neil. 1996. From Compliance to Best Practice in OHS: The Role of Specification, Performance, and Systems-Based Standards. *Australian Journal of Labor Law* 9: 221–46
- Gunningham, Neil, Robert A. Kagan, and Dorothy Thornton. 2003. *Shades of Green: Business, Regulation, and the Environment*. Stanford, CA: Stanford University Press.
- Hahn, Robert W. 1989. *A Primer on Environmental Policy Design*. New York: Harwood Academic Publishers.
- Hahn, Robert W., and Gordon L. Hester. 1989. Marketable Permits: Lessons for Theory and Practice. *Ecology Law Quarterly* 16: 361–406.
- Hahn, Robert W., and Robert N. Stavins. 1992. Economic Incentives for

- Environmental Protection: Integrating Theory and Practice. *The American Economic Review*. 82(2): 464–68.
- Hamilton, James T. 1995. Pollution as News: Media and Stock Market Reactions to the Toxics Release Inventory Data. *Journal of Environmental Economics and Management* 28(1): 98–113.
- . 2005. *Regulation through Revelation: The Origin, Politics, and Impacts of the Toxics Release Inventory Program*. Cambridge, UK: Cambridge UP.
- Hamilton, James T., and W. Kip Viscusi. 1999. *Calculating Risks: The Spatial and Political Dimensions of Hazardous Waste Policy*. Cambridge, MA: MIT Press.
- Hutson, Andrew. 2004. Diffusion of Environmental Practices through Value Chain Relationships in the United States and Mexico. Paper presented at the 26th Annual APPAM Research Conference. October 28–30, 2004, Atlanta, GA.
- Hutter, Bridget. 2001. *Regulation and Risk: Occupational Health and Safety on the Railways*. Oxford: Oxford UP.
- ISO (International Organization for Standardization). 2005. Overview of the ISO System. <http://www.iso.org/iso/en/aboutiso/introduction/index.html> (accessed August 9, 2005).
- Johnstone, Nick. 2001. The Firm, the Environment, and Public Policy. Working Party on National Environmental Policy, Organisation for Economic Co-operation and Development. ENV/EPOC/WPNEP(2001)31/Final. Paris: OECD.
- Karkkainen, Bradley C. 2001. Information as Environmental Regulation: TRI and Performance Benchmarking, Precursor to a New Paradigm? *Georgetown Law Journal* 89: 257–370.
- . 2002. Toward a Smarter NEPA: Monitoring and Managing Government's Environmental Performance. *Columbia Law Review* 102 (4): 903–74.
- Kettl, Donald F. 2002. *Environmental Governance: A Report on the Next Generation of Environmental Policy*. Washington, DC: Brookings Institution Press.
- Khanna, Madhu. 2001. Non-Mandatory Approaches to Environmental Protection. *Journal of Economic Surveys* 15(3): 291–324.
- King, Andrew A., Michael J. Lenox, and Ann Terlaak. 2005. The Strategic Use of Decentralized Institutions: Exploring Certification with the ISO 14001 Management Standard. *Academy of Management Journal* 48(6): 1091–106.
- Kleindorfer, Paul R., and Eric Orts. 1998. Informational Regulation of Environmental Risks. *Risk Analysis* 18(2): 155–70.
- Lodge, George C., and Jeffrey F. Rayport. 1991. Responsible Care. Harvard Business School Case #9-391-135. Boston: Harvard Business School.
- Majone, Giandomenico. 1976. Choice among Policy Instruments for Pollution Control. *Policy Analysis* 2: 589–613.
- Makris, Jim. 1998. EPA Perspective on Advances in Process Safety. Transcript of Keynote Address presented at the 1st Annual Symposium of the Mary Kay O'Connor Process Safety Center, "Beyond Regulatory Compliance, Making Safety Second Nature." Mary Kay O'Connor Process Safety Center, Texas A & M University, College Station, Texas. March 1998. <http://psc.tamu.edu/symposium/1998/Papers/Makris.htm> (accessed April 1, 2005).
- Matthews, Deanna Hart. 2001. Assessment and Design of Industrial Environmental



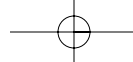
*Management-Based Strategies: An Emerging Approach to Environmental Protection* 27

- Management Systems. PhD dissertation. Pittsburgh, PA: Carnegie-Mellon University.
- Matthews, Deanna Hart, Chris T. Hendrickson, and Lester B. Lave. 2004. Environmental Management Systems: Informing Organizational Decisions. Paper presented at U.S. Environmental Protection Agency Workshop on Corporate Environmental Behavior and the Effectiveness of Government Interventions. April 2004, Washington, DC.
- Mazurek, Janice. 1998. The Use of Voluntary Agreements in the United States: An Initial Survey. Paris: Organization for Economic Cooperation and Development, Environmental Policy Committee. ENV/EPOC/GEEI(98)27/Final. [http://www.oalis.org/olis/1998doc.nsf/c16431e1b3f24c0ac12569fa005d1d99/22ab5fb042b51056c12566d40057e888/\\$FILE/12E89326.DOC](http://www.oalis.org/olis/1998doc.nsf/c16431e1b3f24c0ac12569fa005d1d99/22ab5fb042b51056c12566d40057e888/$FILE/12E89326.DOC) (accessed August 8, 2005).
- Metzenbaum, Shelley H. 2001. Information, Environmental Performance, and Environmental Management Systems. In *Regulating From the Inside: Can Environmental Management Systems Achieve Policy Goals?* edited by Cary Coglianese and Jennifer Nash. Washington, DC: Resources for the Future Press, 146–80.
- Morag-Levine, Noga. 2003. *Chasing the Wind: Regulating Air Pollution in the Common Law State*. Princeton: Princeton UP.
- MSWG (Multi-State Working Group on Environmental Performance). 2004. The External Value Environmental Management System Voluntary Guidance: Gaining Value by Addressing Stakeholder Needs. <http://www.mswg.org/documents/guidance04.pdf> (accessed August 9, 2005).
- Nash, Jennifer, and John R. Ehrenfeld. 2001. Factors that Shape EMS Outcomes in Firms. In *Regulating from the Inside: Can Environmental Management Systems Achieve Policy Goals?* edited by Cary Coglianese and Jennifer Nash. Washington, DC: Resources for the Future Press, 61–81.
- Nash, Jennifer, John Ehrenfeld, Jeffrey MacDonaugh-Dummler, and Pascal Thorens. 1999. ISO 14001 and EPA's Region I's Star Track Program: Assessing their Potential as Tools in Environmental Protection. Washington, DC: National Academy of Public Administration. [http://www.napawash.org/pc\\_economy\\_environment/epafile02.pdf](http://www.napawash.org/pc_economy_environment/epafile02.pdf) (accessed August 8, 2005).
- O'Brien, Tim. 2001. *Ford & ISO 14001: The Synergy between Preserving the Environment and Rewarding Shareholders*. New York: McGraw Hill.
- Orts, Eric. 1995. Reflexive Environmental Law. *Northwestern University Law Review* 89: 1227–340.
- Parker, Christine. 2002. *The Open Corporation: Effective Self-Regulation and Democracy*. Cambridge, UK: Cambridge UP.
- PCA (Portland Cement Association). 2004a. *Cement Manufacturing Sustainability Program*. Washington, DC: Portland Cement Association.
- . 2004b. *Cement Industry Adopts Environmental Management Systems*. Washington, DC: Portland Cement Association.
- Perrow, Charles. 1984. *Normal Accidents: Living with High-Risk Technologies*. New York: Basic Books.
- Portney, Paul R., and Robert N. Stavins (eds.). 2000. *Public Policies for Environmental*

- Protection*, 2nd ed. Washington, DC: Resources for the Future Press.
- Potoski, Matthew, and Aseem Prakash. 2002. Protecting the Environment: Voluntary Regulations in Environmental Governance. *Policy Currents* 11(4): 9–14.
- . 2005a. Covenants with Weak Swords: ISO 14001 and Facilities' Environmental Performance. *Journal of Policy Analysis and Management* 24(4): 745–69.
- . 2005b. Green Clubs and Voluntary Governance: ISO 14001 and Firms' Regulatory Compliance. *American Journal of Political Science* 49(April): 235–48.
- Prakash, Aseem. 2001. Why Do Firms Adopt “Beyond-Compliance” Environmental Policies? *Business Strategy and the Environment* 10: 286–99.
- Probst, Katherine N., and David M. Konisky, with Robert Hersh, Michael B. Batz, and Katherine D. Walker. 2001. *Superfund's Future: What Will It Cost?* Washington, DC: Resources for the Future Press.
- Project on Alternative Regulatory Approaches. 1981. *Performance Standards: A Practical Guide to the Use of Performance Standards as a Regulatory Alternative*. Washington, DC: U.S. Regulatory Council.
- Rees, Joseph V. 1988. *Reforming the Workplace: A Study of Self-Regulation in Occupational Safety*. Philadelphia: University of Pennsylvania Press.
- Revesz, Richard L., and Richard B. Stewart (eds.). 1995. *Analyzing Superfund: Economics, Science and Law*. Washington, DC: Resources for the Future Press.
- Richards, Kenneth R. 2000. Framing Environmental Policy Instrument Choice. *Duke Environmental Law & Policy Forum* 10(2): 221–85.
- Rondinelli, Dennis A., and Gyula Vastag. 2000. Global Corporate Environmental Management Practices at Alcoa. *Corporate Environmental Strategy* 7(1): 288–97.
- Rose-Ackerman, Susan. 1973. Effluent Charges: A Critique. *Canadian Journal of Economics* 6: 512–28.
- Russo, Michael V. 2001. Institutional Changes and Theories of Organizational Strategy: ISO 14001 and Toxic Emissions in the Electronics Industry. Eugene, OR: University of Oregon, Department of Management.
- Salzman, James, and Barton H. Thompson, Jr. 2003. *Environmental Law and Policy: Concepts and Insights*. Westbury, NY: Foundation Press.
- Schmalensee, Richard, Paul R. Joskow, A. Denny Ellerman, Juan Pable Montero, and Elizabeth M. Bailey. 1998. An Interim Evaluation of Sulfur Dioxide Emissions Trading. *Journal of Economic Perspectives* 12(3): 53–68.
- Speir, Jerry. 2001. EMSs and Tiered Regulation: Getting the Deal Right. In *Regulating from the Inside: Can Environmental Management Systems Achieve Policy Goals?* edited by Cary Coglianese and Jennifer Nash. Washington, DC: Resources for the Future Press, 198–221.
- Stahr, Elvis J. 1971. Antipollution Policies, Their Nature and Their Impact on Corporate Profits. In *Economics of Pollution: The Charles C. Moskowitz Lectures*, edited by Kenneth E. Boulding. New York: New York UP, 83–105.
- Stavins, Robert N. 1991. *Project 88—Round II, Incentives for Action: Designing Market-Based Environmental Strategies*. A Public Policy Study sponsored by Senator Timothy E. Wirth, Colorado, and Senator John Heinz, Pennsylvania. Washington, DC, [http://ksghome.harvard.edu/~rstavins/Monographs\\_&\\_Reports/Project\\_88-2.pdf](http://ksghome.harvard.edu/~rstavins/Monographs_&_Reports/Project_88-2.pdf) (accessed March 13, 2006).

*Management-Based Strategies: An Emerging Approach to Environmental Protection* 29

- . 1998. What Can We Learn from the Grand Policy Experiment? Lessons from SO<sub>2</sub> Allowance Trading. *Journal of Economic Perspectives* 12(3): 69–88.
- . 2003. Market-Based Environmental Policies: What Can We Learn from U.S. Experience (and Related Research)? Regulatory Policy Program Working Paper RPP-2003-07. Cambridge, MA: Center for Business and Government, John F. Kennedy School of Government, Harvard University.
- Sunstein, Cass R. 1999. Informational Regulation and Informational Standing: Akins and Beyond. *University of Pennsylvania Law Review* 147: 613–75.
- Teubner, Gunther, Lindsay Farmer, and Declan Murphy. 1994. *Environmental Law and Ecological Responsibility: The Concept and Practice of Ecological Self-Organization*. New York: Wiley.
- U.S. Congress, Office of Technology Assessment. 1995. *Environmental Policy Tools: A User's Guide*. OTA-ENV-634. Washington, DC: U.S. Government Printing Office.
- U.S. EPA. 1990. *Reducing Risk: Setting Priorities and Strategies for Environmental Protection*. U.S. EPA Science Advisory Board, Document No. SAB-EC-90-021. Washington, DC: U.S. EPA.
- . 2002. 40 CFR 262.105. University Laboratories XL Project – Laboratory Environmental Management Standard. Section 262.105, “What must be included in the laboratory environmental management plan?”
- . 2003a. *2003–2008 EPA Strategic Plan: Direction for the Future*. September 20, 2003. Washington, DC: U.S. EPA.
- . 2003b. National Pollutant Discharge Elimination System Permit Regulation and Effluent Limitation Guidelines and Standards for Concentrated Animal Feeding Operations (CAFOs); Final Rule. *Federal Register* 68(29): 7175, February 12.
- . 2003c. Standards for the Use or Disposal of Sewage Sludge; Final Agency Response to the National Research Council Report on Biosolids Applied to Land and the Results of EPA's Review of Existing Sewage Sludge Regulations. *Federal Register* 68(250): 75531, December 31.
- . 2004. EPA's Strategy for Determining the Role of Environmental Management Systems in Regulatory Programs. [http://www.epa.gov/ems/docs/EMS\\_and\\_the\\_Reg\\_Structure\\_41204F.pdf](http://www.epa.gov/ems/docs/EMS_and_the_Reg_Structure_41204F.pdf) (accessed August 8, 2005).
- . 2005a. National Environmental Performance Track. <http://www.epa.gov/performance/track/> (accessed August 8, 2005).
- . 2005b. Environmental Management Systems: Case Studies. <http://www.epa.gov/ems/resources/casestudies/index.htm> (accessed August 8, 2005).
- . 2005c. 2003–2004 State Innovations Grants Competition Results. <http://www.epa.gov/innovation/stategrants/03results.htm> (accessed August 8, 2005).
- . 2005d. Guidance on the Use of EMSs in Settlements as Injunctive Relief or Supplemental Environmental Projects. <http://www.epa.gov/compliance/resources/policies/incentives/ems/emssettlementguidance.pdf> (accessed August 8, 2005).
- . 2005e. EPA Sector Programs—Environmental Management Systems. <http://www.epa.gov/sectors/ems.html> (accessed August 9, 2005).
- Viscusi, W. Kip. 1983. *Risk by Choice: Regulating Health and Safety in the Workplace*. Cambridge, MA: Harvard UP.
- Wagner, Wendy E. 2000. *Innovations in Environmental Policy: The Triumph of*



- Technology-Based Standards. *University of Illinois Law Review* 2000: 83–113.
- Wilson, Robert C. 2001. Ford Spreads the Word about Its EMS Success. *Pollution Engineering* 33(6): 32–3.
- Yosie, Terry F. 2003. Responsible Care Above and Beyond. *Chemistry Business* 31(3): 7.

