

Greener and cleaner? The signaling accuracy of U.S. voluntary environmental programs

NICOLE DARNALL¹ & JOANN CARMIN²

¹*Department of Environmental Science & Policy, George Mason University, 4400 University Dr., MSN 5F2, Fairfax, VA 22030-4400; E-mail: ndarnall@gmu.edu*

²*Department of Urban Studies and Planning, Massachusetts Institute of Technology, 77 Massachusetts Avenue, 9-320, Cambridge, MA 02139; E-mail: jcarmin@mit.edu*

Abstract. Voluntary environmental programs (VEPs) have become a popular alternative to traditional regulation. However, little is known about whether these programs are sending accurate signals about the environmental practices of their participants. As a means for understanding signaling accuracy, this research investigates VEP design characteristics. The findings suggest that there are four distinct types of programs with varying degrees of rigor. Because information for differentiating among program types is limited, less rigorous VEPs can signal that their administrative, environmental performance and conformance requirements are comparable to programs with more robust designs. Further, the lack of monitoring and sanctions in less rigorous programs create opportunities for participants to free-ride and receive benefits without satisfying VEP requirements. Unless some means of distinguishing among program types is implemented, these issues can threaten the long term viability of VEPs as a tool for environmental protection, and the credibility of market mechanisms more broadly.

Introduction

In recent years, traditional command and control approaches to environmental regulation have been criticized for being inefficient. In response, a variety of public policy instruments have been developed as supplements and potential alternatives to traditional regulatory approaches. One such instrument, the voluntary environmental program (VEP), is designed to provide participants with incentives to improve their environmental performance. By the late 1990s, estimates suggested that more than 13,000 companies were participating in VEPs (Mazurek, 2002), and this number has continued to grow. In return for their participation, companies receive a variety of benefits, including the ability to send a “signal” that they are proactive in their environmental management, therefore indicating that they are greener and cleaner than non-participants.

As regulators increasingly rely on voluntary programs, and as more businesses participate, it becomes essential to understand whether VEPs are leading to meaningful changes in environmental performance and whether the signals they send are accurate reflections of their participants’ environmental behavior. Previous VEP research has examined the motivations for companies to participate in these programs (e.g., Videras and Alberini, 2000; Coglianese and Nash, 2001; Arora and Cason, 1995; Darnall et al., 2003), whether participants have improved their environmental performance (e.g., Arora and Cason, 1996; King and Lenox, 2000; Welch et al., 2000; Rivera, 2002; Khanna and Damon, 1999), and the involvement of external stakeholders in VEP design (e.g., Carmin et al., 2003). While several studies have evaluated

program characteristics (Davies et al., 1996; Nash, 2000; Nash and Ehrenfeld, 1997; Mazurek, 2002), to date there has been no systematic attempt to ascertain the requirements of VEPs. Using data from a survey of program managers, this paper evaluates the design characteristics of VEPs operating in the United States (U.S.) and considers whether they are sending accurate signals of their participants' environmental performance.

VEPs as tools for environmental improvement in the United States

Voluntary approaches to environmental management have become increasingly popular in recent years in countries throughout the world. These approaches are defined as public voluntary schemes, negotiated agreements, and unilateral commitments made by polluters to improve environmental performance (Higley et al., 2001; OECD, 2003; Börkey and Glachant, 1997). Public voluntary schemes are developed by government regulators who define the conditions of participation, while unilateral commitments consist of programs designated by firms and their industry associations. By contrast, negotiated agreements are formal contracts between government authorities and industry, and are often developed with the expectation that regulators will not introduce more stringent regulation if firms meet pollution targets within a specified time (OECD, 1999). Although negotiated agreements (or covenants) are prevalent in Europe, they are far less common in the U.S. (Börkey et al., 1998).¹

One type of voluntary approach, the VEP, has become the voluntary management tool of choice in the U.S., with the Environmental Protection Agency (EPA) leading the way in creating and implementing these programs. VEPs consist of programs, codes, agreements, or commitments that encourage private, public, or nonprofit organizations to voluntarily reduce their environmental impacts beyond the requirements established by environmental regulations (Carmin et al., 2003). Promoting the use of VEPs represents a significant shift in EPA's approach to environmental management. In its traditional role, EPA maintains primary responsibility for setting environmental standards and prescribing the ways in which the regulated community must achieve these standards. The agency also requires that regulators have access to inspect companies and their facilities to determine whether they are in compliance with regulations. In some instances EPA wields its regulatory "stick" by imposing penalties (including fines) when companies violate environmental regulations.

Despite the threat of enforcing regulation through penalties, EPA has struggled to satisfy its Congressional mandate of ensuring compliance. The difficulty is due, at least in part, to the limited funding allocated by Congress for regulatory inspections and audits (Davies et al., 1996) and to other reductions in EPA's budget at a time when its mandated responsibilities are increasing (Portney and Stavins, 2000). Both factors have limited EPA's ability to inspect a large number of regulated companies (Davies and Mazurek, 1998). At the same time, critics argue that the regulatory system is inefficient at achieving environmental improvements because efforts are fragmented across media-specific divisions (air, water, waste, toxic laws). Fragmentation of this sort is particularly problematic for many contemporary environmental problems, such as climate change and non-point source pollution, that cut across EPA's departments and span multiple media (Davies and Mazurek, 1998; Mazurek, 2002).

To address these criticisms, EPA began to promote incentive- and information-based instruments as a means for advancing environmental protection. With roots in the Pollution Prevention Control Act of 1990, the Clean Air Act Amendments of 1990, and the Emergency Planning and Community Right-to-Know Act, these approaches are designed to complement traditional regulation. Incentive-based programs include tradable permits and pollution taxes, while information-based programs include EPA's Toxic Release Inventory, which is a database containing information about U.S. facilities' toxic releases to the air, water, and land for more than 650 chemicals. VEPs incorporate aspects of incentive-based programs by providing benefits to participants in return for their commitment to program goals. They also offer information to external parties regarding the environmental performance of participants. Rather than relying exclusively on penalties and fines, EPA is using VEPs as "carrots" by either reducing the threat of penalties or rewarding companies that take steps to reduce their impact on the natural environment.

Though some studies have questioned the ability of VEPs to achieve meaningful environmental improvements (Davies et al., 1996; King and Lenox, 2000), EPA has a number of motivations for developing these programs. For instance, they are being used to investigate and promote innovative environmental policy ideas (Delmas and Terlaak, 2001) such as when regulators want to pilot test policy incentives that have not yet been implemented across the regulated community. Further, EPA is relying on VEPs when political resistance prevents the adoption of more powerful mandatory plans (Lyon, 2003). These programs may reduce political resistance to future regulatory mandates because participants have less incentive to oppose new legislation when they receive government support, such as technical assistance, to implement additional pollution management activities (Lyon, 2003). Finally, VEPs may enable government to allocate fewer resources towards monitoring companies that are ahead of the regulatory curve (Segerson and Miceli, 1998).

Industry groups also are creating VEPs. In some cases, such as the Sustainable Forestry Initiative and Responsible Care, industry sponsored VEPs are financed and implemented by trade associations. These programs address critical environmental issues that are common to all firms within their industries and seek to promote consistency among environmental practices (Nash, 2000). Trade association VEPs may also help to reduce public scrutiny of the participating industry and increase credibility for their environmental practices (King and Lenox, 2000). Other industry sponsored initiatives, such as the Business Charter for Sustainable Development, are developed by business associations that seek to address environmental concerns that are common across multiple business sectors. These cross-sector VEPs tend to be structured with more general requirements so that they are applicable to a variety of production and service companies. Some industry programs have advocated that since their VEPs may achieve or exceed environmental protection objectives, they should preempt future regulation (Maxwell and Decker, 1998; Maxwell et al., 2000), or in some cases, become a replacement for existing regulations (Welch et al., 2000).

Non-governmental organizations, other than industry trade associations, have developed a variety of VEPs such as ISO 14001, the natural step and the recycled paper coalition. There are three types of third-party sponsors: standard-setting bodies, advisory groups, and environmental advocacy organizations (Carmin et al., 2003).

Although prior research has recognized that non-governmental organizations sponsor their own programs (ten Brink, 2002) and that these groups also might participate in designing VEPs sponsored by government or industry (OECD, 1999, 2003), many existing taxonomies do not include third-party sponsored programs as part of their schema (e.g., Higley et al., 2001; Börkey and Glachant, 1997). While fewer in number, the increasingly important role of third-party sponsored programs within the business community suggests that this sponsorship category can no longer be ignored.

VEPs offer participants a variety of benefits. Government sponsored programs improve relations with regulators, increase access to government-funded technical assistance (Darnall et al., 2003), and in a few cases, offer waivers of environmental regulations and reduced regulatory oversight (Darnall et al., 2003). Government, industry and third-party VEPs alike, provide companies with positive publicity that helps to differentiate participants' products and services (Darnall et al., 2003). Such publicity makes it possible for some participants to increase consumer sales and charge premium prices (Rivera, 2002). Just as VEPs can assist companies that market their products directly to consumers, participation in these programs can also benefit companies that sell to corporate buyers (Darnall et al., 2001). For example, Ford Motor Company and General Motors have mandated that their suppliers become certified to ISO 14001, the global standard for environmental management systems. By certifying to ISO 14001, suppliers are able to maintain clients as well as increase access to a wide range of product buyers.

VEPs as environmental signals

The market benefits that companies receive from VEP participation are derived largely from the information that is generated and disseminated about their participation. This information comes in the form of a signal, in that VEP participation communicates to individual consumers, investors, corporate buyers and regulators that a company is acting to reduce its harm to the natural environment. The idea of market signals is not new. Product prices have long been regarded as signaling devices that provide information to consumers about a company's manufacturing costs and product quality. Higher priced products are often associated with more complex (and costly) production processes and higher quality production inputs (Akerlof, 1970). While price is not always a valid signal, it is one form of information that is readily available to consumers. Product guarantees and warranties also send signals about product quality, as does a corporation's reputation, often in the form of branding (Barney and Ouchi, 1986). Similar to prices and branding, environmental signals can provide information to external parties about a firm's otherwise ambiguous environmental activities and policies, thus reducing information asymmetries.

Information asymmetries occur when information about a firm and its performance are unavailable to external parties. When information asymmetries are present, product prices, which are a function of production costs, efficiency and product quality, are pooled within common markets (Akerlof, 1970). In such cases, prices are no longer accurate market signals and instead reflect *average* costs, efficiencies, and qualities of all enterprises operating within the common pool market (Akerlof, 1970). Because purchasers cannot make rational buying decisions, market failures arise (Alchian and

Demsetz, 1972). Similarly, in the absence of accurate information, environmentally proactive companies are unable to differentiate themselves from other firms. In these situations, the environmental performance of companies is “pooled” together. Because there is no readily available means to determine which firms are cleaner than others, market actors, regulators and other external stakeholders who want to identify proactive firms may find it difficult to do so.

To remedy environmental information asymmetries, some companies are relying on VEPs to inform consumers, investors, corporate buyers and regulators about their environmental activities. By participating in VEPs, companies may develop an environmentally conscious reputation that invites patronage from consumers and generates opportunities for business with other organizations that value these principles. Such a reputation can be a powerful tool in shaping the judgments of purchasers, regulators and the public (Kreps, 1990). Over time, a green reputation may become associated with a company’s brand name. These factors may also influence consumers’ purchasing decisions. Further, a company’s environmental signals may affect its shareholder value (Barney and Ouchi, 1986; Khanna et al., 1998; Konar and Cohen, 1997).

While market actors, regulators and other stakeholders are using VEPs as a means for assessing latent environmental management behaviors, participation in a VEP does not guarantee that a company is environmentally proactive. In some instances, VEPs have weak program designs. For instance, some do not require monitoring (King and Lenox, 2000; Davies et al., 1996; Arora and Cason, 1996), while others do not specify environmental performance standards. The lack of monitoring and performance standards creates opportunities for free-riding among participants. Weak program designs such as these enable participants to send a “green signal” and to receive benefits without changing their environmental behavior or meeting program goals.

For VEP participation to be an accurate and informative signal, individual consumers, investors, corporate buyers and regulators alike must be able to trust that member companies are proactively managing their environmental impacts. Drawing on the concept of market failure, instances where VEPs send inaccurate signals can be regarded as “VEP failure.” Failures of this sort can occur at two different levels. The first type of VEP failure is at the level of the individual program and arises when a weak VEP structure allows participants to reap program benefits without satisfying program requirements. In such instances, participants are able to free-ride and inaccurately signal that they are managing their environmental impacts to a greater extent than non-participants. The second type of VEP failure occurs across all programs. These failures arise when publicly available information about the requirements of different VEPs is lacking and external parties cannot differentiate between programs. All programs are therefore regarded as equivalent. Both types of failures threaten the long term credibility of VEPs as a tool for environmental protection and as market mechanisms.

As the variety and number of VEPs grows, and as markets and other stakeholders increasingly rely on these programs as a means for gauging environmental performance, it is essential to understand their signaling accuracy. Additionally, as more and more resources are dedicated to VEP development and implementation, it is imperative to understand their characteristics, their contributions to environmental protection,

and whether VEPs accurately signal information about participants' environmental performance. There are two critical program design and signaling issues that warrant investigation. First, it is pertinent to ascertain whether government, industry and independent third-parties design their VEPs differently, because prior research at the international level has indicated that sponsorship has an important role in how VEPs are designed (Higley et al., 2001; OECD, 1999, 2003; Börkey and Glachant, 1997). Second, it is important to assess the extent that VEPs are sending accurate signals about their program requirements and the environmental performance of their participants. While these two points may seem distinct, sponsorship and signaling are interrelated. If significant variation in program requirements exists among VEP sponsors, then any evaluation of signaling accuracy must control for VEP sponsorship. However, if variations are not present, the signaling accuracy of VEPs can be evaluated in the aggregate.

Sample and research methods

To assess variations in program requirements by VEP sponsor, we conducted an on-line survey of VEP program managers. We identified VEPs by searching the Internet using key words and by reviewing government reports, trade publications, and scholarly literature. Our search resulted in the identification of more than 200 domestic programs or foreign initiatives that operated in the U.S. as of or prior to 2002. As previously noted, we defined a VEP as any program, code, agreement or commitment that encourages companies to voluntarily reduce their environmental impacts *beyond* that required by the environmental regulatory system (Carmin et al., 2003). Our operational definition included programs that encouraged participants to reduce non-regulated impacts, as well as programs that encouraged participants to reduce their regulated pollutants beyond mandated regulatory thresholds. We restricted our study to programs that met our operational definition of a VEP, that were administered regionally or nationally (as opposed to local or state-level programs), and that targeted companies or facilities as participants.

A total of 98 VEPs met our definition and were therefore retained in the study. The managers of these programs were contacted by e-mail and asked to complete our Internet-based survey. In the few instances where programs were discontinued, we contacted a manager of the original program. Prior to its dissemination, the survey was pilot tested by managers of state-level VEPs and then modified based on their suggestions. The revised survey contained 29 close-ended questions and one open-ended question. The relevant close-ended questions asked about different features that VEPs required of their participants and elicited discrete responses of either "Yes" or "No".

Program managers were assured that their individual responses would be kept confidential and used only in aggregated empirical analyses. We sent non-respondents up to four e-mail messages at two-week intervals. A total of 61 program managers (58%) responded to the survey (see Appendix). From the onset of this study, we believed that non-respondents would consist of program managers administering VEPs with weaker designs. We further believed that program managers would want to describe their VEPs as being more rigorous than they actually were. While the results indicate

that the program managers were not reluctant to discuss the negative attributes of their VEPs, these programs may still have more rigorous requirements than those administered by program managers who elected not to participate in this study.

Most prior studies have examined an individual VEP and used specific measures of program rigor (e.g., reductions in toxic release inventory pollution or greenhouse gas emissions). However, these measures were not applicable to our cross-sectional investigation of VEPs. As a means for comparing multiple types of programs, our investigation focused on the types of requirements that were most likely to send accurate signals about the environmental performance of VEP participants. The survey examined three general categories of *environmental requirements*, each of which was designed to improve environmental performance through pollution reductions. The first category of environmental requirement was value and goal statements. Such statements require that participants express a basic level of commitment to environmental protection. Second, we considered whether a VEP required that its participants create environmental plans or targets. The final type of environmental requirement was management systems, including life cycle analysis and environmental management systems. Management systems encourage pollution prevention as well as continuous reductions in environmental impacts (Hart, 1995).

While there is little doubt that environmental requirements are important in assessing the accuracy of a program's environmental signal, environmental requirements need to be supported by administrative and conformance requirements to ensure that environmental goals are met and achieved over time. *Administrative requirements* establish communication between programs and their participants and give program managers some degree of control in managing their VEPs. They also help to identify which companies are subscribing to VEP goals. As such, we considered whether VEP sponsors required participants to submit various forms of written agreements, such as memoranda of understanding and membership pledges.

Creating environmental targets may increase the probability that VEP participants will improve their performance, however, it is not guaranteed. Therefore, the final set of VEP requirements we examined was *conformance requirements*. Conformance in voluntary settings is determined through monitoring and sanctions. Monitoring and sanctions work together to prevent participants from behaving opportunistically (King and Lenox, 2000; Davies et al., 1996), because even rigorous monitoring requirements without sanctions may leave opportunities for participants to receive program benefits without conforming to VEP requirements. Monitoring of VEP participants involves one of four different types of regimes: no monitoring, self monitoring (that sometimes requires participants to submit a progress report to program sponsors), sponsor monitoring, and independent third-party monitoring. Sanctions are the actions taken when participants fail to implement VEP provisions or achieve program goals. We considered whether programs either imposed notices of non-conformance, required plans for non-conforming firms to achieve VEP goals, insisted on evidence of actions bringing non-conforming firms within program guidelines, or removed non-conforming companies from the VEP.²

In assessing differences in program characteristics by program sponsor, we defined VEP *sponsors* as the entities that developed, administered, and financed the program. Programs were assigned to one of three sponsorship categories – government,

industry, or third-party – by having two researchers review each VEP homepage to identify the organization(s) that financed, developed and administered the program.³ In the absence of such information, we identified the server hosting the website or a VEP contact person to determine the organization responsible for a program's design and operation. For situations where a new organization was created to develop and implement a VEP, we identified the original advocates. Finally, we relied on secondary reports to determine sponsorship for programs that were discontinued or had inactive websites. We analyzed the survey data with descriptive statistics and then used an omnibus Fisher's exact test (two-tailed) to assess responses among VEP sponsorship categories.⁴ Fisher's exact is a nonparametric equivalent of the Chi-square test and determines statistical differences between two or more categorical variables. This test was selected over a Chi-square test because of our small sample.

To assess signaling accuracy, we analyzed program design elements to determine whether the VEPs in our study had similar environmental performance, administrative, and conformance standards. We first evaluated patterns in program characteristics and then aggregated similar elements into dichotomous variables. For instance, we created a single dichotomous variable for pollution prevention if a program required participants to either create pollution prevention, waste reduction, or recycling/reuse targets. We then sorted programs based on the presence or absence of each of these design elements to assess whether VEP requirements were similar and whether they accurately reflected the environmental performance of all program participants.

Findings on VEP requirements

Of the 61 VEPs studied, 42 programs were sponsored by government agencies, nine by industry associations, and 10 by third-parties. EPA sponsored most of the government VEPs (79%). In a few instances, VEPs were sponsored either by other governmental or intergovernmental agencies including the Department of Energy, The United Nations, and The U.S. Agency for International Development, or by regional governments. A total of 30 of the government sponsored programs (71%) targeted one or more specific industries with nine of these programs representing government-industry partnerships within the design for the environment program. The other 12 government VEPs targeted participants across multiple sectors.

Of the nine industry programs, industry associations sponsored seven (78%), all of which targeted specific sectors ranging from automobiles and textiles to hotels, drycleaners, and paint manufacturers. The other two programs were sponsored by coalitions with ties to industry. Finally, third-parties sponsored 10 VEPs. Among these programs, environmental advisory groups, comprised of non-governmental organizations and business representatives, sponsored six VEPs, whereas environmental advocacy organizations and standard setting bodies sponsored four programs.

While VEPs are designed to promote environmental performance *beyond* that required by the regulatory system, only one-quarter of the programs studied (25%) used regulatory compliance as a screening device for participation. Similarly, only about one-third of the programs (31%) required companies to demonstrate their compliance with environmental regulations while participating in the VEP. These results suggest that the majority of VEPs do not have provisions for ascertaining whether participants

are meeting minimum regulatory compliance thresholds prior to electing to become involved in the program. While many VEPs are designed with the primary goal of encouraging participants to reduce their environmental impacts beyond that required by law, it appears that most programs, regardless of their sponsor, do not require compliance as a precondition for participation.

Environmental performance requirements

Environmental performance requirements are intended to increase the potential for VEP participants to reduce their environmental impacts beyond that required by law. Such requirements include insisting that participants develop statements of environmental goals, create environmental targets, and implement management systems. All VEPs in this study had some form of environmental performance requirement. As shown in Table 1, one-fifth of the programs (20%) required that their participants prepare a basic statement describing their views about the natural environment, and less than one-half of the programs (46%) required that participants prepare basic statements of their environmental goals.

Though statements are an important means for demonstrating a general commitment to environmental protection, they typically do not provide clear targets for pollution reduction or prevention. The results showed that less than two-thirds of the programs (60%) had a requirement that participants create their own environmental targets or that they adhere to standards set by the VEP. About one-third of the programs (30%) expected participants to establish waste reduction or recycling targets. Fewer VEPs required participants to reduce non-regulated environmental impacts such as energy consumption (21%) and water consumption (16%). More VEPs therefore emphasize the reduction of regulated industrial pollution rather than non-regulated impacts, perhaps because non-regulated impacts are not as central a concern to EPA (Davies and Mazurek, 1998), and therefore are not a priority for many program sponsors.

Less than one-half of the programs (40%) required that participants adopt one or more integrated approaches to pollution management. Specifically, 31% of the VEPs had some form of management system requirement, about one-quarter (28%) required that participants implement an environmental management system and four programs (7%) required that participants implement life-cycle analysis procedures. Three of the four programs requiring life-cycle analysis also required that participants implement an environmental management system.

Administrative requirements

With respect to VEP administrative requirements, less than two-thirds of program sponsors (60%) required that participants develop one or more types of written agreements such as letters of intent, memoranda of understanding and cooperative agreements. As a result, in 40% of the programs, VEP administrators do not have an explicit statement from participants that details their commitment to the program. Of the VEPs that relied on administrative requirements, 14 (23% of the total number of VEPs) required that participants sign either a formalized memorandum of

Table 1. VEP environmental, administrative, and conformance requirements

Type of requirement	VEP Sponsor			Total* (%)
	Government (%)	Industry (%)	Third-party (%)	
Environmental requirements				
Statement of environmental values or Goals (<i>n</i> = 61)				
No statement of environmental values or goals	23 (55)	4 (44)	6 (60)	33 (54)
Statement of environmental values or goals required	19 (45)	5 (56)	4 (40)	28 (46)
Prepare statement of views about natural environment	6 (14)	4 (44)	2 (20)	12 (20)
Prepare statement of environmental goals	19 (45)	5 (56)	4 (40)	28 (46)
Create environmental targets (<i>n</i> = 60)				
No environmental targets requirement	17 (42)	3 (33)	4 (40)	24 (40)
Environmental targets required	24 (58)	6 (67)	6 (60)	36 (60)
For pollution prevention	18 (44)	6 (67)	4 (40)	28 (47)
For waste reduction	11 (26)	4 (44)	3 (30)	18 (30)
For recycling/reuse	11 (26)	4 (44)	3 (30)	18 (30)
For minimizing energy consumption	8 (19)	3 (33)	2 (20)	13 (21)
For minimizing water consumption	5 (12)	3 (33)	2 (20)	10 (16)
Management system (<i>n</i> = 58)				
No management system requirement	32 (80)	4 (44)	4 (44)	40 (69)
Management system required	8 (20)	5 (56)	5 (56)	18 (31)
Implement environmental management system	8 (19)	4 (44)	5 (50)	17 (28)
Conduct product life-cycle analysis	1 (3)	2 (22)	1 (11)	4 (7)
Administrative requirements				
Written agreements (<i>n</i> = 60)				
No written agreement requirement	16 (38)	3 (37)	5 (50)	24 (40)
Written agreement required	26 (62)	5 (63)	5 (50)	36 (60)
Formalized memorandum or cooperative agreement	11 (26)	0 (0)	4 (40)	14 (23)
Letter of intent	10 (24)	5 (56)	0 (0)	15 (25)
Other signed agreement	5 (12)	1 (13)	1 (10)	7 (12)
Conformance requirements				
Monitoring (<i>n</i> = 61)				
No monitoring requirement	13 (32)	3 (30)	3 (33)	19 (32)
Monitoring required	28 (68)	6 (67)	7 (70)	41 (68)
Participants self-monitor, no written report	25 (60)	6 (67)	5 (50)	34 (56)
Participants submit self-reports to VEP sponsor	28 (68)	6 (67)	7 (70)	41 (68)
VEP administrator monitors	11 (26)	3 (33)	3 (30)	17 (28)
Independent third-party monitors	7 (17)	1 (11)	1 (10)	9 (15)
Sanctions for VEPs with reporting or external monitoring (<i>n</i> = 60)				
No of sanctions imposed	23 (56)	5 (56)	6 (60)	34 (57)
Sanctions imposed	18 (44)	4 (44)	4 (40)	26 (43)
Administrators give formal notice of non-conformity	11 (27)	2 (22)	3 (30)	16 (27)
Participants submit plans to achieve conformity	5 (12)	2 (22)	2 (20)	9 (15)
Participants provide evidence of conformity	5 (12)	0 (0)	2 (20)	7 (12)
Participants are expelled	12 (29)	2 (22)	3 (30)	17 (28)

*There were no statistical differences among program sponsors by VEP requirement at $p < 0.05$.

understanding or a cooperative agreement, 15 (25% of the total number of VEPs) had companies write a letter of participation intent, and seven (12% of the total number of VEPs) had participants sign some other form of written agreement.

Conformance requirements

Monitoring and sanctions were the two types of conformance requirements examined in this study. About two-thirds of the programs (68%) required some form of monitoring. Most programs required self-monitoring (56%), and about two-thirds of VEPs (68%) required participants to submit progress reports, therefore indicating that self-monitoring was at least implicitly required. To a lesser extent, VEP administrators took an active role in monitoring their participants' conformance (28%), and still fewer required that independent third-parties monitor participants' performance in the program (15%). In two instances, VEP managers reported that their programs utilized multiple types of monitoring, such as requiring both self-monitoring and monitoring by VEP administration. These patterns suggest that VEPs did not emphasize external monitoring of VEP participants, either by VEP sponsors or by independent third parties, and instead relied more on self-monitoring procedures.

To ensure conformance to VEP goals, and to reduce participant free-riding, monitoring must be coupled with sanctions. Over one-half of the VEPs (57%) imposed no sanctions when participants failed to adhere to program specifications. Programs that sanctioned non-conformance relied on a range of actions with varying degrees of severity. The most common action (seen in 27% of the VEPs) was for VEP administrators to send participants a notice that they were not conforming to program guidelines. A somewhat more rigorous sanction requires that non-conforming participants submit a plan detailing how they will meet VEP goals and obligations (seen in 15% of the VEPs). A total of seven VEPs (12%) required that participants provide evidence that they had brought their company into alignment with program specifications after a deviation had been detected. The most severe type of sanction is the removal of non-conforming participants from the VEP. About one-quarter of VEP managers (28%) reported they expelled companies that failed to satisfy program requirements.

Typology of VEP requirements

After evaluating empirically each of the VEP requirements, we found that there was no variation among program sponsors and therefore we were able to aggregate the VEP requirements in order to develop a typology of programs. We identified four key design features that could be used to assess similarities and differences in performance and conformance requirements across the population of VEPs: internal commitments, self-reporting, external monitoring, and sanctions of any kind. Internal commitments included goal statements, value statements, signed agreements, and targets created by either the VEP or the participant, as well as any form of EMS. In each instance, participants must commit to improving the environment. Self-reporting was represented by the requirement that a participant submit environmental progress reports to VEP sponsors on a regular basis. External monitoring consisted of either VEP administrators or independent third-parties

monitoring participants' environmental performance in the program. The final criterion we considered was any form of sanction.

We classified the VEPs in our study into different groups based on similar combinations of these design features. This inductive process revealed that the sample contained four distinct types of programs, forming a typology of VEPs. Some programs contained all four design features, whereas others contained none. Based on the questionnaire responses, 90% of the programs had characteristics that conformed to one of the four program types. For the remaining 10% of the programs, we searched each VEP's web page, reviewed its program requirements and goals and then assigned it to the category that best reflected its key characteristics. Consistent with the finding of homogeneity among program sponsorship with respect to VEP design features, the three types of sponsors were represented in similar proportions across each category in the typology. Table 2 summarizes the characteristics for each category in the VEP typology.

The first type of VEP, Information, Assistance and Awareness, consisted of programs that provided either technical assistance or education to ensure that participants were familiar with environmental regulations and emerging industry practices. The 11 programs (18%) in this category did not require any agreements, statements or performance requirements (see Table 3). Environmental Pledges, the second type of program in the VEP typology, required that participants make an internal commitment to enhance their environmental performance as demonstrated through a goal or value statement, a signed agreement, or the creation of performance targets. A total of six programs (10%) belonged to this category.

The third type of VEP we identified, Voluntary Reporting Programs, required that participants submit a self-initiated report of their progress to VEP administrators. Of the programs in this category, about one-third (34%) also required some form of internal commitment. Ten of these programs (16% of the total number of VEPs in the study) did not incorporate any sanctions while 11 (18% of the total number of VEPs) elected to sanction non-conforming participants. Of the sanctions that were imposed by voluntary reporting programs, most program managers said that they insisted that non-conformers be removed from the VEP.

Table 2. Typology of VEP requirements

Program types	Performance criteria			
	Internal commitments	Self reporting	External monitoring	Sanctions for non-conformance
Information, assistance and awareness	–	–	–	–
Environmental pledge	X	–	–	–
Voluntary reporting				
Without sanctions	X	X	–	–
With sanctions	X	X	–	X
Performance monitoring				
Without sanctions	X	–	X	–
With sanctions	X	–	X	X

Table 3. Signaling accuracy of VEPs

Signal accuracy	Program category	VEP Sponsor ^a			Total (<i>n</i> = 61)
		Government (<i>n</i> = 42)	Industry (<i>n</i> = 9)	Third-party (<i>n</i> = 10)	
Less accurate ↑ ↓ More accurate	Information, assistance and awareness	8 (19%)	2 (22%)	1 (10%)	11 (18%)
	Environmental pledge	5 (12%)	0 (0%)	1 (10%)	6 (10%)
	Voluntary reporting	14 (33%)	3 (33%)	4 (40%)	21 (34%)
	Without sanctions	6 (14%)	2 (22%)	2 (20%)	10 (16%)
	With sanctions	8 (19%)	1 (11%)	2 (20%)	11 (18%)
	Performance monitoring	15 (35%)	4 (44%)	4 (40%)	23 (38%)
	Without sanctions	6 (14%)	1 (11%)	2 (20%)	9 (15%)
	With sanctions	9 (21%)	3 (33%)	2 (20%)	14 (23%)
	With sanctions including removal	6 (14%)	2 (22%)	1 (10%)	9 (15%)

^aThere were no statistical differences among program sponsors.

Performance monitoring programs were the fourth type of program identified. The common characteristic of all 23 programs in this category was that they required external monitoring by VEP sponsors or independent third-parties. Nine programs (15% of the total number of VEPs in the study) did not impose sanctions for nonconformance. By contrast, 14 programs (23% of the total number of VEPs in the study) imposed sanctions and were the most rigorously designed programs in the typology of VEP requirements.

As indicated in Table 3, of the four types of VEPs in the typology, Information, Assistance and Awareness Programs have the weakest program design and are most likely to create inaccurate signals about participants' environmental behaviors. Because they focus on education and technical assistance, changes in companies' environmental performance are not required. Similarly, environmental pledge programs send less accurate signals. While these programs may lead to environmental performance changes, no mechanisms exist to determine whether such improvements occur. Voluntary reporting programs are likely to be highly variable in their signaling accuracy because they rely on self-reporting rather than external monitoring. While self-reporting may pressure participants to achieve VEP goals, it does not actually ensure that the goals are met. Further, while some voluntary reporting programs sanction non-conforming participants, such actions have little merit since these VEPs are relying only on self-reports of environmental performance. By contrast, the external monitoring associated with performance monitoring programs is likely to yield the greatest degree of signaling accuracy since monitoring is done either by VEP sponsors or by independent third parties. However, even within this subset of programs there may be variation in signaling accuracy. Performance monitoring programs that impose sanctions on non-conforming participants send more reliable environmental signals than those taking no action against non-conforming participants. Finally, performance monitoring programs that expel noncompliant participants will likely have the most reliable signals since participant free-riding is not tolerated.

Discussion and conclusions

The results of this research suggest that while some differences existed among individual components of VEPs, there were no statistically significant differences among program sponsors. These findings extend prior research (e.g., Higley et al., 2001; OECD, 1999, 2003; Börkey and Glachant, 1997) by indicating that unilateral commitments by polluters (industry sponsored VEPs) and public voluntary programs (government sponsored VEPs) have almost equivalent program designs as they relate to environmental, administrative and conformance requirements. The results further enhance our knowledge of VEPs by demonstrating that industry and government sponsors develop VEPs that have features that are similar to those created by independent third parties. Since there are no statistically significant differences in program design features by sponsor, the empirical results of this study suggest that sponsorship may have little influence on a VEP's environmental, administrative, and conformance requirements. Previously developed taxonomies based on program sponsorship therefore are not an effective means for evaluating the signaling accuracy of U.S. VEPs.

At present, VEPs are signaling collectively that their participants are engaged in environmentally proactive behavior. However, the absence of information about the design features and rigor of many of these programs makes it difficult to determine whether VEPs are sending accurate environmental signals. In a pooled environment such as this, participants' environmental signals would be accurate if VEPs had similar performance and conformance requirements. This research illustrates that VEPs are not similar. In fact, there are four distinct categories of programs – Information, Assistance and Awareness Programs, Environmental Pledge Programs, Voluntary Reporting Programs, and Performance Monitoring Programs – each with different standards and requirements. The variations in program characteristics indicate that some VEPs are more likely than others to promote improvements in environmental performance. Performance Monitoring Programs have both environmental performance requirements and a means for ensuring that participants conform to program goals and standards. Because programs in this category reflect the type of expectations that external stakeholders generally associate with VEPs, Performance Monitoring Programs are presently sending the most accurate environmental signal. While the three other types of VEPs are designed to improve the environment, they do not have the same robust standards as Performance Monitoring Programs, and participants are not required to engage in environmental behaviors that we typically associate with VEPs.

In the absence of complete information about how program designs vary, and about whether participants are required to achieve program goals, VEPs are unable to send accurate environmental signals. This situation may cause VEP failures, both within an individual program and across all programs. At the level of the individual program, VEPs that are designed with no external oversight create opportunities for participants to free-ride. As a result, participants are able to accrue benefits from program administrators and from markets without satisfying VEP requirements. Across all programs, the lack of information, and subsequent inability to differentiate among VEPs, may cause external parties to assume that they achieve similar environmental outcomes. In these situations, weak programs, such as Environmental Pledges, are overvalued while those with more robust designs are undervalued. Incomplete information also affects VEPs within each of the four categories in the VEP typology. For example, some Performance Monitoring Programs may be regarded as being more rigorous when in fact they are comparable only to other VEPs within the same program type.

To address the problem of free-riding within individual programs, participants need to be separated in some way. That is, companies that intend to fulfill program requirements must be differentiated from participants that are just beginning to consider their impact on the natural environment or that are seeking participation in programs with more lenient standards. Imposing monitoring and sanctions is one way to create this separation, in that firms intending to free-ride would be discouraged from participating in a VEP or removed for their nonconformance. Advocating for stronger monitoring and sanctions across programs suggests that all VEPs should resemble Performance Monitoring Programs. However, recommending that all VEPs have the same design requirements neglects the potential contributions made by less rigorous VEPs, such as those that encourage companies to begin thinking proactively about their impacts on the natural environment.

Another approach to remedying VEP failures is to reduce information asymmetries across VEPs by providing information about how they differ. Participant free-riding therefore may be addressed by means of a “separating equilibria” that distinguishes among different types of VEPs. However, a classification system alone will not remedy information asymmetries. To ensure the accuracy of VEP signals, such a system should be coupled with a certification process to ensure that individual programs are placed into their proper VEP category. Just as companies participating in some programs certify that they are meeting program standards, the programs themselves could be certified based on their goals and levels of rigor. The typology developed in this paper reflects the characteristics of the population of VEPs operating in the U.S. without preference to any one type of sponsor. As a result, it may serve as a useful starting point to form both a classification and a certification system.

Adopting a classification and certification system, such as the one presented in this paper, will help differentiate among VEPs and make it possible for programs to send signals that more accurately reflect their key functions and attributes. By distinguishing among VEPs and by making this information public, external parties may be able to more easily assess the merits of individual programs. In doing so, firms seeking to send stronger environmental signals will participate in more robust VEPs. VEPs with more rigorous program requirements will be unattractive to companies that do not wish to adhere to a higher program standard. VEP classification and certification would also benefit other constituents, as described in Table 4.

It is important to acknowledge that a limitation of this VEP typology is that we did not evaluate the rigor of environmental targets. For instance, while we asked if a program had waste minimization targets, we did not examine the thoroughness of these targets. This research was designed to understand the accuracy of signals through an assessment of VEP requirements. While conducting a cross-sectional survey made it possible to understand broad patterns across VEPs, this approach did not afford opportunities to account for the unique characteristics of individual programs. Future research therefore should be conducted to evaluate the quality of program targets and to develop a means for differentiating their characteristics.

Since many VEPs are constrained in their ability to alter environmental behavior, critics might suggest that support for VEPs should be discontinued so that increasingly scarce resources can be allocated towards regulatory enforcement. Others may argue that VEPs should be redesigned and repositioned so that they fall within the regulatory system. While these perspectives may have some merit, it is essential to acknowledge that many VEPs rely on flexible approaches to encourage environmental improvement. In some instances, this flexibility may help companies find innovative ways to shift their environmental management activities so that they move beyond regulatory compliance, or simply alert them to emerging technologies. In other instances, VEPs may foster collaborative relationships between government and the regulated community while promoting environmental learning and capacity-building. In the short-term these activities may not lead to pollution reductions, but they may create a foundation for long-term environmental management improvements.

In other instances, scholars have noted that some VEPs are being developed as substitutes for certain types of environmental regulations (Welch et al., 2000). This study identified four distinct types of VEPs, each with different requirements and goals.

Table 4. Benefits of VEP classification and certification

Beneficiary	VEP classification and certification benefits
Regulators	<p>Improved ability to identify which companies have implemented more rigorous environmental practices</p> <p>Greater opportunity to divert scarce monitoring resources away from companies that participate in more rigorous VEPs</p> <p>Increased ability to help companies see the value of participating in more rigorous VEPs</p> <p>Enhanced capacity to identify and promote proactive corporate environmental behavior</p> <p>Increased long term credibility of VEPs as a public policy tool</p>
Consumers	<p>Improved ability to make informed purchasing decisions</p> <p>Increased knowledge of companies' environmental activities</p>
Communities and NGOs	<p>Enhanced awareness of how different types of VEPs function as tools for environmental protection</p> <p>Increased knowledge of which VEPs are more likely to lead to superior environmental improvements</p>
Non-participating companies	<p>Greater ability to benchmark their environmental management practices with the practices of companies participating in different types of VEPs</p> <p>Improved ability to identify the types of VEPs that may be most appropriate for their needs</p>
VEP participants	<p>Greater recognition for their environmental achievements</p> <p>Improved ability to promote themselves as good corporate citizens</p> <p>Improved ability to send accurate market signals</p>
VEP managers	<p>Increased long term credibility of VEPs as a public policy tool</p> <p>Greater ability to market their VEPs to target participants</p>

Programs designed to provide technical assistance, for instance, have dramatically different properties than environmental regulations and even other VEPs. The variability in program requirements suggests that VEPs may not be suitable replacements for regulation. However, they may be important complements to existing environmental regulations, because they can promote environmental awareness, internal capacity development and perhaps even long-term behavioral changes.

The development of VEPs as an alternative to regulatory approaches raises questions about their ability to improve the natural environment. Our study suggests that while all VEPs play a role in building capacity for environmental management, only a small portion take steps to ensure that participants reduce their environmental impacts. Further, opportunities exist for free-riding among program participants and across the different programs. Both types of problems threaten the long term credibility of VEPs as tools for environmental protection and as market mechanisms. By creating a classification and certification scheme for VEPs, the pool of programs will more accurately represent participants' environmental behavior, thereby diminishing the potential for free-riding. Such a scheme would also help external parties to differentiate among the population of programs by giving them information to determine whether participating companies are proactively managing their environmental performance.

Appendix: VEPs included in the analysis

33/50	Great Lakes Automotive Pollution Prevention Project
Alliance for Environmental Innovation	Great Printers Project
Audubon Cooperative Sanctuary Program	Green Power Market Development Group
Building America	Hospitals for a Healthy Environment
Caux Round Table Principles for Business	International Hotels Environment Initiative
Certified Environmental Drycleaner	ISO 14001 Environmental Management System Standard
Chemical Strategies Partnership	Landfill Methane Outreach Program
Climate Challenge	Mercury Challenge Program (Partners for Change)
Coalbed Methane Outreach Program	Merit Partnership for Pollution Prevention
Coalition for Environmentally Responsible Economies	Metal Finishing Strategic Goals Program
Coatings Care	Mobile Air Conditioning Climate Protection Partnership
Commuter Choice Leadership Initiative	National Environmental Performance Track
Consumer Labeling Initiative	National Waste Minimization Partnership Program
Design for the Environment	Natural Gas STAR Program
Adhesives and Foam Furniture and Sleep Products	Paper Task Force
Automotive Refinishing Partnership	Pesticide Environmental Stewardship Program
Flexography Partnership	Project XL
Garment and Textile Care Program	Recycled Paper Coalition
Gravure Partnership	Responsible Care
Industrial and Institutional Laundry Partnership	Ruminant Livestock Efficiency Program
Integrated EMS	SF6 Emission Reduction Partnership for the Magnesium Industry
Lithographic Printing Partnership	SF6 Emissions Reduction Partnership for Electric Power Systems
Screen Printing Partnership	StarTrack
Encouraging Environmental Excellence (E3)	Sustainable Forestry Initiative
Energy Star	The Natural Step
Environmental Leadership Program (Pilot)	UNEP Advertising and Communication Forum on Sustainability
Environmentally Preferable Purchasing and Production	UNEP Financial Institutions Initiative
Environmental Technology Verification Program	US Automotive Pollution Prevention Project
Farm*A*Syst/Home*A*Syst	Voluntary Reporting of Greenhouse Gases Program
Global e-Sustainability Initiative	WasteWise
Global Reporting Initiative	Water Alliances for Voluntary Efficiency (WAVE)

Acknowledgments

We are grateful to Darryl Chatman, Laurie Gharis, Nicole Kreiser and Joao Mil-Homens for their research assistance. Additionally, we thank the VEP program managers, who so generously participated in this study.

Notes

1. Two negotiated agreements have been developed in the U.S., both by the Environmental Protection Agency. These agreements were designed to improve upon traditional regulation, unlike the European model where negotiated agreements serve as a substitute for regulation or a means for preempting regulation (Börkey et al., 1998). Because negotiated agreements are rarely distinguished from other types of voluntary approaches in the U.S., they are not regarded as a separate program category in this discussion or in the evaluation that follows.
2. In developing our list of sanctions we considered a variety of actions, some being quite generous (i.e., program administrators giving participants formal notices of their non-conformity and participants submitting plans to achieve conformity) and others being more rigorous (i.e., providing evidence to achieve conformity and expulsion). Our rationale for this was that the latter two sanctions might violate anti-trust laws (Kappas, 1997), and therefore industry sponsored VEPs may be restricted in using them, whereas notices of non-conformity or requiring that participants submit plans to achieve conformity do not violate these laws and therefore are applicable to the broader population of programs.
3. Since the two negotiated agreements developed in the U.S. were both sponsored by EPA, they were designated as government sponsored VEPs.
4. If the omnibus test showed that differences existed, we then evaluated pairwise differences among program sponsors.

References

- Akerlof, G. (1970). 'The market for lemons: Quality uncertainty and the market mechanism,' *Quarterly Journal of Economics* 84: 488–500.
- Alchian, A. A. and H. Demsetz (1972). 'Production, information costs and economic organization,' *American Economic Review* 62: 777–795.
- Arora, S. and T. N. Cason (1995). 'An experiment in voluntary environmental regulation: Participation in EPA's 33/50 program,' *Journal of Environmental Economics and Management* 28: 271–286.
- Arora, S. and T. N. Cason (1996). 'Why do firms volunteer to exceed environmental regulations? Understanding participation in EPA's 33/50 program,' *Land Economics* 72: 413–432.
- Barney, J. B. and W. G. Ouchi (eds.). (1986). *Organizational Economics*. San Francisco: Jossey-Bass.
- Börkey, P. and M. Glachant (1997). *Les Engagements Volontaires de l'industrie dans le Domaine de l'environnement: Nature et Diversité*. Paris: CERNA.
- Börkey, P., M. Glachant, and F. Lévêque (1998). *Voluntary Approaches for Environmental Policy in OECD Countries: An Assessment*. Paris: CERNA, Centre d'économie Industrielle.
- Carmin, J., N. Darnall and J. Mil-Homens (2003). 'Stakeholder involvement in the design of U.S. environmental initiatives: Does sponsorship matter?' *Policy Studies Journal* 31: 527–543.
- Coglianesi, C. and J. Nash (eds.). (2001). *Regulating from the Inside: Can Environmental Management Systems Achieve Policy Goals?* Washington, DC: Resources for the Future.
- Darnall, N., J. Carmin, N. Kreiser, and J. Mil-Homens (2003). *The Design and Rigor of U.S. Voluntary Environmental Programs: Results from the VEP Survey*. Department of Political Science and Public Administration, North Carolina State University and Department of Urban Studies and Planning, Massachusetts Institute of Technology.
- Darnall, N., D. R. Gallagher, and R. N. L. Andrews (2001). 'ISO 14001: Greening management systems,' in Joseph Sarkis, ed., *Greener Manufacturing and Operations*. Sheffield, UK: Greenleaf Publishing, pp. 178–190.
- Davies, J. C. and J. Mazurek (1998). *Pollution Control in the United States: Evaluating the System*. Washington, DC: Resources for the Future.
- Davies, J. C., J. Mazurek, K. McCarthy, and N. Darnall (1996). *Industry Incentives for Environmental Improvement: Evaluation of U.S. Federal Initiatives*. Washington DC: Resources for the Future, Center for Risk Management.
- Delmas, M. A. and A. K. Terlaak (2001). 'A framework for analyzing environmental voluntary agreements,' *California Management Review* 43: 44–62.

- Hart, S. L. (1995). 'A natural-resource-based view of the firm,' *Academy of Management Review* 20: 986–1014.
- Higley, C. J., F. Convery, and F. Lévêque (eds.). (2001). *Voluntary Environmental Approaches: Research Insights for Policy-Makers*. Paris: Centre d'Economie Industrielle, Ecole Nationale Supérieure des Mines de Paris, Concerted Action on Voluntary Approaches.
- Kappas, P. (1997). *The Politics, Policy, Practice and Performance of Chemical Industry Self-Regulation*. Ph.D. Dissertation, Political Science, University of California, Los Angeles.
- Khanna, M. and L. A. Damon (1999). 'EPA's voluntary 33/50 program: Impact on toxic releases and economic performance of firms,' *Journal of Environmental Economics and Management* 37: 1–25.
- Khanna, M., W. R. H. Quimio, and D. Bojilova (1998). 'Toxic release information: A policy tool for environmental protection,' *Journal of Environmental Economics and Management* 36: 243–266.
- King, A. and M. Lenox (2000). 'Industry self-regulation without sanctions: The chemical industry's responsible care program,' *Academy of Management Journal* 43: 698–716.
- Konar, S. and M. A. Cohen (1997). 'Information as regulation: The effect of community right to know laws on toxic emissions,' *Journal of Environmental Economics and Management* 32: 109–124.
- Kreps, D. M. (1990). 'Corporate culture and economic theory,' in J. E. Alt and K. A. Shepsle, eds., *Perspectives on Positive Political Economy*. Cambridge, UK: Cambridge University Press.
- Lyon, T. P. (2003). *Voluntary versus Mandatory Approaches to Climate Change Mitigation*. Washington, DC: Resources for the Future, Issue Brief 03-01.
- Maxwell, J. W. and C. Decker (1998). 'Voluntary environmental investment and regulatory flexibility,' Working paper, Department of Business Economics and Public Policy, Kelley School of Business, Indiana University.
- Maxwell, J. W., T. P. Lyon, and S. C. Hackett (2000). 'Self-regulation and social welfare: The political economy of corporate environmentalism,' *Journal of Law and Economics* 43: 583–618.
- Mazurek, J. (2002). 'Government-sponsored voluntary programs for firms: An initial survey,' in T. Deitz and P. C. Stern, eds., *New Tools for Environmental Protection: Education, Information, and Voluntary Measures*. Washington, DC: National Academy Press, pp. 219–234.
- Nash, J. (2000). 'Voluntary codes of practice: Non-governmental institutions for promoting environmental management by firms,' A paper presented at the National Academy of Sciences/National Research Council Workshop on Education, Information, and Voluntary Measures in Environmental Protection, Washington, DC.
- Nash, J. and J. Ehrenfeld (1997). 'Codes of environmental management practice: Assessing their potential as a tool for change,' *Annual Review of Energy and the Environment* 22: 487–535.
- Organisation for Economic Co-Operation and Development (OECD). (1999). *Voluntary Approaches for Environmental Policy: An Assessment*. Paris: OECD.
- Organisation for Economic Co-Operation and Development (OECD). (2003). *Voluntary Approaches for Environmental Policy: Effectiveness, Efficiency, and Usage in Policy Mixes*. Paris: OECD.
- Portney, P. R. and R. N. Stavins (eds.). (2000). *Public Policies for Environmental Protection* (2nd ed.). Washington, D.C: Resources for the Future.
- Rivera, J. (2002). 'Assessing a voluntary environmental initiative in the developing world: The Costa Rican Certification for Sustainable Tourism,' *Policy Sciences* 35: 333–360.
- Segerson, K. and T. J. Miceli (1998). 'Voluntary environmental agreements: Good or bad news for environmental protection?' *Journal of Environmental Economics and Management* 36: 109–130.
- ten Brink, P. (2002). *Voluntary Environmental Agreements: Process, Practice and Future Use*. Sheffield, UK: Greenleaf Publishing.
- Videras, J. and A. Alberini (2000). 'The appeal of voluntary environmental programs: Which firms participate and why,' *Contemporary Economic Policy* 18: 449–461.
- Welch, E. W., A. Mazur, and S. Bretschneider (2000). 'Voluntary behavior by electric utilities: Levels of adoption and contribution of the climate challenge program to the reduction of carbon dioxide,' *Journal of Public Policy Analysis and Management* 19: 407–426.