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**THE USE OF VOLUNTARY AGREEMENTS IN THE UNITED STATES:
AN INITIAL SURVEY**

This is the final version of the report prepared by Ms. Janice Mazurek, an environmental policy consultant in Washington DC, in the context of the OECD survey on the use of voluntary approaches in environmental policy.

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THE USE OF VOLUNTARY AGREEMENTS IN THE UNITED STATES: AN INITIAL SURVEY

by
Janice Mazurek¹

I. Introduction

This survey describes the role and scope of voluntary environmental approaches in the United States. In contrast to regulatory or market-based approaches, voluntary agreements (VAs) use cooperative strategies to improve social outcomes. Over 350 such agreements are in place in OECD member countries (Dowd and Boyd 1998). European examples include the Dutch covenant system and the Danish CO₂ Agreements.

In the United States, 42 national voluntary initiatives have been developed since 1988 by the U.S. Environmental Protection Agency (EPA) and industrial trade organizations.²³ In contrast to the European experience, VAs in the United States are used primarily to extend the scope and efficacy of individual air, water, waste, and toxics laws. While much is known in Europe on the use and effectiveness of VAs employed there, relatively less is known about the role and scope of voluntary environmental instruments used in the United States (EEA 1997). The focus of this survey is therefore primarily on voluntary environmental initiatives administered by EPA and U.S. industry trade organizations.

Despite their growing popularity, a 1997 study commissioned by the U.S. Congress found EPA's voluntary initiatives to be "marginal" to the agency's regulatory activities (NAPA 1997). Similarly, a 1996 study commissioned by 21 U.S. companies found EPA's major voluntary programs "peripheral, both to business and to society (Davies et al. 1996)." Observers agree that the existing legislative framework limits EPA's ability to use voluntary efforts to improve environmental regulation (NAPA 1997; U.S. GAO 1997a; Davies et al. 1996; NAPA 1995). In contrast, industry attempts at self-regulation are constrained by U.S. anti-trust law (Kappas 1997).

Program novelty, lack of data, and weak metering and evaluation methods make it difficult to determine the extent to which voluntary programs in the United States have reduced pollution or abatement and administrative costs. In most cases, poorly designed program evaluation methods make it difficult to attribute environmental changes exclusively to voluntary programs (NAPA 1997; U.S. GAO

¹ This author is an environmental policy consultant in Washington D.C.

² The U.S. Department of Energy administers about 20 voluntary climate change programs that have been examined elsewhere (Storey et al. 1996; Storey, Boyd and Dowd 1997; Dowd and Boyd 1998).

³ For an analysis of several prominent state voluntary programs, see Daniel P. Beardsley. 1996. *Incentives for Environmental Improvement: An Assessment of Selected Innovative Programs in the States and Europe*. Report submitted to the IDEA 21 Work Group of the Global Environmental Management Initiative (GEMI). Washington D.C.

1997a, 1997b). Because few data exist to demonstrate environmental effectiveness, it is virtually impossible to assess whether or to what degree voluntary programs affect abatement cost. Some data exist with which to assess the administrative cost of voluntary programs.

To supplement what is known about VA effectiveness, this survey draws from a small but growing literature that examines several of the more prominent U.S. voluntary programs including Responsible Care, 33/50, Green Lights, and Project XL (U.S. GAO 1994; INFORM 1995; Arora and Cason 1995; NAPA 1995; Davies et al. 1996; Storey et al. 1996; U.S. GAO 1997a, 1997b; Kappas 1997; Morgenstern and Al Jurf 1997; NAPA 1997; Dowd and Boyd 1998; Krupnick, Boyd and Mazurek 1998). The studies underscore the degree to which the lack of data and evaluation methods complicates assessment.

Findings and organization

While it is likely that poor evaluation methods have overstated environmental effectiveness, voluntary climate change and pollution prevention programs such as 33/50 have helped to reduce a subset of toxic and greenhouse gas emissions. However, the evidence suggests that other categories of private and social benefits are intangible and difficult to measure. The private sector views voluntary approaches as a way to promote regulatory goodwill and favorable public opinion. Such factors may indirectly reduce costs associated with more stringent regulations, permitting, and reporting. From EPA's perspective, voluntary programs are a way to promote cooperation among industry, non-government organizations, and the public. Some VAs provide more opportunities for stakeholder participation than status quo regulations. However, the lack of clearly defined administrative, monitoring, and participatory procedures makes voluntary approaches opaque. VAs must be made more transparent.

To assess the U.S. experience with voluntary agreements, this paper is organized into six sections. Section two describes VA goals, characteristics, and motivations of private and public sector participants. Section three describes the legal and policy context in which voluntary agreements operate. Section four shows how laws and regulations impede effective implementation. Section five pairs assessment data developed by implementing organizations with independent studies to describe the performance of several prominent voluntary initiatives. Section six concludes that legislative change is necessary to improve how environmental laws and programs manage pollution.

II. Background

To assess VAs, it is necessary to distinguish among them. Lévêque's (1996) work for the European Commission identifies three VA types: public voluntary, unilateral, and negotiated agreements. Unilateral commitments refer to programs established by industry to encourage firms to achieve environmental improvements. Public voluntary schemes refer to non-mandatory rules developed by a government body such as EPA. Negotiated agreements refer to contracts between public authorities and industry. In contrast to public voluntary efforts, negotiated agreements contain specific targets and are legally-binding.

In the United States, VAs combine features from each of Lévêque's three categories. For example, EPA patterned the 33/50 Program after Responsible Care, the most prominent unilateral program in the United States to date (Chemical Week 1991). Similarly, while Project XL and the Common Sense Initiative (CSI) involve negotiation, they also resemble public voluntary programs. Neither contain specific emissions reduction targets. Of all VAs used in the United States, only Project XL contains legally-binding features.

Table 1. Voluntary agreement categories

<i>Climate Change Action Plan^a</i>	PUBLIC VOLUNTARY		UNILATERAL	NEGOTIATED
		<i>Pollution Prevention</i>		
1. AgStar Program (1993)	1. 33/50 (1991)		1. Responsible Care (1988)	1. Project XL (1995)
2. Climate Wise (1993)	2. Design for the Environment (1991)		2. Responsible Distribution Process (1991)	2. Common Sense Initiative (1994)
3. Chlorofluorocarbon Substitutes (post 1993)	3. Environmental Accounting Project (1992)		3. Responsible Recycling Code	
4. Coalbed Methane Outreach Program (1994)	4. Environmental Leadership Program (1994)		4. Responsible Carrier (1994)	
5. Commuter Choice (post-1993)	5. Green Chemistry (1992)		5. Coatings Care (1996)	
6. Energy Star Buildings (1994)	6. Indoor Environments Program (1995)		6. Encouraging Environmental Excellence (1992)	
7. Energy Star Homes (1995)	7. Pesticide Environmental Stewardship Program (1993)		7. Sustainable Forestry Initiative (1995)	
8. Energy Star Office Equipment (1993)	8. Waste Minimization National Plan (1994)		8. Strategies for Today's Environmental Partnership (1990)	
9. Energy Star Transformer Program (1995)	9. Water Alliances for Voluntary Efficiency (WAVE) (1992)		9. Great Printer's Project (1992)	
10. Environmental Stewardship Initiative (1997)	10. Voluntary Standards Network (1993)			
12. Green Lights (1991)				
12. HFC-23 Reductions (post-1993)				
13. Landfill Methane Outreach Program (1994)				
14. Natural Gas Star (1993, 1995)				
15. Ruminant Livestock Methane Efficiency Program (1993)				
16. Seasonal Gas Use for the Control of Nitrous Oxide (post-1993)				
17. State and Local Climate Change Outreach Program (1993)				
18. Transportation Partners (1995)				
19. The U.S. Initiative on Joint Implementation (1993)				
20. Voluntary Aluminum Industrial Partnership (1995)				
21. WasteWise (1992)				

Source(s): U.S. EPA. 1997c. Risk Reduction Through Voluntary Programs. Office of Inspector General. Report of Audit. Washington, D.C.: EPA; U.S. Environmental Protection Agency. 1996d. Partnerships in Preventing Pollution: A Catalogue of the Agency's Partnership Programs. Office of the Administrator. Washington, D.C.: EPA. Dowd, Jeff and Gale Boyd. 1998. A Typology of Voluntary Agreements Used in Energy and Environmental Policy. Washington, D.C.: U.S. Department of Energy, Office of Policy and International Affairs; Kappas, Peter Denison. 1997. The Politics, Practice and Performance of Chemical Industry Self-Regulation. Doctoral dissertation in political science. University of California, Los Angeles.

For the most part, VAs in the United States are public voluntary programs. EPA independently or in tandem with other federal agencies administers 33 of the 42 voluntary nationwide initiatives in the United States. (See Table 1.) Of these, 31 are purely public voluntary programs. Project XL and CSI are hybrids. Industry trade organizations have entered into approximately eight voluntary agreements with their member companies. Industry-led efforts in the United States primarily represent the expansion or duplication of Responsible Care, developed and administered by the Chemical Manufacturers Association (CMA). (See Table 1.) Examples include the American Petroleum Institute's self-regulation program, "Strategies for Today's Environmental Partnership," or "STEP," and the American Forest and Paper Association's (AFPA) "Sustainable Forestry Initiative." The National Association of Chemical Recyclers has developed a "Responsible Recycling Code," which complements Responsible Care. The Synthetic Organic Chemical Manufacturers Association (SOCMA) has adopted Responsible Care's pollution prevention management codes. The Great Printers Project is a unilateral effort implemented by the Printing Industries of America, the Environmental Defense Fund, and governors from four states in the Great Lakes Region. The Great Printers Project and Responsible Care have no formal EPA ties. However, the Great Printers Project has received EPA's strong endorsement (U.S. EPA 1998b).

VA Goals

EPA voluntary programs are primarily designed to either meet the goals of the Clinton Administration's 1993 Climate Change Action Plan (CCAP) or to adopt voluntary goals established under the Pollution Prevention Act of 1990. The CCAP seeks to reduce greenhouse gas emissions to 1990 levels by the year 2000. Voluntary climate change programs (Green Lights, Energy Star) primarily provide participants with technical information in order to promote energy conservation. Others (AgStar, Ruminant Livestock Efficiency) encourage farmers to adopt best management practices to reduce agricultural methane emissions.

EPA's first major voluntary program, 33/50, was designed to promote pollution prevention. Most prevention programs seek to reduce a subset of toxic chemicals released and transferred by manufacturers. Concluded in 1995, 33/50 encouraged manufacturers to voluntarily reduce emissions of 17 target chemicals by 50 percent. Other prevention programs (Design for the Environment, Green Chemistry) are designed to promote the development of cleaner products and industrial processes. A primary goal of negotiated strategies is to improve efficiency by reducing regulatory burden. In practice, most Project XL and CSI projects attempt to reduce administrative costs associated with reporting, monitoring, and permitting.

In contrast to EPA programs, which primarily seek to reduce pollution, unilateral strategies are designed to improve public opinion. Public opinion is to be improved by encouraging companies to voluntarily adopt management codes. For example, Responsible Care contains six management practice codes that range from pollution prevention to product stewardship. CMA provides its members with general guidance documents that explain how companies may adopt the codes. CMA expects member companies to implement five of the six codes by 1998. Firms are expected to fully implement the product stewardship code by 1999.

As the foregoing examples suggest, voluntary programs in the United States primarily provide participants with information subsidies, technical assistance, and/or public recognition. Public recognition may be provided through awards, press announcements or the use of product logos. For example, Energy Star participants that meet EPA standards may advertise products using a logo that bears the program's name. Unilateral approaches such as Responsible Care similarly allow participants to use a registered Responsible Care trademark.

Participation

It is impossible to estimate confidently the total number of VA participants in the United States due to program overlap. Straightforward addition of participants in public voluntary, unilateral, and negotiation programs would likely overstate the total number of firms and organizations that participate in voluntary initiatives. The following discussion therefore examines participation in public voluntary and unilateral initiatives.

In 1996, 6,882 corporations, small businesses, local governments, and non-governmental organizations participated in public voluntary and negotiated programs administered by EPA, according to the agency's most recent estimates (U.S. EPA 1998b). Figure 1 illustrates participation in EPA programs since 1991, when EPA implemented the 33/50 Program. Voluntary climate change programs have the largest number of participants. Project XL has the smallest total number of participants. EPA initially hoped to admit at least 50 companies to XL. Since EPA announced Project XL in 1995, only seven projects have been implemented (U.S. EPA 1998c). In 1996, more than 2 338 organizations participated in EPA's Green Lights program alone. More than 500 organizations participated in EPA's various Energy Star programs (U.S. EPA 1996d).

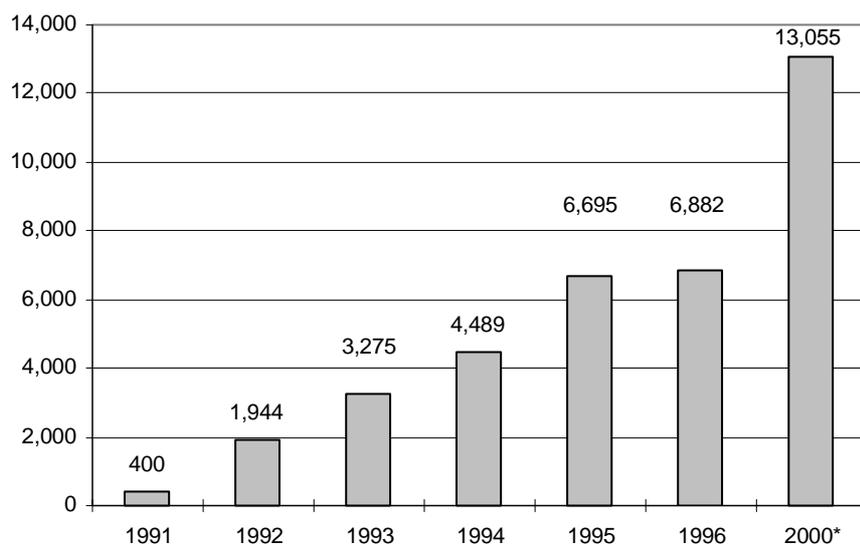


Figure 1. Participation in EPA voluntary programs, 1991-2000.

Source(s): U.S. Environmental Protection Agency. 1998b. Partners for the Environment: Collective Statement of Success. Office of Reinvention. Washington, D.C.: EPA;

U.S. Environmental Protection Agency. 1997a. Pollution Prevention 1997: A National Progress Report. Office of Pollution Prevention and Toxics. Washington, D.C.: EPA.

Note: * Projected.

More than 2 000 companies participate in unilateral initiatives. For example, CMA's 190 members participate in Responsible Care. In addition, 42 non-member companies have adopted the initiative (CMA 1997b). Other participants include the American Forest and Paper Association's (AFPA) 167 members (AFPA 1998). Three hundred American Petroleum Institute member companies participate in STEP (API 1998). The American Waterways Operators' 350 members participate in the "Responsible Carrier" program (AWO 1998). The National Paints and Coating Association's 400 members have a self-regulation process entitled "Coatings Care." The 150 members of the American Textile Manufacturers

Institute have a similar initiative entitled “Encouraging Environmental Excellence.” About 335 firms participate in the “Responsible Distribution Process,” administered by the National Association of Chemical Distributors (NACD 1998). About 270 print shops participated in the Great Printers Project as of December 1997 according to the Environmental Defense Fund.

Table 2. Sectoral participants

Sector	Voluntary Agreement
Agriculture	AgStar The Ruminant Livestock Methane Program Pesticide Environmental Stewardship Program
Forestry	Sustainable Forestry Initiative
All Manufacturing (Standard Industrial Codes 20-39) (See Table 3.)	33/50 Climate Wise WasteWise ^a Environmental Accounting Project Environmental Leadership Program Green Lights Indoor Environments Program WasteWise
Mining	Coalbed Methane Outreach Program
Energy	Energy Star Transformer Program Natural Gas Star Program WasteWise
Transport	Landfill Methane Outreach Program Responsible Care Responsible Carrier Responsible Distribution Process Transportation Partners WasteWise
Packaging Services	Green Lights Water Alliances for Voluntary Efficiency (WAVE) WasteWise
Construction Industrial, Commercial, and Residential Buildings	Energy Star Buildings Green Lights Indoor Environments Program Energy Star Residential Programs Green Lights Indoor Environments Program
Hazardous Waste Generators, Haulers, Landfill	Landfill Methane Outreach Program Waste Minimization National Plan WasteWise

Source(s): U.S. EPA. 1997c. Risk Reduction Through Voluntary Programs. Office of Inspector General. Report of Audit. Washington, D.C.: EPA; U.S. Environmental Protection Agency. 1996d. Partnerships in Preventing Pollution: A Catalogue of the Agency’s Partnership Programs. Office of the Administrator. Washington, D.C.: EPA; Dowd, Jeff and Gale Boyd. 1998. A Typology of Voluntary Agreements Used in Energy and Environmental Policy. Washington, D.C.: U.S. Department of Energy, Office of Policy and International Affairs; Kappas, Peter Denison. 1997. The Politics, Practice and Performance of Chemical Industry Self-Regulation. Doctoral dissertation in political science. University of California, Los Angeles.

Note: ^aEPA refers to the program as WasteWi\$e.

Sectors targeted

Voluntary agreements target individual companies in roughly nine major U.S. sectors -- from extraction (mining, forestry) to manufacturing (chemicals, electronics and computers). (See Table 2.) No national voluntary agreements specifically seek to reduce waste associated with packaging. However, EPA's WasteWise program encourages more than 400 organizations from 35 different business sectors to reduce waste generation and improve recycling.

Some U.S. public voluntary agreements target more than one sector (Energy Star, Green Lights, WasteWise, Climate Wise). For example, Energy Star programs include agreements with construction, electronics, office equipment, and energy firms. Others target individual sectors or industries. Examples include: the Voluntary Aluminum Industrial Partnership (primary aluminum); Water Alliances for Voluntary Efficiency (hotels), and the Coalbed Methane Outreach program (coal mining). CSI targets six industry groups: computers and electronics; iron and steel; automobiles; printing; metal finishing; and petroleum refining. Unilateral agreements target individual industries (e.g., Sustainable Forestry Initiative; Great Printers; Responsible Care (chemicals)).

Of the 33 voluntary programs that EPA administers, 14 target the manufacturing and energy sectors. This observation is consistent with the goals and foci of voluntary climate change and pollution prevention programs. Table 3 illustrates voluntary programs that target industries classified as manufacturing under U.S. Standard Industrial Classification Codes (20-39). In the United States, manufacturers are required to report annually on releases and transfers to the Toxics Release Inventory (TRI). TRI was developed under the Superfund Reauthorization Amendment's Emergency Planning and Community Right to Know Act (EPCRA). EPA uses the TRI reports to track the progress of manufacturers in voluntary programs such as 33/50.

Private sector characteristics

Chemical manufacturers and distributors participate in the greatest number (seven) of voluntary programs, followed by electronics and computer manufacturers. It is likely that high chemical industry rates are due to Responsible Care and its complementary initiatives. For example, EPA found chemical industry participation in 33/50 to be significantly higher than firms in other industries (U.S. EPA 1995a, 1995b). About 30 percent of all firms in the chemical industry participated in 33/50. On average, about 12 percent of firms in other manufacturing industries participated in 33/50. It is unclear why voluntary agreements are popular among electronics and computer firms. One factor may be EPA's selection criteria for CSI and Project XL. The agency prefers applicants that have a strong record of participating in other EPA voluntary initiatives (NAPA 1995; U.S. EPA 1996b). Another may be due to the high use of toxic and hazardous substances in electronics and computer manufacture.

No comprehensive data have been developed to illustrate the composition of VA participants according to company size. EPA and trade organizations such as CMA offer largely anecdotal evidence to show that voluntary programs involve equal numbers of large, medium, and small-sized firms. The heterogeneous composition of CMA's membership supports such claims. CMA's 190 member companies include firms with one plant and \$6 million in annual sales as well as companies with multinational facilities and \$20 billion in annual sales (Kappas 1997). Roughly 100 CMA members, known as the "Council of 100," have less than \$150 million in annual sales (CMA 1997b). The expansion of Responsible Care to other trade associations has increased the number of small and medium-sized participants. For example, Synthetic Organic Chemical Manufacturers Association (SOCMA) member companies typically have less than 50 employees and \$50 million in annual sales. The Great Printers project primarily targets print shops with less than 20 employees.

Table 3. Manufacturing industry participants

Standard Industrial Codes 20-39	VA
Food	Project XL
Tobacco	
Textiles	Encouraging Environmental Excellence
Apparel	Design for the Environment Encouraging Environmental Excellence
Lumber	Sustainable Forestry Initiative
Furniture	
Paper	Project XL Sustainable Forestry Initiative
Printing	Great Printer's Project Design for the Environment Common Sense Initiative
Chemicals	Responsible Care Responsible Distribution Process Responsible Recycling Code Coatings Care Green Chemistry Program Project XL Partnership to Eliminate HFC-23
Petroleum	Strategies for Today's Environmental Partnership Common Sense Initiative
Plastics	
Leather	
Stone/Clay/Glass	
Primary Metals	Common Sense Initiative Voluntary Aluminum Industrial Program Environmental Stewardship Initiative
Fabricated Metals	Design for the Environment Common Sense Initiative
Machinery	Energy Star Office Equipment
Electrical Equipment	Common Sense Initiative Project XL Design for the Environment Energy Star Office Equipment Project XL Environmental Stewardship Initiative
Transportation Equipment	Design for the Environment Common Sense Initiative

Source(s): U.S. EPA. 1997c. Risk Reduction Through Voluntary Programs. Office of Inspector General. Report of Audit. Washington, D.C.: EPA; U.S. Environmental Protection Agency. 1996d. Partnerships in Preventing Pollution: A Catalogue of the Agency's Partnership Programs. Office of the Administrator. Washington, D.C.: EPA; Dowd, Jeff and Gale Boyd. 1998. A Typology of Voluntary Agreements Used in Energy and Environmental Policy. Washington, D.C.: U.S. Department of Energy, Office of Policy and International Affairs; Kappas, Peter Denison. 1997. The Politics, Practice and Performance of Chemical Industry Self-Regulation. Doctoral dissertation in political science. University of California, Los Angeles.

EPA's initiatives appear slightly skewed towards large companies. For example, of the seven industrial facilities that currently participate in Project XL, four employ more than 500 workers. Three XL participants (Intel, Merck, Weyerhaeuser) are large corporations. One (HADCO) operates plants in four states. One is a military base operated by the Department of Defense. Among the six CSI groups, two -- printing and metal finishing -- target small firms that employ less than 20 people. Four -- automobiles, petroleum, computers and electronics, and iron and steel -- target large companies.

While the agency maintains no systematic inventory of participants according to firm size, EPA examined the composition of 33/50 Program participants. The agency reports a 60 per cent participation rate among large firms at the program's close (U.S. EPA 1995). This estimate is somewhat higher than Arora and Cason's (1995) finding that firms with a large number of employees were 44 per cent more likely to participate in the 33/50 Program than small firms.

While most voluntary initiatives target manufacturers, EPA has entered into voluntary partnerships with companies in the agricultural, construction, and service sectors as well. For example, the Energy Star Buildings program encourages construction firms to build more energy efficient homes and offices. The Water Alliances for Voluntary Efficiency (WAVE) program encourages 26 hotel chains to reduce water use and energy consumption through the installation of water-efficient equipment. AgStar and the Ruminant Livestock methane program target farmers. The Pesticide Environmental Stewardship program is administered jointly by EPA, the U.S. Department of Agriculture, and the Food and Drug Administration. The initiative promotes the adoption of integrated pest management (IPM) strategies.

Public sector characteristics

Most voluntary agreements are between EPA and individual manufacturers. Some agreements also include interested political jurisdictions, such as states and localities. Several EPA voluntary partnerships do not involve industry at all. For example, the Voluntary Standards Network is an inter-agency mechanism to coordinate EPA interests in international voluntary standards. Developed in 1993, a major focus of the standards network is the development and implementation of ISO 14000 Environmental Management Standards (U.S. EPA 1996d). EPA also participates in the U.S. Initiative on Joint Implementation (USIJI). USIJI is designed to promote international projects to reduce greenhouse gas emissions.

In addition to VAs that address international issues, EPA administers several voluntary programs that target states and localities. The State and Local Outreach Program helps jurisdictions to build their capacity to reduce greenhouse gas emissions (U.S. EPA 1996d). The Indoor Environments Program enlists national medical, consumer, public interest, and private sector groups to disseminate information to improve indoor air quality. Established in 1995, the Indoor Environments Program has formed over 600 partnerships with organizations such as the American Lung Association and the National Association of Counties.

Among the three VA categories, negotiated agreements involve the widest array of participants up front in order to minimize potential legal challenge later on. CSI used a process under the Federal Advisory Committee Act (FACA) to appoint 150 representatives from industry, trade organizations, labor, environmental, and environmental justice organizations to participate. FACA is a law to insure fair representation. Project XL requires industry participants to recruit residents who live near participating facilities, or who have a direct interest in the outcome, to participate in a six-month negotiation process (U.S. EPA 1996b).

In contrast, industry-led efforts such as Responsible Care excluded environmental and labor organizations from program development. Instead, CMA recruited about 15 relatively unknown public participants to assist in Responsible Care's development. CMA excluded representatives from prominent environmental and labor organizations in order to preserve Responsible Care's autonomy (Kappas 1997).

While it was not developed with the input of national environmental groups, Responsible Care encourages member plants to establish 15-member community advisory panels (CAPs). The CAP process has proven to be so popular that firms outside the chemical industry have patterned similar public involvement programs after it. For example, computer chip maker, Intel Corporation, adopted CMA's community advisory process for all of its facilities. Intel used the CAP process to meet EPA's public participation requirements under Project XL.

III. Legislative Background and Policy Context

The goals and scope of VAs in the United States illustrate the context in which they operate. In general, EPA and industry use voluntary agreements to either: 1) address risks that U.S. laws and regulations fail to adequately target; or 2) integrate individual air, water, waste, and toxics laws and programs (NAPA 1995; NAPA 1997; Davies and Mazurek 1998). Negotiated agreements in the United States are designed to improve the effectiveness and efficiency of laws by providing relief to regulated industry.

To better understand the context in which VAs operate, it is necessary to identify briefly nine major U.S. pollution control laws. Among the nine laws, three the Clean Air Act, the Clean Water Act, and the Safe Drinking Water Act are based on the environmental medium in which pollution occurs. The Resource Conservation and Recovery Act is focused primarily on a medium -- land -- but deals with other matters as well. The Federal Insecticide, Fungicide, and Rodenticide Act deals with a particular set of products. The Toxic Substances Control Act deals with chemicals in general. The Comprehensive Environmental Response, Compensation and Liability Act, also known as "Superfund," deals with accidents, spills, dump sites, and liability. The Superfund Reauthorization Amendments (SARA) established the TRI. Two (the National Environmental Policy Act and the Pollution Prevention Act) deal with general policy (Davies and Mazurek 1998).

The type of VA applied depends on the nature of the environmental problem and the degree to which federal laws and policies address the problem. For example, EPA uses voluntary agreements to target high-risk problems such as atmospheric pollution or indoor radon that are international or local and thus beyond the immediate scope of U.S. laws. Some VAs target problems that are not regulated under federal law. For example, WasteWise attempts to reduce solid waste generation while the Water Alliances for Voluntary Efficiency (WAVE) program is designed to reduce water consumption.

Public voluntary programs typically focus on individual chemicals (33/50) or problems restricted to individual media (e.g., atmospheric pollution). In contrast, negotiated and unilateral agreements attempt to integrate the fragmented air, water, and waste laws and programs. For example, a number of CSI and Project XL efforts seek to develop consolidated permits, instead of permits that address each medium separately. EPA also hoped that Project XL participants would seek to conduct facility-level pollutant trades across different media. However, participants have not sought to develop such projects because EPA lacks authority under the current system of statutes to authorize cross-media pollutant trades.

Congress passed the Pollution Prevention Act of 1990 in order to promote integrated prevention measures. In practice, the law is inadequate to overcome the control-based focus of air, water, waste, and

toxics legislation. One reason is that unlike existing pollution control laws, the Pollution Prevention Act largely establishes voluntary -- rather than mandatory -- national policy goals (Gottlieb 1995). Ten EPA voluntary programs have pollution prevention as a primary goal. Most others have prevention as an ancillary objective.

Project XL and CSI represent EPA's most direct attempt to date to reform environmental regulation (Davies et al. 1996; U.S. GAO 1997a). Both were designed in response to complaints from the regulated community regarding the growing detail and complexity of federal pollution control laws (Pedersen 1995). Consider that the 1990 amendments to the Clean Air Act are more than 300 pages long and add 162 statutory deadlines to EPA's workload. The detail is driven by a mistrust of EPA by Congress (Davies and Mazurek 1998). In response, Congress in 1994 advanced 13 bills designed to reform environmental regulation. In general, the bills have sought to require federal regulatory agencies to evaluate the risk and cost of regulation. Project XL and CSI were developed by the Clinton administration as an alternative to regulatory reform bills.

Legality and sanction

Among U.S. VAs, only Project XL contains legally binding provisions. This is because only Project XL promises to provide firms relief from existing laws and regulations. In exchange, participants must be able to demonstrate environmental performance superior to status quo standards. Typically, the legally binding portions of an XL agreement are contained as a separate document such as a permit to ensure the agreement's enforceability. Non-binding provisions appear in what is known as a "Final Project Agreement (FPA)." Enforceable provisions carry sanctions such as compliance actions and fines. Failure to meet non-binding commitments results in FPA termination. In theory, CSI would eventually produce agreements with legally binding provisions. To date, the effort has only led to projects that contain non-binding commitments.

For most EPA voluntary initiatives, participants sign non-binding letters of agreement such as a Memorandum of Understanding (MOU), which imposes no sanction for program withdrawal. Failure to meet the MOU terms means that the company can no longer claim the benefits of participation, which usually consist of public recognition. The threshold for participation in 33/50 was even lower. The program simply asked potential participants to send EPA a letter indicating their willingness to reduce the 17 targeted chemicals. In the case of 33/50, firms were free to reduce as much or as little as they saw fit.

For most unilateral agreements, participation is a condition of trade association membership. Companies make an ethical pledge to meet program goals. Sanction is the threat of dismissal from the trade organization. The only evidence of dismissal to date comes from the American Forest and Paper Association. The trade organization terminated 15 of its 167 members for failure to comply with the Sustainable Forestry Initiative in 1996 and suspended another company in 1997 (AFPA 1998). Responsible Care participants that fail to implement management practice codes, or make adequate progress toward program goals, are subject to a sequence of actions, commencing with letters of inquiry and terminating with dismissal. There is no evidence to suggest that CMA has terminated membership. The trade association prefers to provide information and technical assistance to laggards, rather than punish them with expulsion (Ember 1992).

Reporting and monitoring

Public voluntary programs (33/50, Green Lights, VAIP, Climate Wise, Energy Star) and unilateral programs (Responsible Care) primarily monitor progress through annual self-reporting (Kappas 1997; Dowd and Boyd 1998). Responsible Care participants can elect to obtain independent, third party

verification. Since 1997, only ten out of CMA's 190 members have elected to participate in third-party reviews (Chemical Week 1997b). CMA members are not required to disclose results to the public or to other companies.

For most public voluntary programs, EPA measures progress in terms of pollution reduction goals. For example, progress under 33/50 was measured according to pounds of toxic emissions reported to TRI. Green Lights participants report on how many square feet of conventional lighting are converted to energy efficient bulbs. Based on these data, EPA extrapolates pollution reduction from energy savings. In some cases, EPA collects data not so much to monitor progress but to conduct research (Storey et al. 1996). For example, EPA requires participants in the Voluntary Aluminum Industrial Partnership to report annually on anode effects and the duration of aluminum production levels (Dowd and Boyd 1998).

For XL projects, reporting and monitoring requirements vary from facility to facility. Reporting frequency may be annual, bi-annual, or quarterly. Most are self-reported. Legally binding provisions contained in separate enforceable documents may be subject to government verification. In contrast, CMA assesses participant progress under Responsible Care in terms of implementation. CMA allows firms to individually define "full implementation." Results are self-reported. CMA measures progress toward environmental goals based on member company reports filed by law with EPA and other federal agencies such as the Department of Transportation.

Motivations

As the foregoing discussion suggests, regulators use voluntary programs to extend the scope of laws or to promote their integration. More recently, regulators have sought to reduce costs and pollution by providing companies with regulatory relief. While the private sector complains about the rising cost and inflexibility of environmental regulation, it is difficult to state with certainty why companies find VAs appealing. Part of the problem is likely due to the fact that U.S. industry fails to articulate exactly what laws and regulations companies find burdensome. The U.S. General Accounting Office (GAO) in 1996 sought to gain some insight on the "cumulative impact of regulations on companies." GAO researchers were only able to identify 51 companies willing to even participate in the study. Few companies were able to specify what regulations were burdensome. The GAO study concludes that measuring the incremental impact -- direct costs, indirect costs, and benefits -- of federal regulations is "an extremely problematical endeavor (U.S. GAO 1996)."

Independent studies of several prominent VAs (33/50, Project XL, CSI, Green Lights, Responsible Care) provide some insights. Public recognition appears to be a key factor. Positive public perception may indirectly reduce the possibility of higher abatement or reporting costs that would otherwise arise from more stringent regulation. Voluntary climate change programs may present a more palatable alternative to regulation given lingering albeit declining disputes regarding atmospheric air pollution risk. Companies also prefer programs such as 33/50 that are easy to implement with low or zero incremental administration costs (Davies et al. 1996).

Arora and Cason (1995) examined the statistical probability of a firm participating in the 33/50 Program during the initiative's first two years. Their analysis shows that firms characterized by high customer interfacing were 20 per cent more likely to participate in the program. The authors speculate that one reason for greater participation among this segment is due to greater proximity to the final customer. EPA marketed the program as a means for firms to gain public recognition for responsible environmental management.

Project XL participants such as Intel Corporation report that their primary motivation in participating was to improve community relations (Boyd, Krupnick, and Mazurek 1998). Similarly, CMA marketed Responsible Care primarily as a method to improve public opinion (Chemical Week 1991). CMA convinced its membership that the continued survival of the industry requires reversing the public's negative perception of the chemical industry. To promote adoption, CMA members designed Responsible Care to mirror participants' ongoing environmental, health and safety (EHS) programs (Kappas 1997).

IV. Implementation

In theory, the primary disadvantage of VAs arises from the collective nature of their benefits -- participants have a strong incentive to act as free riders. Voluntary agreements also may act to exclude competitors and restrain trade. Such practices may privately benefit participants but not society generally by reducing supply and increasing cost. Another potential problem is that industry may use VAs to influence and capture the details of environmental policy. In practice, such problems have not yet been observed because laws impede VA implementation. In particular, negotiated strategies designed to provide regulatory relief fail because EPA lacks legal authority to waive regulatory requirements. Unilateral approaches are weakened primarily by legislation to minimize anti-competitive behavior.

For all VA categories, environmental laws impede implementation because Congress and the courts require EPA to focus attention and resources on meeting legal requirements and judicially imposed deadlines (NAPA 1995). The persistence of pollution control laws also makes it difficult for groups that traditionally act as adversaries to effectively harness cooperative strategies (Davies et al. 1996). While cooperative strategies tend to be more inclusive than status quo approaches, they also are less transparent.

Negotiated agreements

Implementation of Project XL and CSI is hampered because Congress has not given EPA the authority to provide firms with relief from existing laws and regulations (NAPA 1995; Davies et al. 1996; NAPA 1997). The results are two fold: First, the lack of regulatory flexibility has led to suboptimal outcomes, with projects that are largely possible under existing regulations. For example, EPA cannot authorize companies to reduce abatement costs via plant-level pollutant trades. The second problem is procedural: When government or trade associations fail to possess legal authority, they can only act by achieving some degree of consensus. This situation gives each participant a potential veto power and leads to large, sometimes intractable transaction costs. Reliance on consensus-based methods also fail to maximize outcomes. Instead, they tend to result in goals that represent the lowest common denominator on which all parties agree. In the extremely adversarial context of U.S. environmental regulations, consensus is typically difficult to achieve. Consider the CSI case.

In 1996, procedural problems contributed to EPA's dismissal of two CSI participants perceived as obstructionist. Procedural problems slowed CSI's progress, causing petroleum companies to defect in 1996. Automobile manufacturers announced plans to withdraw from CSI by mid-1997 (Inside EPA 1997). Withdrawal was ultimately unnecessary because the sector group completed its work in mid-1997. The exodus of industry followed the departure of several environmental justice groups, as well as representatives from the State of Michigan.

EPA has attempted to address implementation problems by issuing a number of guidelines that explain more clearly criteria for decision making. The agency also is reevaluating whether the consensus process is a realistic operating procedure. Finally, EPA has hired neutral, third party facilitators to help minimize unnecessary conflicts at CSI meetings.

In contrast to CSI, Project XL's limitations stem more directly from uncertainties regarding its legality. However, the time and resources required to negotiate the first three XL agreements were higher than forecast due to procedural problems. Under Project XL, EPA agreed to give up "letter of the law" compliance with all applicable regulations in return for environmental performance exceeding what traditional regulation could bring. Because the experiment involves negotiation, it was understood that initial transaction costs to industry, to regulators, and to public participants would be high for all parties. It was hoped that the benefits in cost reductions accorded by increased compliance flexibility would more than make up for delays and costs of negotiations.

Concerns regarding the legality of Project XL have resulted in participation rates lower than EPA originally envisioned. While EPA had originally hoped to admit 50 firms to Project XL, the agency since 1995 has approved seven plans -- all of which are currently underway (U.S. EPA 1998c). (See Table 4.) Nine additional projects are in various stages of development or negotiation; and 30 proposals have been withdrawn or rejected. As mentioned, questions regarding the legality of XL projects also have resulted in proposals that fall largely within the scope of existing laws. As a result, environmental benefits are likely to be lower than originally envisioned.

While XL projects are largely possible under current laws, environmental groups nonetheless worry that XL projects could set precedents that would weaken existing laws and regulations. For example, at Intel's XL effort in Arizona, local participants agreed to provide Intel with relief from air permitting requirements in exchange for a set of binding and voluntary environmental commitments. The local community supported the plan. However, 130 non-local environmental organizations and individuals signed a petition in protest of the agreement (CRT 1996). It has been suggested that national environmental groups protested the Intel XL plan because they were not invited to participate in the formal, six-month project negotiation (see NAPA 1997). EPA reasoned that only parties directly affected by the project outcome should participate in the bargaining process (U.S. EPA 1996f).

Table 4. Project XL participants

Company/Product	Project Agreement
Berry Corp./juice company	Comprehensive plan to replace all permits and eliminate costs associated with permit preparation.
HADCO/printed wiring board manufacturer	Remove wastewater sludge from regulation under the Resource Conservation and Recovery Act.
Weyerhaeuser/paper manufacturer	Reduce effluent, water use, solid waste generation in exchange for the ability to consolidate reporting requirements and waive government review of routine production modifications.
Merck/pharmaceuticals	Lifetime caps on criteria pollutants in exchange for waiver of government review of routine production modifications.
Osi specialties/chemical manufacturer	Install pollution controls in advance of when they are required in exchange for EPA deferral on new organic emissions regulations.
Intel Corporation/semiconductor manufacturer	Adopt facility-wide operating plan for air, water, and waste. Adopt emissions caps below federal legal requirements in exchange for government waiver of routine production modification permit review.
Vandenburg Air Force Base	Waiver of air permitting review. In exchange, military facility will use compliance savings to upgrade and retrofit emissions controls.

Source: U.S. Environmental Protection Agency. 1998c. Project XL home page. Office of Reinvention. Available at: http://199.223.29.233.xl_home.

Unilateral agreements

Among the VA types, unilateral programs have the greatest potential to restrain trade within an industry by changing relative costs or by establishing entry barriers. CMA designed Responsible Care with attention to anti-trust law (Kappas 1997). As a result, the industry has successfully managed to avert competitiveness issues. Furthermore, companies report that Responsible Care has had no impact on price, which remains the principle basis of competition in the industry. The trade-off is that Responsible Care has resulted in an initiative that more closely mirrors an ethical set of codes rather than industry self-regulation with standards, deadlines, and sanction.

Responsible Care combines the procedural shortcomings of negotiated strategies with several of the status quo system's most inefficient features. Like environmental regulations, Responsible Care's management practice codes are uniform and are administered by a Washington D.C.-based organization that assumes the role of a quasi-bureaucracy. Like negotiated strategies, Responsible Care was developed through a consensus-based process. Concerns regarding the initiative's legality similarly diluted project goals and objectives.

In contrast to Project XL, Responsible Care's chief impediment is anti-trust law. According to Kappas (1997) it is only within narrowly defined limits that antitrust law and regulation in the United States recognize the right of industry associations to develop and enforce self-regulatory codes. Responsible Care's design reflects a rational decision on behalf of CMA and its members to develop institutions that minimize the potential for antitrust authorities to view the initiative as a restraint on trade.

In response to anti-trust legislation, CMA developed codes that minimize the potential for discriminatory or exclusionary behavior on behalf of member companies. Primarily, CMA refrained from the use of codes that would require companies to employ specific management strategies, actions, or outcomes. CMA's ability to use such methods would have made Responsible Care considerably less ambiguous and more transparent. Uncertainties regarding the legality of Responsible Care therefore have the added effect of limiting the effectiveness of monitoring and enforcement.

Anti-trust legislation also constrained the type of decision-making tools that CMA could use in Responsible Care's development. According to Kappas, courts in the United States have determined that trade association use of product or process standards allowed firms to fix prices and, in effect, restrict competition. To further minimize this possibility, CMA used a consensus process, rather than majority rule among its members to minimize the potential for internal schism. While the use of consensus may have minimized potential rifts, it also is likely that the process increased transaction costs. Another result is that the use of consensus also served to dilute Responsible Care's goals (Kappas 1997). In general, it has been demonstrated that the consensus process tends to result in sub-optimal or "lowest common denominator" goals and objectives that minimize potential losses to participants invested in the status quo (Ostrom 1990).

Anti-trust law also constrains the type of enforcement mechanisms available to industry trade groups such as CMA. Courts have interpreted the legislation to limit the types of sanction that trade associations may employ. At most, trade associations may use persuasion to encourage companies to improve practices. Stronger action could be construed as an unreasonable restraint of trade. Thus, CMA relies upon external factors such as status quo law, regulation, and interest group pressure to ensure compliance with Responsible Care (CMA News 1995). To enhance the likelihood of compliance, Responsible Care's management practice codes are consistent with current and reasonable foreseeable future federal and state laws and regulations.

Transparency

Ambiguity surrounding decision-making, monitoring, and reporting requirements has made both Responsible Care and Project XL vulnerable to the charge that they lack transparency (Ember 1992; CRT 1996; U.S. EPA 1996f; Kappas 1997). National environmental groups faulted EPA for failing to develop independent, third party verification methods to monitor companies participating in Project XL (CRT 1996; EPA 1996f). Shortly after CMA unveiled Responsible Care, environmental groups and others faulted the initiative for lack of independent verification systems (Ember 1992). To the extent that it relied on self-reporting and contained virtually no formal participatory requirements, environmental groups were similarly skeptical of the 33/50 Program's achievements (Gottlieb 1995).

Efforts to improve VA transparency have been largely unsuccessful. One reason is that companies dislike the additional burden. For example, when EPA tried to initiate a follow-up to 33/50 that included additional checks and controls, potential industry participants complained and said that they would not participate in a follow-up program (Davies et al. 1996). Similarly, environmental groups wanted EPA to require at least one Project XL participant to use continuous, real-time monitoring methods, instead of estimates, to insure that the firm would meet environmental goals. EPA reasoned that third-party verification for XL efforts was unnecessary because XL projects operate largely within the scope of existing federal laws (U.S. EPA 1996f).

CMA in 1993 developed a third party "management system verification (MSV)" process to increase Responsible Care's credibility. Outside verification of the industry's Responsible Care performance, established in Canada, has been undertaken by about 10 percent of CMA's membership in

the United States (Chemical Week 1997b). The MSV process is not a formal environmental audit, but instead a system to insure that member companies have adequate systems in place to implement Responsible Care's management practices. The verification system is voluntary and not a mandatory requirement of Responsible Care. Furthermore, CMA will treat the results as a member company's privileged information, although the company is free to disclose the results to the public if it wishes. As of July 1997, twelve companies had undertaken the third-party verification and eight others had conducted more limited pilots (Chemical Week 1997b).

V. Assessment

Overview

This section applies eight OECD (1997) criteria to assess VAs:

- Environmental effectiveness
- Economic efficiency
- Administrative cost
- Wider economic effects (e.g., prices)
- Competitiveness implications
- Dynamic effects
- "Soft effects" (e.g., trust, cooperation)
- Viability

The OECD criteria are applied selectively, depending on VA goals and objectives. For example, Responsible Care is assessed primarily with respect to "soft effects" because the program's primary goal is to improve public opinion. Conversely, climate change programs, which assume that participants at worst experience no net benefit, are assessed according to whether or not they will reduce greenhouse gas emissions to 1990 levels.

Because most U.S. VAs are public voluntary programs, they are examined first. This section then reviews the results of unilateral efforts such as Responsible Care. Finally, this section assesses prospectively the degree to which CSI and Project XL can be expected to reduce pollution in a manner more effective and efficient than conventional regulation.

Assessment is hampered by program novelty, lack of data, and weak metering and evaluation methods. In most cases, it is only possible to report on environmental effectiveness. However, poor evaluation methods make it difficult to attribute environmental changes exclusively to voluntary programs. Due in part to the lack of environmental data, virtually no data have been developed to demonstrate whether voluntary approaches are efficient. Some data illustrate administrative and compliance costs. Overall, implementation problems have led to lower-than-expected environmental results.

EPA reports that voluntary programs such as 33/50 reduced 757 million pounds of toxics between 1988 and 1994 (U.S. EPA 1996g). The agency reports that voluntary greenhouse gas emissions programs prevent 24.7 million metric tons of carbon dioxide emissions per year (U.S. EPA 1998b). The agency credits such reductions with saving \$852 million dollars per year. CMA similarly reports that Responsible Care has curbed toxic emissions from chemical manufacturers by 60 per cent since 1988 (CMA 1997b).

To put the voluntary program numbers into perspective, consider that total toxic emissions in 1995 came to nearly five billion pounds and total carbon dioxide emissions to 1 305 million metric tons (U.S. EPA 1997b; U.S. Department of State 1997). Cost savings attributed by EPA to voluntary initiatives represent just a fraction of the \$170 billion dollar annual cost of federal environmental regulations (U.S. EPA 1990). Such figures underscore the “marginal” role and effectiveness of voluntary programs (NAPA 1997). To supplement EPA and trade association data, this section draws from a small but growing literature that examines several of the more prominent U.S. voluntary programs (U.S. GAO 1994; INFORM 1995; Arora and Cason 1995; NAPA 1995; Davies et al. 1996; Storey et al. 1996; U.S. GAO 1997; Kappas 1997; Morgenstern and Al Jurf 1997; NAPA 1997; Dowd and Boyd 1998; Boyd, Krupnick and Mazurek 1998). VAs examined include Green Lights, the 33/50 Program, Responsible Care, Project XL, and CSI.

Public voluntary programs

Climate Change

By all accounts, voluntary climate change programs established under the 1993 Climate Change Action Plan will fail to achieve reductions originally forecast in 1993, according to estimates revised in 1997 by a federal interagency evaluation team. However, experts disagree on the cause of the shortfall. Agencies charged with voluntary climate change program implementation attribute budget cuts and falling fuel prices for lower-than-expected greenhouse gas emissions reductions (U.S. Department of State 1997). However, the General Accounting Office has found that poor assessment methods caused EPA to initially overestimate program effectiveness (U.S. GAO 1997b). While EPA may have overstated program effectiveness, Morgenstern and Al Jurf 1997 developed data that support some of EPA’s program effectiveness claims.

In 1993, the Climate Change Action Plan projected year 2000 baseline emissions to be 106 million metric tons above their 1990 levels. A similar effort published in 1997 projects emissions reductions by 2000 will fall significantly short of 1993 estimates (U.S. Department of State 1997). With current program funding, projected emissions in 2000 will exceed 1990 levels by 188 million metric tons. Agencies charged with VA implementation cite lower-than-expected fuel prices, strong economic growth, and a 40 per cent reduction in funding levels for voluntary programs as factors responsible for the shortfall.

Table 5 compares projections made in 1993 with figures revised in 1997 for some of EPA’s voluntary climate change programs. Direct comparison is complicated because funding level fluctuations have led to the elimination of some voluntary climate change programs (pesticide use), the consolidation of others (Industrial Golden Carrot into Motor Challenge), and the addition (Environmental Stewardship Initiative) or expansion (Green Lights, Energy Star) of others. Projections for both years represent net emission reductions. EPA developed the net projections using a “business-as-usual” baseline. For example, to calculate reductions from Energy Star technologies, EPA subtracted from Energy Star product sales a baseline that includes projected growth in the sale of efficient technologies. Figures in both columns reflect only the Climate Change Action Plan portion of EPA programs, thus total reductions for pre-existing programs such as Green Lights may be higher.

Table 5. Summary of EPA actions to reduce greenhouse gas emissions
(million metric tons of carbon equivalent, MMTCE by 2000)

	1993 action plan estimates	1997 action plan estimates
Green Lights + Energy Star Buildings	3.6	3.4
Energy Star Products	5.0	4.3
Energy Star Transformers	0.8	0.5
Natural Gas Star	3.0	3.4
Landfill Methane Outreach	1.1	1.9
Coalbed Methane Outreach	2.2	2.6
HFC-23 Reductions	5.0	5.0
AgStar	1.5	0.3
Ruminant Livestock Program	1.8	1.0
Environmental Stewardship Program	[new]	6.5
Climate Wise	not est.	1.8
State and Local Outreach Program	not est.	1.9
Seasonal Gas Use for Control of Nitrous Oxide	2.8	0.
Waste Minimization ^a	4.2	2.1
Voluntary Aluminum Industrial Partnership	1.8	2.2

Source: U.S. Department of State. 1997. Climate Action Report: 1997 Submission of the United States of America Under the United Nations Framework Convention on Climate Change, July. Available at: http://www.global/oes/97climate_report/part1.html.

Note(s): ^aIncludes WasteWise, NICE3, and U.S. Department of Agriculture's expansion of Recycling Technology; several of the Climate Change Action Plan (CCAP) programs are part of larger federal efforts. These programs include Green Lights and Energy Star, Energy Star Products and Natural Gas Star. Only the CCAP portions of these programs are included in this table. Also, numbers may not add precisely due to interactive effects and rounding. There is uncertainty in any attempt to project future emission levels and program impacts, and this uncertainty becomes greater with longer forecast periods. The results of this evaluation of CCAP represent a best estimate. They are also based on the assumption that programs will continue to be funded at current funding levels.

According to the revised 1997 projections, Green Lights and Energy Star will reduce fewer emissions than originally forecast. The Landfill Methane and Coalbed Methane outreach programs will reduce more emissions than originally forecast. Two others, AgStar and the Ruminant Livestock Program, will curb less methane than originally forecast. No projections were developed in 1993 for the ClimateWise and the State and Local Outreach programs. Among the voluntary programs, the new Environmental Stewardship Initiative is expected to achieve the greatest reductions. The Environmental Stewardship Initiative targets perfluorocarbons and hydrofluorocarbons from semiconductor production (U.S. Department of State 1997).

A 1997 GAO report found that EPA's projections were inconsistent with the experience of three out of four voluntary climate change programs studied. GAO investigators also faulted EPA program managers for their failure to isolate environmental changes attributable to voluntary programs from other non-program factors. The GAO study examined Green Lights, Source Reduction and Recycling, State and Local Outreach and the Coalbed Methane Outreach Program. EPA credits these four programs with making substantial greenhouse gas emission reductions. The four initiatives also target a cross-section of greenhouse gas emissions and emission sources. Combined, the four EPA programs represented roughly one-third of EPA's \$86 million dollar budget for voluntary climate change programs in fiscal year 1997 (U.S. GAO 1997a).

Among the four programs studied, only projections for the Coalbed Methane Outreach Program were found by GAO to be consistent with the experience of the program to date. Table 6 presents funding levels and projections of gross emissions reductions. At the time of the study, EPA was only able to supply GAO auditors with net numbers for the Coalbed Methane Outreach Program. GAO questioned the basis of EPA's emission reduction estimates for Green Lights, Source Reduction and Recycling, and State and Local Outreach Programs.

GAO also questioned the extent to which Green Lights was responsible for adoption decisions among one-quarter of the program's participants. The program uses information subsidies to encourage the adoption of energy efficient lighting. EPA reports that Green Lights participants have experienced rates of return up to 50 per cent. The agency also reports that total energy savings translate into \$100 million dollars per year (U.S. EPA 1996d). GAO found that 593 of Green Lights' 2 308 participants represented companies that were likely to install energy efficient lighting even in the absence of Green Lights. The subset was comprised of companies that manufacture, sell, and install lighting products. Combined, the 593 companies contributed to about six percent of total emissions reductions attributed by EPA to Green Lights.

Finally, GAO found evidence to suggest that a substantial amount of floor space was upgraded before the Green Lights program was well established. GAO based its findings on a national survey of commercial buildings conducted by the Department of Energy's Energy Information Administration (EIA). The EIA survey found that 43 per cent of commercial floor space had lighting conservation features in the years prior to EPA's implementation of Green Lights.

Morgenstern and Al-Jurf (1997) drew a sample of buildings from a 1992 EIA survey to assess the claims of program effectiveness made by providers of information subsidies such as Green Lights. While they did not focus specifically on Green Lights, Morgenstern and Al-Jurf found that information programs appear to make a significant contribution to the diffusion of high efficiency lighting in commercial office buildings. Morgenstern and Al-Jurf's evidence suggests that information programs such as Green Lights are more effective in encouraging retrofits among those who have already invested in advanced lighting technologies than first-time buyers. While their evidence suggests that information

subsidies may promote adoption, they were unable to examine whether such programs are cost-effective due to insufficient cost data.

Table 6. Participants, funding, and other details about four CCAP programs

	Green Lights	Source Reduction and Recycling	Coalbed Methane Outreach	State and Local Outreach^a
Targeted gas (es)	Carbon dioxide	Carbon dioxide and methane	Methane	Various
Type of participants	Business and government	Business and local government	Coal companies	States, territories, and local government
Number of participants	2,308	513	13 ^b	29 states, Puerto Rico, 42 cities
FY 1996 funding (million \$)	\$20.1	\$2.9	\$1.7	\$5.3
GHG reductions through FY 1995 MMTCE	0.6	0.9-2.4 ^c	2.7 ^d	0.8
GHG reductions in 2000 MMTCE	3.9	4.1-8.9	6.1 ^d	1.7

Source: U.S. General Accounting Office. 1997. Global Warming: Information on the Results of Four of EPA's Voluntary Climate Change Programs. June 30. GAO/RCED-97-163. Washington, D.C.: U.S.GAO. Available at <http://www.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=gao&docid=f:rc97163.txt>.

Note(s): ^aThe State and Local Outreach Program was primarily intended to help lay a foundation for greenhouse gas emission reductions beyond 2000, not to achieve greenhouse gas reductions by 2000. However, according to EPA, the program did achieve substantial reductions through 1996 and is expected to achieve even greater reductions in 2000.

^bRepresents number of projects.

^cData for the Source Reduction and Recycling Program are for fiscal year 1995.

^dRepresents "gross" reductions. "Net" reductions are estimated to be about 40 percent of the "gross" reductions--1.1 MMTCE in 1996 and 2.6 MMTCE in 2000.

EPA assumes that Green Lights participants will experience a rate of return that is at least cost-neutral. Thus, the relevant issue is administrative cost. For EPA, Green Lights funding for fiscal year 1996 was approximately \$20.1 million (U.S. GAO 1997a). Storey et al. (1996) report that annual reporting costs and data collection are estimated to average around \$2 000, including costs for non-reporting elements such as facility surveys to identify lighting upgrade opportunities.

Pollution prevention

EPA points to 33/50 as one of the agency's most successful voluntary programs. While the initiative did reduce toxic emissions, the General Accounting Office (U.S. GAO 1994) and two non-profit organizations (Citizen Fund 1994; INFORM 1995) found that EPA overstated the success of the 33/50 Program. Moreover, there is no evidence to suggest that participants used prevention rather than control methods to achieve 33/50 program goals.

EPA implemented 33/50 in 1991 as a way to encourage companies to reduce voluntarily 17 toxic chemicals reportable to the TRI. EPA challenged companies to reduce emissions 33 per cent by 1992 and 50 per cent by 1995, based on 1988 baseline emissions levels. It was hoped that 33/50 would demonstrate that prevention methods could reduce toxics more expeditiously than conventional abatement methods. Assessment therefore involves two issues: 1) did participants achieve quantitative reduction targets; and 2) are the results consistent with the Pollution Prevention Act's voluntary reduction objectives (U.S. EPA 1997b).

According to EPA, the 33/50 Program's interim and final emissions reduction goals were both met one year ahead of schedule (U.S. EPA 1996g). EPA calculated 33/50 Program reductions for the 17 chemicals by aggregating reductions from all reporting firms. By this method, EPA found that participants reduced the targeted chemicals by 590 million pounds in 1991, and by 757 million pounds in 1994. In 1995, releases and transfers for the 17 target chemicals totaled 664 million pounds, a 55.6 per cent reduction from the program's 1988 baseline. EPA reports that between 1991 and 1994, reductions in releases and transfers among program participants outpaced non-participant reductions by 19 per cent but the actual figure may be even lower (U.S. EPA 1996g).^{4 5}

GAO faulted EPA's 33/50 assessment methods for many of the same reasons it faulted EPA's climate change assessments. Primarily, GAO found that EPA incorrectly attributed emissions reductions to the 33/50 Program. GAO researchers found evidence to suggest that companies had made substantial reductions prior to 33/50's implementation. GAO also faulted EPA's decision to use 1988 emissions as a baseline against which to compare performance under 33/50. GAO's findings were reinforced by another study which found that prior to 33/50's implementation, about 83 per cent of all facilities had started to make reductions in 33/50 Program chemicals (Citizen Fund 1994).

Researchers from INFORM, a non-profit environmental research organization, similarly found that 31 per cent of 33/50 Program participants had already initiated reduction activities prior to 1991. Based on these findings, GAO recommended that EPA only consider reductions achieved between 1991 and 1994. Table 8 shows how the 33/50 Program's results change when the baseline is modified from 1998 to 1991. From this perspective, 33/50 Program chemical emissions fell by only 204 million tons (as opposed to 757) by 1994 -- a 27 percent, rather than 51 per cent decline (Davies et al. 1996).

GAO estimated that about 38 per cent of 33/50 Program reductions were made by non-participating companies (U.S. GAO 1994). EPA's (1996g) estimates are slightly lower. EPA found that about 26 per cent (196 million pounds) of reductions attributed to 33/50 were made by non-participants. EPA nonetheless concludes that 33/50 influenced non-participants to make such reductions.

The 33/50 Program's ancillary goal was to promote pollution prevention. However, GAO found no evidence to suggest that 33/50 promoted prevention measures, as opposed to less-favorable strategies such as abatement (U.S. GAO 1994). Citizen Fund (1994) and INFORM (1995) similarly found 33/50's impact on prevention to be questionable. The studies found 33/50's prevention goals ineffectual because EPA failed to require participants to link reported reductions to the use of prevention methods.

⁴ The 19% figure is relative to releases and transfers only from participating firms, not total 1991 releases and transfers. The 19% difference in reductions by participating firms constitutes an 11% reduction relative to the *total* releases and transfers of 33/50 chemicals in the 1990 reference year. The total releases and transfers is a more appropriate baseline since it was the goal of the 33/50 program to reduce all discharges of 33/50 chemicals, not just those by a subset of firms.

⁵ I am indebted to Kathryn Harrison at the University of British Columbia for making this distinction.

Subsequent modifications to the TRI help to provide further insight into whether 33/50 promoted pollution prevention. In 1991, TRI required reporting facilities to calculate production-related waste as a proxy for prevention. Facilities calculate production related waste by aggregating all recycled, reused, combusted, treated, and released emissions at the facility, as well as for transfers off-site. Table 9 shows that between 1991 and 1994, 33/50 participants reduced production related waste by 1 percent. During this same period, production related waste increased 9 per cent among non-participants (U.S. EPA 1996g).

33/50's impact on economic factors remains unclear. It is likely that the incremental reporting costs to participants were minimal because EPA gauged program progress with TRI reports, which are required by law. However, baseline, metering, and assessment problems make it difficult to evaluate why firms sought to reduce more pollution than laws require.

Arora and Cason (1995) suggest that firms participated in 33/50 as a way to improve public perception. (See Table 10.) They found that companies characterized by high customer interfacing were 20 per cent more likely to participate in the 33/50 Program than companies that manufactured primary or intermediate goods. The authors suggest that companies whose operations are closer to the final customer are more likely to experience the benefits of improved public perception. Arora and Cason also found that firm size increased the probability of participation. They suggest that large firms have greater resources to allocate towards pollution reduction activities than small or medium-sized companies. After controlling for firm size, Arora and Cason found that firms with large releases of 33/50 and non-program chemicals were more likely to participate than companies with small releases, which tends to reinforce the idea that the primary benefit to participants is improved public recognition.

Table 7. Emissions and transfer declines, participants and non-participants

Years	33/50 Program Participants	Non-participants
1991-1994	-49 percent	-30 percent

Source: U.S. EPA 1996g. 1994 Toxics Release Inventory. Public Data Release. Office of Pollution Prevention and Toxics. Washington, D.C.: U.S. EPA.

Table 8. Baseline selection and 33/50 Program results

Reduction Goal/Year	1994 Result (1988 baseline)	1994 Result (1991 baseline)
33 percent by 1992	40 percent	12 percent
50 percent by 1995	51 percent	28 percent

Source: Adapted from Davies, Clarence, Jan Mazurek, Nicole Darnall, and Kieran McCarthy. 1996. *Industry Incentives for Environmental Improvement: Evaluation of U.S. Federal Initiatives*. Washington, D.C.: Global Environmental Management Initiative.

Table 9. Production related waste declines, 33/50 and non-program chemicals

Years	33/50 Program chemicals	Non-program chemicals
1991-1994	-1 percent	9 percent

Source: U.S. EPA 1996g. 1994 Toxics Release Inventory. Public Data Release. Office of Pollution Prevention and Toxics. Washington, D.C.: U.S. EPA.

Table 10. Characteristics of firms likely to participate in the 33/50 Program

Firm Description	Increased Probability of Participation
High customer interfacing	20 percent
High R&D intensity	12 percent
Large number of employees	44 percent
High non-33/50 chemical releases	99 percent
High 33/50 chemical releases	22 percent

Source: Arora, Seema and Timothy Cason. 1995. Why Do Firms Overcomply with Environmental Regulations? Understanding Participation in EPA's 33/50 Program. Discussion Paper 95-38. Washington, D.C.: Resources for the Future.

Unilateral agreements

Unilateral agreements are primarily designed to improve public perception. They do so not by reducing emissions, but by encouraging companies to adopt better environmental management practices. The following discussion summarizes the experience of Responsible Care, the most prominent VA employed in the United States.⁶

Since CMA implemented Responsible Care in 1988, the initiative has been adopted in over 40 countries, or 86 per cent (by production volume) of the global chemical industry (ICCA 1996). Responsible Care's growing popularity suggests that the private costs to companies of participation are outweighed by Responsible Care's benefits. In the United States, it is likely that Responsible Care's greatest potential private benefit is in the form of improved public outreach. The 10-year-old initiative has not significantly altered the general public's perception of the chemical industry. However, Responsible Care has helped to improve relations between some plants and their local communities. The following discussion attempts to resolve the apparent paradox in public opinion.

While CMA's goal is to improve public opinion, CMA has narrowly targeted its message to plant employees and people who live near CMA-member facilities. For example, CMA in 1991 allocated \$4 million to develop public outreach materials (Chemical Week 1991). Efforts to reach the public at large took a lower priority. CMA spent between \$8.5 and \$10 million annually on televised commercials. Despite these expenditures, broader public perceptions of the industry have not improved. The percent of people who hold generally favorable or very favorable views of the chemical industry declined by seven percentage points from 1990 to 1995. (See Table 11.) In 1996, even fewer respondents (20 percent) viewed the industry favorably. Survey questions asked respondents whether the chemical industry

⁶ A companion case study to this survey (Mazurek 1998) examines Responsible Care in depth.

provides adequate information to the public and whether the industry takes sufficient voluntary actions to protect public health and the environment (Chemical Week 1997a).

Employee awareness of Responsible Care has steadily increased over the last three survey years. However, employee understanding of Responsible Care's requirements remains low. CMA's 1996 employee survey shows that 77 per cent of 10 458 employees surveyed are aware of Responsible Care. Only 43 per cent of those polled had a good understanding of the program (Chemical Week 1997c). To increase employee involvement, companies are extending the scope of Responsible Care beyond the plant level to all levels of the corporation.

While public perceptions and employee understanding remain low, most observers agree that Responsible Care's 15-member Community Advisory Panels (CAPs) are the initiative's greatest achievement (Hook 1996; Chemical Week 1997a). Nine out of ten companies surveyed by CMA report that improved community relationships provide the greatest benefit (CMA 1997a). Among the companies surveyed, 61 per cent reported that Responsible Care significantly "improved community dialogue." Surveys of plant neighbors, local politicians, and emergency response personnel familiar with Responsible Care were more favorable to the industry than those who were unfamiliar with the voluntary initiative. Community surveys showed improvement in favorability from 44 per cent in 1989 to over 80 per cent in 1994 (CMA 1997b).

CAPs are credited with providing a formal communications channel between plant managers and the local community. To illustrate their success, CMA points to their growing popularity. There were 316 CAPs in 1997, compared with 56 in 1991 (CMA 1997a). Furthermore, companies outside the industry such as chip maker, Intel Corp., have adopted the CAP process for their own manufacturing facilities.

Table 11. Public favorability towards ten industries, 1990-1995
(percent very/generally favorable)

Industry	1990	1991	1992	1993	1994	1995
Computer		78	78	79	83	82
Food		73	72	73	57	69
Lumber and Paper		61	57	60	57	62
Airline		68	62	62	44	52
Automobile		59	51	42	42	50
Pharmaceutica l		58	51	42	42	50
Petroleum		36	39	41	35	44
Nuclear		33	35	38	25	26
Chemical	28	27	25	26	20	21
Tobacco		15	12	14	12	11

Source(s): NFO Research, Inc. 1989-1993. National Opinion Surveys for the Chemical Manufacturers Association. Arlington, Virginia: CMA; Market Directions. 1994-1995. Attitude and Perception Studies. Arlington, Virginia: CMA.

Table 12. Percent of CMA members with code fully implemented, 1996 (unless noted)

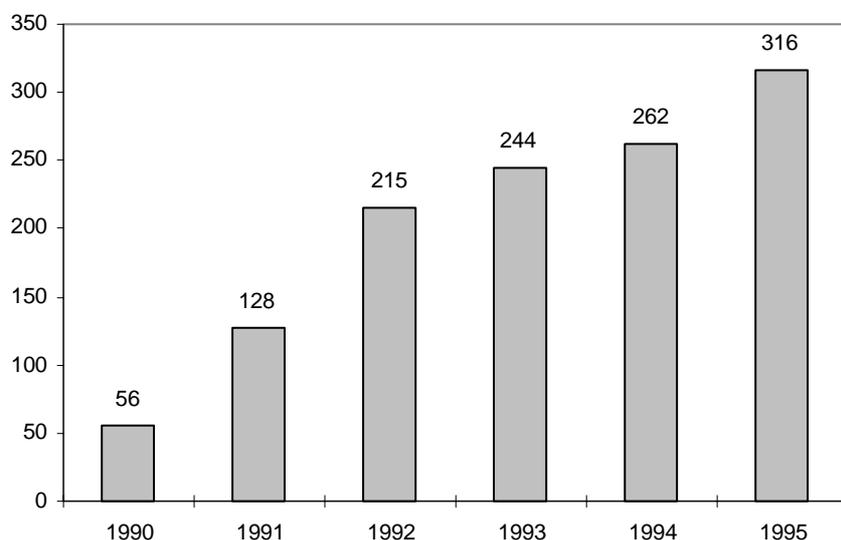
Code	Full implementation
Community Awareness, Emergency Response (CAER)	89 percent
Pollution Prevention ^a	88 percent
Process safety	86 percent
Distribution code	84 percent
Employee health and safety ^a	92 percent
Product stewardship ^a	70 percent

Source: Chemical Manufacturers Association. 1997b. The Year in Review, 1995-1996. Responsible Care Progress Report. Arlington, Virginia: CMA.

Note: ^a 1995.

According to proponents, CAPs have contributed substantially to increased understanding of environmental issues faced by both industry and community. In this regard, local citizens and industry officials have been able to maximize benefits to both the manufacturer and the community (Hook 1996; Chemical Week 1997a).

One explanation for the divergence between the opinions of CAP members and those of the public at large is that CAPs modify risk perceptions by giving outsiders an opportunity to directly meet with plant managers and observe operations. Such interactions build trust and improve public perceptions. However, it is thought that CAPs involve such a small fraction of the population to alter significantly the general public's views (Chemical Week 1997a).

**Figure 2. Community Advisory Panels in the United States, 1990 - 1995**

Source: Chemical Manufacturers Association. 1997b. The Year in Review, 1995 - 1996. Responsible Care Progress Report. Arlington, VA: CMA. 30.

Environmental activists mistrust CAPs because they are established by member companies, rather than by the public. CAPs are perceived by some as a docile process where under-informed citizens simply ratify industry actions (Ember 1992). Industry critics charge that CAP members lack the technical

expertise to sufficiently evaluate and challenge information provided by companies. Industry counters that the lack of controversy simply underscores the level of trust and goodwill engendered by the CAP process (Chemical Week 1997a).

Implementation

Responsible Care is designed to improve public perception through the voluntary adoption of six management practice codes. Assessment of implementation is complicated by the fact that CMA allows member companies to independently define full implementation. Nonetheless, CMA expects member companies to fully implement five of the six management practice codes by 1998 (Chemical Week 1997b). CMA members are expected to fully implement the sixth code, product stewardship, in 1999.

Table 12 displays the percentage of CMA membership that reports full implementation of the six practice codes. According to CMA's most recent progress reports, 92 per cent have fully implemented Responsible Care's employee health and safety code. The code is largely consistent with Occupational Health and Safety Administration (OSHA) law and regulations. Only 70 per cent have fully implemented Responsible Care's product stewardship code, Responsible Care's most novel and complex provision. The product stewardship code requires companies to promote the safe handling of chemicals from initial manufacture to distribution, sale, and ultimate disposal.

Environmental effectiveness

CMA supplements information from member self-evaluation forms with data that member companies must file annually with EPA, the Occupational Health and Safety Administration (OSHA), and the U.S. Department of Transportation (DOT). To monitor pollution prevention progress, CMA collects emissions data reported by companies to EPA's Toxics Release Inventory (TRI). CMA also tracks injury and illness rates reported by companies to OSHA. To monitor distribution accidents, CMA collects records on bulk rail shipment accidents reported to DOT.

According to CMA, members reduced toxic releases to air, water, and land by 52 per cent, or around 350 million pounds, between 1988 and 1994, while sales volume increased 10 per cent (CMA 1998a). CMA bases its calculation on reports from 55 member companies that account for about 90 per cent of all TRI releases and offsite transfers reported by CMA membership. Some of these declines likely reflect commitments on behalf of member companies to voluntarily curb releases and transfers of 17 priority chemicals under EPA's 33/50 program. According to CMA, member companies reduced emissions of 33/50 Program chemicals by 53 per cent between 1988 and 1994 (CMA 1998a).

CMA reports that occupational illness rates have declined over the period as well. In 1990, CMA member companies reported to OSHA 3.61 recordable illness and injuries per 200 000 employee exposure hours. By 1995, the rate had fallen to 2.5 incidents (CMA 1997, 14). Unlike the TRI data, which firms are required to report publicly, OSHA does not require companies to publicly report on illnesses and injuries. Department of Transportation bulk rail shipment data show that CMA member company accidents declined from 378 in 1992 to 262 in 1994, a 21 per cent drop (CMA 1995). CMA will need to collect these data for several years before a clear trend line emerges.

While they illustrate general trends, the federal data are not a reliable Responsible Care progress indicator for several reasons. Primarily, it is impossible to isolate the degree to which changes in the federal data are due to Responsible Care. Second, the federal data contain a number of weaknesses. For example, the TRI requires manufacturing firms that fall within Standard Industrial Classification (SIC) Codes 20 through 39 to report on emissions and transfers of 343 target chemicals. In 1994, EPA expanded

to roughly 650 the number of chemicals on which companies are required to report. EPA's expansion of TRI, which took effect in 1995, makes it difficult to directly compare reports for 1995 with reports from previous years. TRI also exempts firms that employ less than ten workers or use less than 10 000 pounds or manufacture fewer than 25 000 pounds of TRI chemicals per year. Finally, TRI emissions and transfer data are based on estimates, rather than actual measures from the facility that companies report to EPA annually.

Economic effectiveness

About one-sixth of the chemical industry's investment in plants and equipment investment is for environmental improvements such as pollution abatement. Chemical industry pollution abatement spending in 1994 was \$4.6 billion, about 5.8 times larger than the 1975 level (CMA 1998b). Ideally, industry self-regulation would provide firms with sufficient flexibility to use the most cost-effective abatement strategy. However, Responsible Care operates entirely within existing environmental laws and regulations that mandate abatement methods. Thus, it is unlikely that Responsible Care has led to reductions in abatement cost. Even if Responsible Care affected abatement costs, the lack of data to illustrate Responsible Care's environmental effectiveness makes it difficult to estimate abatement cost changes.

To date, Responsible Care's primary benefit to companies is in the form of reduced insurance premiums (CMA 1997a). Some companies have reported achieving 25 to 40 per cent reductions in their insurance coverage though their involvement in Responsible Care. CMA also has worked with several insurance brokers and underwriters to obtain recognition for member companies. Related to reduced insurance costs are declines in workers' compensation costs. While insurers offer lower rates to companies that actively participate in Responsible Care, it is more difficult to attribute declines in occupational illness and injury to the initiative. Nonetheless, several companies reported to CMA that they reduced compensation costs by improving employee health and safety programs and reducing work-related injuries and accidents. For example, one company reports cutting workers' compensation costs from \$2 million in 1988 to \$60 000 in 1996 (CMA 1997a).

Companies cited fewer citations and small fines as a result of Responsible Care. Here too, however, it is impossible to definitively link the declines to Responsible Care. Declines may be due to environmental, health, and safety improvements made by member companies before Responsible Care, or EPA funding cutbacks in compliance and enforcement area. Furthermore, several companies report that their relationships with EPA have improved "dramatically" as a result of Responsible Care. Primarily, companies report that commitment to Responsible Care enables them to convince regulators to reduce product toxicology testing. One company reports that although its number of violation notices and notices of permit noncompliance have increased, fines paid have decreased 90 per cent, indicating a decline in seriousness of reported violations (CMA 1997a).

Negotiated agreements

EPA implemented CSI and Project XL in 1994 and 1995, respectively. Due to their novelty, it is not possible to retrospectively evaluate either initiative. As envisioned, both would provide participants with regulatory relief in exchange for pollution reductions in excess of status quo standards. However, uncertainties regarding the legality of both XL and CSI have caused EPA to dilute their design and goals. As a result, CSI focuses more on processes, rather than quantitative outcomes. While it is possible to count the number of CSI projects developed or the number of CSI participants, such indices fail to reflect the quality of projects or their appropriateness to the industrial sector targeted (SCG 1997). CSI's benefits

are likely to be of the “soft” variety. The initiative has promoted interaction among groups that under the status quo system act as adversaries.

In contrast, some Project XL agreements contain quantitative pollution reduction goals and implementation timetables, although they are non-uniform. It is therefore possible to prospectively assess environmental performance, and administrative and abatement cost issues for XL projects. Moreover, the facility-specific focus of Project XL raises competitiveness issues for at least one project underway.

Common Sense Initiative

CSI’s goal is to achieve “cleaner, cheaper, smarter” results to six industrial sectors and to society. EPA hoped that CSI would become a mechanism for industry, non-government organizations, and regulators to review and, if necessary, revise regulations identified as ineffective or inefficient (U.S. EPA 1994). However, regulatory reform and review have proven most elusive. Industrial sector groups have largely avoided projects requiring regulatory relief precisely because there exists no statutory authority to do so.

Four years after EPA implemented CSI, few of the initiative’s deliberative efforts have translated into regulatory change. Forty-four demonstration projects involved actions possible under current law and regulations (see Table 13). One exception is a sector-wide agreement adopted by the metals finishing industry in October 1997. The agreement contains commitments on the part of EPA to change its regulations affecting the industry, industry-wide goals for full compliance, improved economic payback, and prevention of soil water contamination. The agreement contains enforcement sanctions on firms that fail to meet sectoral goals. The agreement also includes a comprehensive action plan for stakeholders, including state and local regulators, interested organizations, and individuals (U.S. EPA 1998a). The 44 pilot projects primarily represent efforts to incrementally improve how U.S. laws and regulations target industries. Among the current CSI projects underway:

- 23 address regulations
- 20 promote pollution prevention
- 7 seek to reduce record keeping and reporting
- 9 address compliance and enforcement
- 6 address permitting
- 9 attempt to stimulate new environmental technology

To date, no information has been developed to document environmental or economic benefits associated with the 44 projects because most are process-oriented and lack goals or timetables (SCG 1997).

CSI’s institutional features suggest that incremental administrative costs to participants are positive. Administrative costs are likely higher than status quo laws and regulations because the initiative relies on consensus-based negotiation. To administer CSI, EPA must assemble representatives from industry, non-government organizations, and state and local regulatory agencies for quarterly meetings.

Administrative costs borne by EPA include labor time to staff and administer CSI on a day-to-day basis, as well as to assemble participants from across the United States. These costs are likely substantial. For example, in fiscal year 1996, CSI groups met 168 times. In 1995, they met 151 times (SCG 1997). Estimation of EPA’s administrative costs is complicated by the fact that Congress has not provided EPA with the authority to implement the initiative. As a result, EPA must re-allocate

Congressional appropriations and personnel from programs with legislative authorization to administer CSI. Thus, there is no well-defined way in which to determine EPA's costs to administer CSI. For private sector participants, incremental administration costs are likely positive because the initiative is supplemental to activities required by law. For this reason, costs associated with negotiation also are likely to be positive for other stakeholders, including state and local governments, non-government organizations (NGOs) and public participants.

It is likely that CSI's primary benefit is of the "soft" variety. EPA, under CSI, has created a forum where individuals who typically act as adversaries instead work to jointly improve laws and regulations. A 1997 EPA contractor report found that while many participants interviewed were disappointed with CSI's failure to develop tangible products, almost all recognized improvements in the process as a success (SCG 1997). Participants cited increased understanding of other stakeholders and their positions as a real accomplishment. They also reported that getting to know adversaries as individuals was valuable and that these relationships would continue to be beneficial outside CSI. The result is underscored by a survey that measured whether participants would be willing to continue to serve on CSI. Of the 180 participants surveyed, 76 per cent said yes, 9 said no, and 15 per cent were undecided or failed to respond. Among the 9 per cent who no longer wished to participate, about 30 per cent suggested that replacements be sought (SCG 1997).

Table 13. Common Sense Initiative projects

Project	Category
METAL FINISHING SECTOR	
Regulatory information inventory team	Recordkeeping and reporting
Chrome emission pollution prevention technology pilot	Environmental technology
Metal finishing 2000	Regulation
National resource center for metal finishing	Regulation
Compliance leadership through enforcement, auditing, and negotiation	Compliance and enforcement
Environmentally responsible site transition	Regulation
Public treatment facility flexibility, training, and incentives	Regulation
Metal finishing wastewater sludge project	Regulation
Strategic research plan	Environmental technology
Metal finishing guidance manual	Compliance and enforcement
Near zero discharge demonstration project	Environmental technology
Tier 4 facility enforcement project	Compliance and enforcement
Strategic outcomes workgroup	Regulation
Access to capital	Environmental technology
Regulatory assessment of metals products	Regulation
PETROLEUM REFINING	
Equipment leaks project	Regulation
One stop reporting	Recordkeeping and reporting
PRINTING SECTOR	
New York City education project	Pollution prevention
Multi-media flexible permitting project	Permitting

Source: Scientific Consulting Group (SCG). 1997. Review of the Common Sense Initiative. Gaithersburg, Maryland: SCG.

Table 13. Common Sense Initiative projects

Project	Category
AUTOMOTIVE SECTOR	
Automotive assembly plant database	Regulation
Alternative regulatory system principles and process	Regulation
Louisville-Ford community project	Regulation
Tools and policies statement for Life Cycle management	Pollution prevention, regulation
Identify and document supply chains for automotive assembly plants	Pollution prevention, regulation
Life Cycle inventory document	Pollution prevention, regulation
Regulatory initiative project-VOC/Area metric	Regulation
COMPUTER AND ELECTRONICS SECTOR	
National conference on electronic product recovery/recycling	Pollution prevention
Residential collection pilots for end-of-life equipment	Pollution prevention
Barriers to cathode ray tube (CRT) recycling	Regulation
Consensus document to create more flexible system	Regulation
Test components of a more flexible system	Regulation
Reporting and public access to information	Recordkeeping and reporting
Emergency Response Reporting	Recordkeeping and reporting
Barriers to closed loop recycling	Regulation
IRON AND STEEL SECTOR	
Brownfields	not applicable
Alternative compliance strategy	Permitting, enforcement, compliance
Innovative technology web site	Environmental technology
Identification of barriers to use of innovative technology	Regulation
Multi-media permitting	Permitting, pollution prevention
Identify permit issues	Permitting
Community involvement	Pollution prevention
Consolidated multi-media reporting	Recordkeeping and reporting
Spent pickle liquor workshop	Regulation
Redevelopment	Compliance, enforcement, regulation
Improved compliance	Compliance, enforcement, regulation

Source: Scientific Consulting Group (SCG). 1997. Review of the Common Sense Initiative. Gaithersburg, Maryland: SCG.

Project XL

Project XL is an exercise in case-by-case regulation, with negotiations between EPA and the regulated firm driving the outcome but subject to stakeholder approval. The initiative is designed to achieve superior environmental and economic performance than status quo regulation (U.S. EPA 1996b). In November 1996, Intel became the first major U.S. manufacturer approved for Project XL. The world's largest microprocessor manufacturer had a lot to gain. Intel routinely releases a new chip every 18 months and must typically construct new, billion-dollar plants in which to craft them (Hatcher 1994). To achieve refinements and optimize its production process, Intel must constantly modify process chemistries up to 35 times a year and equipment five times a year. However, the manufacturer's ability to make refinements in a timely manner is threatened by air permitting provisions. The facility must obtain approval each time it makes a manufacturing change.

To address these issues, Intel under Project XL sought a five-year air permit that approved chemical and equipment changes in advance. The binding, enforceable air permit is part of a larger package of voluntary commitments to reduce water use and waste generation at the company's newest manufacturing facility in Phoenix, Arizona. The package also contains commitments that fall outside the scope of federal pollution control law. For example, Intel pledges to donate used computer equipment to local schools. The negotiation for the entire XL project, including enforceable air permit provisions, required over nine months, 100 official meetings, and dozens of informal conversations. As required by EPA, Intel assembled 23 official representatives from ten different government agencies and from the local community to negotiate the XL project agreement. At least five Intel employees devoted from 40 to 60 days each on the negotiation.

In addition to official participants, at least four non-local environmental groups filed detailed technical objections to the air permitting portion of the XL agreement, the most visible and hotly contested element of the agreement. The air permit covers emissions of conventional and hazardous air pollutants at Intel's new facility, and gives the manufacturer the ability to construct an additional manufacturing facility without having to secure a new permit. In exchange, Intel pledged to accept air pollution caps for the Phoenix facility set lower than the Clean Air Act Amendments of 1990 require. (See Table 14.)

Three categories of benefit to Intel stem from flexibility in the air permit:

- *Advanced approval of production changes: Under a traditional air permit, Intel's facility would be required to file up to 28 notifications per year.*
- *Plant-wide emissions caps: The XL air permit replaces some individual air emissions limits with aggregate limits. Caps give the plant greater flexibility to use the most cost-effective substances and abatement methods.*
- *The ability to expand operations without re-permitting: Intel may expand its current plant or add an additional facility without securing additional permits -- a process that may require six months to one year.*

Table 14. Project XL emissions and two baselines

Pollutant (tons/per year)	Federal requirements for minor sources	1994 plant air permit	Project XL site permit^a
Carbon Monoxide	<100	59	49
Nitrogen Oxide	<100	53	49
Sulfur Dioxide	<250	10	5
Particulate Matter-10	<70	7.8	5
Total Volatile Organic Compounds	<100	25	40
Hazardous Pollutants (HAPs) ^b	Air <25 10 for individual HAP	aggregate; 5.5 for any	10 Total Organic 10 Total Inorganic ^c

Source: U.S. Environmental Protection Agency. 1996e. Project XL: Final Project Agreement for the Intel Corporation Ocotillo Site Project XL, Office of Policy, Planning and Evaluation. Available at: http://199.223.29.233.xl_home/intel/fpa_final6.html.

Note(s): ^a While Intel has not officially announced plans to construct a second plant at the Arizona site, the emissions levels under the XL permit column are for two plants, or the entire site.

^bHazardous air pollutants (HAPs) are those listed in Section 112(b) of the federal Clean Air Act, as amended; the 10 ton per year limits for total organic HAPs and total inorganic HAPs assume that more than one HAP will be emitted from the site. If a single HAP is emitted from the site, the emissions limit is 9.9 tons per year; based on Intel’s modeling exercise and Arizona Ambient Air Quality Guidelines (AAAQG), the permit establishes a separate limit for phosphene, at 4 tons per year, and sulfuric acid at 9 tons per year, to be included in the aggregated combined inorganic HAP emissions plant site emissions limit.

Boyd, Krupnick, and Mazurek (1998) considered various types of costs and benefits registered as part of Intel’s XL air permit. Cost and benefit categories include environmental benefits, abatement costs, and transaction costs. They also examined potential benefits associated with reducing permit-based delays in production. Overall, they found that the air permit could raise abatement costs for Intel and increase environmental benefits over a standard air permit baseline, although there is ample room for debate over both of these conclusions. As in the case of 33/50, the calculation of environmental benefits is complicated by poor baseline measures: The Intel XL air permit applies to a new plant and to a possible second manufacturing facility that only exists on paper. Because one facility is new, and the other remains in blueprint form, the site lacks an emissions history with which to craft a baseline, or base case to determine what emissions would have been in the absence of Project XL.

EPA and Intel XL project stakeholders decided that absent historic data, the theoretical maximum under the Clean Air Act Amendments of 1990 constituted an appropriate baseline. Non-local environmental groups objected to the use of this baseline measure, claiming that it failed to constitute environmental performance “superior” to the status quo. National environmental groups encouraged EPA to develop an industry air emissions benchmark against which to compare how well the Intel facility actually performed. EPA attempted such a calculation but concluded that the exercise was complicated due to the lack of industry-wide air emissions data (U.S. EPA 1996f). In response to criticism from environmental groups, Intel and EPA adopted as binding a set of voluntary ambient air pollution guidelines issued by the State of Arizona.

In addition to questioning the project's environmental benefits, over 130 non-local environmental groups signed a petition that claimed the project lacked transparency (CRT 1996). Under the XL agreement, Intel agreed to develop public quarterly emissions reports. Emissions estimates are based on the flow of materials and energy into and out of the plant. Such flows are estimated by emissions factors that consider, for example, fuel use and the type of equipment used to generate pollution. However, Intel claimed as confidential any emissions factors that applied to specific equipment. Intel's confidentiality claims make it impossible for the public to independently verify quarterly emissions reports.

Controversy surrounding the XL air permits required Intel, government agencies, and public volunteers to spend more time and money than required to develop a traditional air permit. Unexpected involvement from non-local environmental organizations increased even further the cost and time required of all participants to secure the XL air permit. However, costs to administer the permit over its five-year life are likely lower than a traditional permit, since a traditional permit would require Intel to notify local air regulators each time a production modification occurs. The XL permit's pre-approval provisions may save the manufacturer time and money, and reduce administrative costs borne by local government agencies.

Positive private abatement and transaction costs associated with the XL permit are likely outweighed by permit features that reduce the threat of production delay. Perhaps more than in any other major industry, delayed semiconductor production translates into significant foregone profits and (perhaps) foregone consumer benefits. The importance of time-to-market in the semiconductor industry is illustrated by the fact that in five years, the average Intel plant introduces at least two new generations of process technology (Hatcher 1994).

Potential private benefits associated with reduced delay include accelerated income benefits, or the ability for the firm to achieve profits sooner rather than later. By extension, consumers may benefit from having the latest chips today, rather than tomorrow. Whether or not the firm experiences such benefits is complicated by a number of issues. One of these is related to Intel's strategy to produce in rapid succession new products that make existing products obsolete. If a new product is introduced too soon, it cannibalizes the old. The complementarity of chips adds another layer of complexity to the estimation of benefits that arise from speeded product introduction.

The greatest potential source of private benefit to Intel is likely due to the effects of accelerated product introduction in a competitive environment. In the presence of competition, delay threatens to erode slim technological and marketing leads. Accelerated permits may provide the firm with "first-mover" effects that allow the firm to pursue strategies to deter the entry of competitors. Market dominance may be reinforced by "platform effects" -- that is, Intel's alliance with software and hardware manufacturers.

The existence of economic benefits to Intel need not imply economic benefits to society generally (Boyd, Krupnick and Mazurek 1998). Theoretically, product introductions can be too early, too numerous, and lead to higher prices. Consider the case of early adoption. The private benefits of moving products to market first comes at the expense of rival firms. Moreover analyses of first-mover behavior suggests that market power can be created and that such power has ambiguous effects on social welfare. By definition, firms with market power can sustain price levels that exceed production costs.

In addition to benefits associated with accelerated product introduction, it is possible that a firm's participation in Project XL, particularly in the early phases of the program will help to build "goodwill" with EPA and with the public. Indeed, Intel representatives claimed that building goodwill

with the community in which their new facility was located was the primary benefit of Project XL participation (Boyd, Krupnick and Mazurek 1998). However, the existence of this goodwill is by no means certain and in any event difficult to measure.

Boyd, Krupnick and Mazurek conclude that precise measurement of the XL air permit's incremental effects is likely to be difficult, if not impossible. This is due in part to the site-specific nature of the XL air permit. It also is due to the complex effects that any form of regulation -- including command and control -- can have on the private sector. While it is difficult to isolate the effects of the XL air permit with precision, analyses of such effects can provide suggestive evidence on the social welfare effects of the XL agreement.

VI. Conclusions

Voluntary programs in the United States combine the features of unilateral, negotiated, and public voluntary approaches employed in the European Union (EU). EU features are selectively applied to fit U.S. goals and regulatory requirements. In the United States, VAs are primarily employed to address legislative shortcomings. Most U.S. voluntary efforts are cooperative, non-mandatory strategies. However, the persistence of federal laws impedes VA implementation, particularly of industry-led efforts and public projects that employ negotiation (Davies et al. 1996; Kappas 1997; Boyd, Krupnick and Mazurek 1998). As a result, voluntary approaches remain largely "marginal" to federally mandated air, water, waste, and toxics programs. Implementation of voluntary agreements may be strengthened by the consideration of legal factors. However, in the United States, it is likely that the effectiveness of VAs will remain limited until the existing legislative framework is changed.

Implementation problems have led to lower-than-expected environmental results for all VA categories. Among the different types of VAs employed in the United States, programs designed to reduce greenhouse gas emissions and a subset of toxic chemicals have contributed to emissions declines. However, weak evaluation methods likely caused EPA to overstate the environmental effectiveness of both climate change and prevention programs.

In all cases, VA assessment is hampered by program novelty, lack of data, and weak metering and evaluation methods. In most cases, it is difficult to attribute environmental changes exclusively to voluntary programs. Due in part to the lack of environmental data, virtually no studies have been developed to demonstrate whether voluntary approaches are efficient. Some data illustrate administration and compliance costs. A small but growing VA literature underscores the need for better methods to evaluate VAs (U.S. GAO 1994; INFORM 1995; Arora and Cason 1995; NAPA 1995; Davies et al. 1996; Storey et al. 1996; U.S. GAO 1997a, 1997b; Kappas 1997; Morgenstern and Al Jurf 1997; NAPA 1997; Dowd and Boyd 1998).

The data that do exist identify a number of "soft effects." Participants in Responsible Care, 33/50, CSI, and Project XL all cite public opinion and/or regulatory goodwill as significant benefits. The Intel case also shows that Project XL may confer competitive advantages to participants as well. Improved goodwill may indirectly lower costs associated with permitting and reporting, as well as minimize the threat of more stringent regulation. Soft factors may indirectly reduce administrative and abatement costs.

At a minimum, VAs such as CSI have the potential to promote interaction among groups that act under status quo laws as adversaries. Such VAs provide more opportunities for stakeholder participation than the status quo. However, implementation is hampered by the lack of clearly defined administrative, monitoring, and participatory procedures. Thus, VAs — particularly unilateral and negotiated

approaches — lack credibility among environmental groups and some industries. To promote trust, VAs must be made more transparent. If they are made more viable, then VAs can help to promote agreement on ways to improve the U.S. legislative framework.