1999 Greening of Industry Network Conference
Best Paper Proceedings

VOLUNTARY ENVIRONMENTAL INITIATIVES AND SUSTAINABLE INDUSTRY

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October 1999

ABSTRACT

Voluntary environmental initiatives are private or public efforts to improve corporate environmental performance beyond legal requirements. They include five broad categories of activity -- industry-led initiatives, NGO- led programs, standards organization-led programs, voluntary challenges, and negotiated agreements. Voluntary initiatives have become an important element in the mix of public policies and corporate strategies for managing industrial impacts on the environment. But considerable uncertainty exists concerning the effectiveness, economic efficiency, equity and transparency of voluntary programs relative to other policy instruments. This paper considers the potential role for voluntary initiatives in the transition toward more sustainable industrial systems, in light of these criteria. Several pervasive problems have hindered evaluation of their environmental effectiveness so far including poorly specified objectives, inadequate data on results, and poorly specified baselines for comparison. Economic models indicate that in different circumstances, voluntary approaches may increase or decrease economic efficiency. However, these conditions remain poorly understood. Little if any analysis so far has focused on the intergenerational and intragenerational equity of voluntary approaches. Evaluations of negotiated agreements indicate that they often reduce transparency -- the ability of outside parties to observe both the process and the outcomes of a policy -- relative to regulations. These considerations suggest that while voluntary initiatives can help us move toward more sustainable industrial systems, they will probably not be adequate by themselves to drive the transition. Considerable advances in the design and analysis of voluntary initiatives will be required to harness their full potential.

I. INTRODUCTION

Voluntary environmental initiatives are private or public efforts to improve corporate environmental performance beyond legal requirements. These initiatives attempt to change the behavior of individual corporations directly, or to induce them to change by creating market pressures to produce more environmentally conscious products and services.

Voluntary initiatives have become an important, if unheralded, element in the mix of public policies and corporate strategies for managing industrial impacts on the environment. In Europe, more than 300 voluntary agreements have been negotiated between national governments and industry associations (European Environment Agency, 1997). Japan has more than 30,000 voluntary agreements between single firms and local agencies in place (Tsutsumi, 1999). The U.S. has based its policy for dealing with global climate change almost entirely on voluntary programs such as Green Lights, Energy STAR, and Climate Wise (US Department of State, 1997).

Despite the growing importance of these voluntary initiatives in practice, research in environmental economics and policy has devoted relatively little attention to them. This paper considers the potential role for voluntary initiatives in the transition toward more sustainable industrial systems.

Debate on industry's role in addressing global environmental issues has shifted over the last decade from a focus on "greening" to a new vision for more sustainable industrial systems (see for example, Roome, 1998). This dialogue has raised the expectations for corporate environmental performance (Hart, 1997), while generating conflicting prescriptions for action.

Dialogue concerning the definition and implications of sustainable industry has raised disagreement about the way in which firms must balance social concerns with other corporate objectives and responsibilities. Allenby (1997) for example, points out that some arguments in favor of extensive voluntary actions imply a fundamental (and inappropriate) shift in the theory of the firm. In particular, he argues that the most extreme definitions of sustainable industry would require abandoning the profit-motive altogether. Allenby suggests that a more appropriate challenge is to incorporate the goals of sustainability without abandoning the profit motive in the theory of the firm.

Hart (1996), on the other hand, argues that sustainability is entirely consistent with the profit motive. He suggests that a "sustainable" corporation may achieve significant competitive advantage by exerting leadership in meeting environmental and social needs.

The transition from "greening" to "sustainability" compounds the dilemma over the role of the firm. *Greening of industry* focuses on a perceived obligation to reduce pollution. While the goals of greening are sometimes difficult to formulate specifically, the broad outlines are relatively clear. Obligations that pertain to greening relate directly to the activities of the firm and more recently, its suppliers and customers. As a result, a firm's obligations are often relatively clear from the nature of its current and past actions.

Greening requires the firm to internalize the externalities it creates to the extent possible within the constraint of achieving positive profits. Analytically, this can be expressed as an additional constraint on profit maximization. For example, a common (and usually implicit) definition considers a corporation to be green if it keeps pollution emissions below some acceptable level while it achieves its business objectives (profit, growth, etc.).

The concept of *sustainable industry* implies that firms will pollute very little, will use few resources, and in addition will be actively involved in improving social welfare. The concept of industrial sustainability is inherently more problematic and more difficult to model analytically than the greening of industry. There are two critical components of sustainable industry. *Eco-efficiency* refers to the pollution emissions and other resource impacts per unit of industrial activity. *Development* refers to the positive contributions to social and economic well being resulting from industrial investment and technology transfer.

Actions in pursuit of sustainability are intended to remedy both sins of commission by industry (such as environmental pollution, or disruption of traditional social systems) and sins of omission by society as a whole (such as under-investment in developing countries). Many of the social needs that need to be addressed occur in areas remote from the businesses that may be called upon to take action. Because of this disconnection, the nature of industry's obligations in general, and the specific obligations of any particular firm may be inherently ambiguous.

While the specific role for industry in the pursuit of sustainability remains unclear, existing public policies and business strategies clearly need to change in order to assure a sustainable future. Progress toward sustainability will undoubtedly require industry and

governments to increase their reliance on voluntary environmental initiatives in the mix of public policy instruments and private sector strategies.

But considerable uncertainty exists concerning the effectiveness and economic efficiency of voluntary programs relative to other policy instruments. This paper considers the role of voluntary initiatives in light of recent experience, insights from the small body of analytical studies on voluntary approaches that has emerged within the past decade, and potential evaluation criteria.

II. THE DIVERSITY OF VOLUNTARY ENVIRONMENTAL INITIATIVES

Governments and firms have developed considerable experience with voluntary initiatives over the last decade. The language used to describe these programs is quite inconsistent, and similar labels often disguise very different types of program. Table 1 summarizes several major types of initiatives.

European research on "voluntary approaches" generally focuses on three broad categories of activity -- industry-led initiatives, voluntary programs, and negotiated agreements (Barde, 1999). Two additional categories appear to be important as well -- programs led by non-government organizations, and programs led by standards organizations.

Industry led initiatives are efforts by individual firms or industry associations. These typically do not include government actors, except in an advisory role. A wide range of industry-led efforts has emerged in the past decade. These may be collective efforts led by organizations that span unrelated industries. For example, the Keidanren, the Japanese Federation of Economic Organizations, has developed a Voluntary Action Plan to reduce greenhouse gas emissions, with specific agreements negotiated in 37 industries (Keidanren, 1997; Imura, 1999). They may also focus at the industry level. The best known of these initiatives, the chemical industry's Responsible Care program provides codes of practice that industry members agree to enact - as a condition of trade association membership.

Table 1: Major Types of Voluntary Environmental Initiatives

Type	**Key Features**	**Example**
Individual firm	Unilateral action on dimensions of environmental performance chosen by the firm.	3M - Pollution Prevention Pays
Trade association	Specific actions or codes of conduct agreed upon by at least a large segment of an industry.	Keidanren Voluntary Action Plan, Chemical industry Responsible Care program
Cross-industry efforts	Codes of conduct or environmental commitments designed by industry to address performance across a range of industries.	International Chamber of Commerce, Global Environmental Management Initiative, the Natural Step.
Standards organization	System for verifying environmental performance through third party certification.	ISO 14000
Non-government organization	Voluntary codes of conduct developed by organizations focused on environmental objectives or corporate social responsibility.	CERES Principles
Government-led voluntary challenges.	Opportunities for firms to take voluntary action and receive technical help, help in coordinating with other actors, and public recognition.	Energy STAR, Green Lights
Government-led voluntary agreements.	Contractual agreement, in lieu of regulation.	European voluntary agreements.

Company-specific programs may be very wide in scope, such as the environmental management systems adopted by many companies. Or they may be more narrowly focused, such

as 3M Company's Pollution Prevention Pays (3P) program, or Hewlett-Packard's Product Stewardship program.

Initiatives led by organizations outside both government and industry display characteristics similar to both industry-led and government-led efforts. Efforts led by non-government organizations, such as CERES, create codes of conduct much more stringent than prevailing environmental laws. These NGO led programs provide positive publicity for companies that commit to their principles and make tangible progress toward achieving them. Standards organizations can increase the credibility of individual firms' voluntary efforts, by establishing standards for the health and safety characteristics of products, or by providing external certification of environmental practices. In particular, the International Organization for Standardization (ISO), a worldwide federation of national standards bodies with long established credibility in certifying product characteristics, has established the ISO 14000 series of standards for environmental management systems (ISO, 1996).

Voluntary challenge programs create opportunities for firms to receive public recognition for their energy saving or pollution reducing activities (Harrison, 1999). Most of the US voluntary policies -- such as Green Lights, Energy STAR, 33/50 and Climate Wise -- fit in this category. Each individual company is free to participate or not, as its circumstances permit. Typically, each participating firm commits to specific voluntary improvements specified in "memoranda of understanding" in lieu of formal contractual agreements. The firm is free to withdraw from the agreement, with no sanction from the policy agency, other than the loss of recognition the program provides.

Negotiated agreements involve contracts reached between government and industry. Although these are typically called "voluntary agreements", their effect is often similar to regulations in that they create specific obligations that firms must meet. Industry participants typically face the threat of regulation or environmental taxation if they fail to reach agreement. Ashford and Caldart (1999) point out that negotiated rulemaking in the US, though not typically considered a voluntary approach, essentially fits the characteristics of this group.

Storey et al (1997) identify several characteristics that differentiate among negotiated agreements. These include the manner in which goals are set, the nature of participant commitment, the degree of regulatory threat, and the mix of participation incentives. They

subdivide voluntary agreements into four types - target based, performance based, cooperative R&D, and monitoring and reporting, based on the type of activity they address.

- Target based agreements may set legally binding targets. These agreements may explicitly aim to preempt future regulatory requirements.
- Performance based agreements commit participants to adopt specific performance goals or to set their own performance improvement goals over a certain timeframe. These are not legally binding nor are they explicitly designed to preempt future regulatory requirements.
- Cooperative R&D agreements focus on "spurring new technology development that advances the best practice frontier".
- Monitoring and reporting agreements commit participants to provide information to the sponsoring agency. These may be used alone or with any of the other forms of agreement.

The differences among these diverse types of voluntary initiatives have contributed to the major differences in experiences in different parts of the world. The next section reviews recent experience in Europe, Japan, and the United States.

III. EUROPEAN, JAPANESE, AND US EXPERIENCE

Public agencies and firms have developed considerable experience with voluntary policy programs and negotiated agreements, particularly in the last decade. Experiences have differed significantly between Europe, the US, and Japan.

European Experiences. In 1997, the European Environment Agency (EEA) reviewed member country experiences with voluntary agreements (EEA, 1997). The EEA study found that over 300 environmental agreements between national governments and industries were in effect during 1996. The EEA analysis found environmental agreements in place in all of the EU countries, with the Netherlands and Germany accounting for approximately two-thirds of them.

The EEA analysis raised several concerns about all of the agreements. First, the lack of available and reliable information limited their ability to assess the effectiveness of these agreements quantitatively. Although their analysis showed some improvement in environmental attributes addressed by the agreements, the EEA could not establish clear cause-and-effect relationships between the agreement and improvements. They found qualitative evidence

indicating that the agreements led to other positive results including consensus building, information sharing and improvement of environmental management by business.

The EEA analysis noted that parliaments and NGOs have raised several concerns about environmental agreements. These included concerns about the transparency of the negotiation process, and lack of access to information on the agreements and their implementation.

In particular the EEA found significant problems with data availability. The EEA analysis found that the lack of reliable monitoring data and inconsistent reporting methods prevented effective evaluation. They found little available data to evaluate:

- the reference situation, prior to the agreement,
- the baseline or "business-as-usual" scenario, if the agreement were not in effect, and
- the current situation, with the agreement in effect.

They found that although environmental improvements had occurred since the agreements were signed, they could not assess their effectiveness compared with the "business as usual" scenario. As a result, they could not conclusively attribute the observed improvements to the agreements.

Despite these limitations, the EEA found that negotiated agreements improved information flows between government and industry, promoted awareness of new technical and management practices, and generally led to more flexible responses on the part of both government and industry. Accordingly, they found that negotiated agreements contribute to the overall improvement of the environment. However they expressed concern that if more stringent targets are necessary, negotiated agreements may not be effective except in concert with a broader package of policy instruments. They argued that future agreements needed to provide mechanisms for setting clear targets and for monitoring and reporting results.

The EEA study found that the difficulties in evaluating the effectiveness of the agreements limited their credibility and threatened to limit their adoption in future situations. The EEA concluded that environmental agreements appear to be most useful as complements to other policy measures such as regulations and fiscal instruments.

The European Commission, responding to similar concerns, issued guidelines for member countries to follow in developing environmental agreements (European Commission, 1996). These guidelines instructed member countries to adopt several practices to improve environmental agreements, including setting quantifiable objectives, monitoring results,

requiring periodic reports, verifying results, and providing access to information for interested parties.

The EC communication concluded that, “environmental agreements with industry have an important role to play within the mix of policy instruments sought by the commission. They can offer cost-effective solutions when implementing environmental objectives and can bring about effective measures in advance of and supplementary to legislation. In order to be effective, it is essential however, to insure their transparency and reliability.”

An OECD study currently in progress (Barde, 1999) has developed preliminary findings similar to the EEA study. The study team has attempted to evaluate a sample of European voluntary agreements according to commonly suggested criteria - environmental effectiveness, economic efficiency, administrative savings, and “soft effects”. Barde reported that evidence on the environmental effectiveness of voluntary agreements appears inconclusive, but observed that typically the stated objectives were not particularly ambitious, and that implementation had been inconsistent. He did observe that environmental agreements did appear to be somewhat effective in initiating action on policy issues for which no regulations exist yet.

Although economic efficiency is one of the most widely cited advantages of voluntary agreements, the OECD study, to date, has not found evidence to support claims that the agreements have increased economic efficiency. Efficiencies from increased flexibility appear likely, but have been difficult to document. Similarly, cost savings to regulatory agencies administering voluntary agreements have not been documented. One possible cause appears to be the high transaction costs associated with lengthy negotiations to reach agreement. Barde reported negotiations lasting up to two years for some agreements, inducing high costs in both the regulators and the participating industries.

Barde concluded that “soft effects” might provide the major benefits that both firms and regulatory agencies gain from participating in voluntary agreements. These effects include increased diffusion of information, learning-by-doing and demonstration effects, and in some instances increased stakeholder participation.

In addition to international bodies, national governments in Europe have conducted their own evaluations. For example, both the Danish Environmental Agency (1999) and the Danish Energy Agency (1999) expressed strong caution about the effectiveness of negotiated

agreements. The Danish Environmental Agency reported that a survey of 13 agreements found 5 had been fulfilled, 6 had been delayed or not fulfilled, and 2 could not be determined from the available data. The Agency concluded that it could not demonstrate that the agreements achieved any of the generally acknowledged advantages of negotiated agreements - increased flexibility and cost-effectiveness, and encouragement of a proactive role for industry.

Japanese experiences. Japan, with more than 31,000 voluntary agreements in place has more cumulative experience than all other countries combined (Keidanren, 1997; Sugiyama, 1999; Tsutsumi, 1999). Two basic types of agreement dominate the Japanese agreements.

The great majority are agreements between a single firm and a local agency. This form of agreement arose in the 1960's, before most of the national environmental laws were enacted. Although local agreements are not legally supposed to be more stringent than national regulations, in practice local agreements often include strict requirements tailored to local conditions. These agreements are based on Japan's system of administrative guidance, through which government agencies exercise strong influence over firm behavior.

A second form of agreement emerged in the 1990's in response to growing concerns over climate change. The Keidanren, the Japanese Federation of Economic Organizations, has developed a Voluntary Action Plan, consisting of specific agreements for 37 industries to reduce greenhouse gas emissions (Keidanren, 1997; Imura, 1999). These agreements, which have no formal basis in Japanese law and contain no sanctions, form the basis of Japan's strategy for meeting the commitments under the Kyoto protocol. The Keidanren Action Plan is based on four basic principles:

1. Action must be at the discretion of the participating industries and free from "compulsion by any government or regulatory body"
2. Plans must include a wide range of industries, including non-manufacturing sectors such as transportation, distribution, construction, and insurance industries.
3. Plans must have quantitative targets and specified dates for achieving them.
4. Progress must be reported annually, and results must be made public.

This framework, which reflects distinctive elements of Japanese culture, appears to provide a workable framework for significant progress toward stabilization of greenhouse gas

emissions. It stands in stark contrast to European and American voluntary policy frameworks, which have emerged from more adversarial relationships between business and government.

American experiences. American experience has focused on voluntary environmental challenges which individual firms may choose to join or not at their own discretion. Several studies have examined individual US voluntary challenges such as Industrial Toxics Program popularly known as the 33/50 program. Other U.S. programs-- such as the Energy STAR programs-- have received little or no academic attention (Howarth et al, forthcoming).

The 33/50 program is the most extensively studied U.S. voluntary program. The program, begun in 1991, encouraged industry to reduce toxic air pollutant emissions voluntarily. The program targeted 17 chemicals regulated under the 1990 Clean Air Act with three important characteristics—serious health and environment effects, high-volume industrial releases, and potential for pollution prevention. Participants were asked to reduce emissions of these chemicals by 33% by 1992 and by 50% by 1995, compared with 1988 Toxic Release Inventory data for emissions of the same chemicals. The program achieved both its interim and final goals ahead of schedule and provided justification for further experiments with voluntary programs (Inform, 1995).

Several external studies evaluated the 33/50 program, in addition to EPA's internal evaluations. Aurora and Casson (1995, 1996) and Inform (1995) evaluated the program to assess the extent of participation, the factors affecting firms' choices to participate, and the effect of the program on emission reductions.

Inform evaluated the 33/50 program, in part, to determine whether the program had achieved its objectives. Inform found that although industry leaders had considered the goals of the program "quite ambitious" when EPA first proposed it, the program had exceeded its objectives. Firms participating in the program maintained a greater pace of reductions for those chemicals than firms not participating in the program. Inform also found that participants in the program accelerated their reduction of chemicals not targeted by the program. On the other hand the data do not indicate any reduction in the total amount of the 17 program chemicals *generated* as waste. Firms appeared to rely predominantly on end of pipe treatment or onsite recycling and energy recovery rather than source reduction to achieve the reductions.

Inform questioned whether the 33/50 program produced reductions in emissions of the targeted chemicals greater than would have occurred without the program. Aurora and Casson (1996) reflect a similar concern, pointing out, for example, that two of the 17 chemicals were subject to phase out requirements under the Montreal Protocol. As a result, firms would be expected to phase these chemicals out during the time interval covered by the 33/50 program, even in the absence of the program. Both Inform and Aurora and Casson found the results of the program ambiguous.

The Energy STAR programs target voluntary improvements in product energy-efficiency. EPA initiated the Energy STAR Office Products program in 1992 to expand markets for energy-efficient products. Since then, the Clinton Administration has expanded the Energy STAR family of programs, including several administered by the U.S. Department of Energy (DOE). Firms participating in the Energy STAR programs gain the right to use the program's logo to differentiate participating products from less energy-efficient ones. EPA publicizes the cooperative efforts of industry groups, creates awards to recognize superior efforts by individual firms, and conducts media campaigns to raise public awareness of the Energy STAR program.

The Energy STAR programs are designed to intervene on both the supply and demand sides of the market (Howarth et al, forthcoming). The program influences supply by encouraging manufacturers to produce energy-efficient equipment they otherwise might not. The program influences demand by providing large customers with a simple criterion for specifying energy-efficient equipment. In 1993, these programs received a significant boost from Executive Order 12845, which ordered government procurement offices to purchase Energy STAR compliant products whenever possible. These demand-side interventions have created a sizeable market for energy-efficient products.

Measuring the performance of Energy STAR programs is problematic because program rules do not require participating firms to report data on sales volume for participating projects. An internal government audit evaluated the management and reporting practices for the Energy STAR programs for office equipment, buildings, and homes (EPA, 1997). The report found that the Office Products program had "transformed a significant percentage of the markets to Energy STAR by the end of 1995," resulting in estimated savings of 2.3 billion kWh hours of electricity for 1994 and 1995.

Diversity of international experiences. The wide range of experiences with voluntary environmental policies among European, Japanese, and American governments reflect differences in culture, historical experience with other forms of environmental policy, and the character of relationships between business and government. The analytical models described in the next section attempt to generalize from this broad range of experience. However, in practice these research perspectives appear to be heavily influenced by the antagonistic relationship between government and business characteristic of American environmental policy.

IV. RESEARCH PERSPECTIVES ON VOLUNTARY INITIATIVES

Academic research on voluntary initiatives over the past decade has provided empirical insights, as well as theoretical insights from economics and political science. This section summarizes key insights from these three streams of research.

Empirical research. Several investigators have explored the links between environmental performance and economic performance of firms. Many but not all of these inquiries have focused on voluntary actions by firms.

Porter and van der Linde (1995a, 1995b) cite evidence from a wide range of industries to indicate that firms often gain competitive advantage from their voluntary efforts to improve environmental performance. They argue that innovation offsets -- product or process improvements resulting from environmental improvements that provide positive net returns -- account for the economic gains. Palmer, Oates, and Portney (1995) argue, skeptically, that the existence of innovation offsets must rest on "pre-existing opportunities for cost savings or profitable product enhancements that have, for some reason, gone unrealized." Such unrealized opportunities cannot be pervasive under conventional economic assumptions, but appear to be widespread in actual practice.

Florida (1996) found that the investments firms make in capabilities needed to compete effectively in their industries often contributed to improvements in environmental performance. He provides evidence that firms that adopt advanced manufacturing practices often "simultaneously realize improvements in productivity and environmental performance." His results suggest that voluntary improvements may -- under appropriate circumstances -- provide environmental improvements at little or no incremental cost.

Resource-based strategy investigations have probed the apparent positive relationship between proactive environmental strategies and economic performance of firms, asking, "Does it pay to be green?" Hart and Ahuja, (1996) found that efforts by firms to reduce emissions contributed to increased profits within one to two years from when they began. Firms with the highest emissions in their sample of 127 large firms gained the most from emissions reductions. Russo and Fouts (1997) analyzed data on 243 firms over two years, and found significant positive correlation between environmental performance and economic performance. They concluded that it does "pay to be green", and found that this was particularly true in high growth industries.

Sharma and Vredenburg (1998) conducted qualitative studies in the Canadian oil and gas industry to explore the relationship between proactive environmental management strategies in firms, and the emergence of competitively valuable capabilities. They concluded that firms with proactive environmental strategies developed valuable capabilities for building trust-based relationships with stakeholders, achieving higher order learning, and fostering continuous innovation. Proactive firms' in their study found that these advantages carried over to other aspects of their businesses.

Hart (1995) describes a progression -- from pollution prevention to product stewardship to sustainable development -- in which firms have accumulated resources to gain competitive advantage from environmental management capabilities. Pollution prevention draws on a firm's experience with problem solving skills to simultaneously reduce emissions and capital expenditures for pollution control. Product stewardship broadens the scope of environmental performance beyond the firm's own operations to incorporate the concerns of customers and other key stakeholders. Sustainable development holds the potential for creating enduring competitive advantage by extending the firm's capabilities. Firms investing in sustainable development strategies develop collaborative skills that help them find business opportunity by creating solutions to interrelated social and environmental problems. This progression emphasizes the firm-specific, difficult-to-imitate capabilities that firms have begun to develop to gain long-term competitive advantage from their environmental management skills.

These studies make a convincing case that -- at least under some circumstances -- voluntary improvements in environmental performance can convey significant economic

advantage to firms that undertake them. But other empirical investigations have produced conflicting or inconclusive results.

Christman (1999) sheds light on these conflicting results, by distinguishing between the assumptions of five different lines of inquiry -- environmental economics, dynamic perspective on environmental regulation, environmental management, social responsibility, and finance -- into the relationship between environmental performance and economic performance. Differences in their focus and level of analysis lead these fields to different conclusions.

The *environmental economics* literature has focused on the effects of environmental regulations on the competitiveness of US industry, relative to industries in other countries. These studies typically find statistically insignificant results, or small negative effects. The *dynamic perspective* on environmental regulation (Porter and van der Linde, 1995a, 1995b) have found that stringent environmental regulations induce innovations that lead regulated firms to achieve cost savings.

The *environmental management* perspective analyzes the relationship between environmental best practices and competitiveness at the firm or project level. These studies typically indicate that firms adopting best practices gain "first-mover" advantages as well as cost savings and improved stakeholder relationships. The *social responsibility* perspective examines the relationship between environmental performance -- as one element of corporate social responsibility -- and economic performance. Empirical studies in this approach have produced conflicting results. The *finance* literature has examined whether investors value environmental performance. Empirical studies in this approach have, so far, delivered inconclusive results.

Overall, these empirical studies provide a mixed message concerning the relationship between environmental performance and economic performance. They do illustrate, however, that under some circumstances, voluntary actions by firms can improve their environmental performance at little or no net cost. In these instances, voluntary actions can improve social welfare, by producing environmental benefits that greatly exceed their costs. In other instances, improvements in environmental performance may prove too costly to accomplish through voluntary approaches.

Economic research. Economic research has provided significant insights into the economic structure of negotiated agreements. Typically these models employ neoclassical

models, which for simplicity and clarity of insight, rely on a highly stylized picture of the firm. Taking advantage of the rigor and parsimony of the neoclassical model, these studies have provided significant insights into the requirements for realizing potential efficiency gains from using voluntary agreements, the role of regulatory threats (Segerson and Micelli, 1998), and the effects of asymmetric information (Segerson, 1999).

The model used in Segerson and Micelli's analyses calculates the equilibrium outcomes from negotiations over a voluntary agreement between a single, profit-maximizing firm and a single regulator, under several different conditions. The model begins with several simplifying assumptions to isolate the variables under consideration:

- An exogenous threat of regulation lurks in the background. In the absence of a voluntary agreement, the relevant legislative body, with some probability -- which can be varied in the analysis -- will pass legislation leading to regulation.
- A subsidy is possible to help offset some of the costs born by industry in complying with a voluntary agreement. The amount of the subsidy and the cost of funds can be varied in the analysis.
- A potential voluntary agreement leads to cost savings for the firm. These savings result from increased flexibility in implementing emissions reductions and from reduced transactions costs.
- The regulator is welfare maximizing -- that is it seeks to achieve emissions reductions only to the point at which the marginal social cost of abatement equals the marginal social benefit.

Segerson and Micelli argue that, under these assumptions, there are three incentives for the firm to participate in a voluntary agreement. First, the firm may enjoy a market-based payoff, presumably from lower costs and positive consumer response to the firm's reduced emissions. (Segerson and Micelli do not discuss this factor further in their analysis.) Second, the background threat of regulation raises the possibility that the firm may face higher expenses in the absence of an agreement. (This threat may be extended to include taxes, without altering the insights from the analysis.) Third, the regulator may offer a financial inducement, to reduce the costs to the firm imposed by a potential agreement.

Segerson and Micelli derive two key conclusions from this model. First, under the stated assumptions, a voluntary agreement is always the equilibrium outcome, if the level of abatement is determined by the negotiations. Second, the equilibrium may be efficient or inefficient depending on the magnitude of the regulatory threat, the social cost of funds, and the relative bargaining power of the regulator and the firm. If the regulatory threat is sufficiently strong, a negotiated agreement can achieve significant efficiencies relative to regulation.

Segerson (1999) extends the insights from this model. Keeping the same basic structure of the original model, but changing several assumptions, this study analyses the effects of asymmetric information. The presence of asymmetric information is a major complication affecting real life negotiations. In trying to reach an economically efficient agreement, as noted above, the regulator will attempt to set abatement levels at the point where marginal social cost equals marginal social benefit. But the firm has better information about the actual costs of implementing the agreement than the regulator does. The firm has no incentive to report its projected costs accurately. Instead, the firm has a strong incentive to overestimate its costs, in order to produce an agreement with lower abatement levels and correspondingly lower costs. The study concludes that with asymmetric information, negotiations will result in a less efficient outcome than regulation. The negotiations will result in either a lower abatement level than a welfare maximizing regulation, or a higher subsidy paid to the firm.

Segerson concludes that, as before, in negotiations under these assumptions a voluntary agreement will always be the equilibrium result if the parties are allowed to negotiate the level of abatement. However, if the level of abatement is fixed -- for example by legislation or international treaty -- the parties may not reach a voluntary agreement.

Much of the value of the economic models of voluntary approaches results from their ability to strip away details and illustrate the underlying structure of the negotiations. However, some of the abstractions that give these neoclassical models their analytical power also systematically misrepresent some aspects of the actual negotiations. These assumptions ignore some of the potential advantages of entering into voluntary agreements.

The most fundamental of these assumptions is that firms actually maximize profits. Evidence from U.S. voluntary programs such as the 33/50 program indicates that firms typically achieved significant *savings* from the emission reductions achieved under the program. These

savings typically resulted from reductions in wasted raw materials and waste disposal costs. These savings are important in terms of Segerson and Micelli's analyses, because when they occur, they create precisely the conditions that cause voluntary agreements to improve efficiency relative to regulation.

A second, implicit assumption is that the firm's costs for abatement are fixed, and known by the firm. Participants in the Green Lights program typically found that information from EPA helped them achieve significant savings that they would not have achieved on their own. Such joint learning effects and other "soft effects" may be the principal source of gains in economic efficiency from participating in voluntary agreements (Barde, 1999). But the structure of the economic models systematically excludes them from the analysis.[1]

Glachant (1996) models a negotiated agreement as a collective decision process between a government agency and an entire industry. This approach allows the model to evaluate the effect of transaction costs on the efficiency of voluntary agreements. Glachant models an agreement between a public authority and an industrial association, with a specified target date and abatement requirements that must be apportioned among firms. Efficiency issues arise at the implementation stage in this model as the industry allocates specific pollution abatement requirements among the firms. He cites research results from non-cooperative bargaining theory to predict that high transaction costs should reduce the allocative efficiency of bargaining in such a case.

Glachant modeled the burden sharing process as a bargaining game. Transaction costs at the firm level derived from three activities -- collecting information about their own pollution abatement efforts and costs, collecting information about their competitors efforts and costs, and "computing" their own and their competitors' best strategies. He found that negotiated agreements may be economically efficient compared with regulations, in concentrated industries, when pollutant abatement activities and costs are relatively low, but uncertainty about costs of additional pollution abatement is high.

Glachant's results suggest that analysis of additional scenarios will be necessary to predict the conditions under which bargaining between multiple firms and a government agency will

[1] For further discussion of these issues, see Haddad et al, 1998, Howarth et al , forthcoming, and Paton, 1999.

create efficiencies relative to mandatory rules.

Economic analysis has also shed light on voluntary challenge programs-- such as Green Lights, Energy STAR, and 33/50. These approaches create opportunities for firms to receive public recognition for their energy saving or pollution reducing activities.

Cavaliere (1999) uses a game-theoretic analysis to demonstrate that a firm's customers may come to regard the firm's participation in a voluntary program as a quality signal. He shows that the assurance provided by such a signal can be critical in situations of asymmetric information to prevent adverse selection. As a result, a firm opting out of a voluntary program may suffer economically unless it can provide a comparable quality signal. This model demonstrates that the absence of formal sanctions does not indicate that withdrawal from the voluntary program will be cost-less.

Conspicuously absent from these economic perspectives is any attempt to portray the decision-making process of firms realistically. This omission is significant, because it potentially distorts the economic modeling of these policy instruments. Although the literature on organizational learning has taken a central place in management research in recent years, the economic modeling explicitly excludes learning effects. Although Segerson and Micelli (1998) assume that savings may occur from participating in voluntary agreements, compared with compliance with regulations, they ignore learning effects and attribute those savings entirely to reduced transaction costs.

Despite this limitation, these economic models provide insights into the circumstances in which voluntary approaches may be more or less efficient than other policy instruments. However, they do not provide simple rules of thumb or other broadly applicable methods for predicting whether a particular approach will be more efficient than the alternatives. In addition, the conclusions from these models seem particularly sensitive to the assumptions about relative costs, asymmetry of information, transaction costs, and the number of decision-makers. These limitations suggest that -- at least until more extensive analysis has occurred -- voluntary approaches must be considered relative to alternative approaches in the specific settings in which they would be employed.

Political science models. Political science models offer a very different set of insights, focusing on the causes and political consequences of the growing popularity of voluntary

programs. Hansen (1996) provides a simple model based on American environmental policy experience. He argues that environmental policy outcomes reflect the interactions among four key actors:

- the legislative body, which creates the legal framework for environmental policy,
- the regulatory agency, which implements environmental policy by developing and enforcing regulations,
- the regulated industry, which must comply with environmental regulations, and
- national environmental groups, which help assure that the regulatory agency fulfills its legislative mandates, by taking the agency to court if necessary.

Hansen presents a simple model of "agency capture" to explain the emergence of voluntary agreements. He argues that agreements reached between the regulatory agency and the regulated industry effectively exclude the legislative body from scrutinizing results. This exclusion reduces the accountability of both the regulatory agency and the regulated industry through a two-stage process of burden shifting. First, the voluntary agreement signals that the regulator has taken action to address the specific environmental issue, particularly if the industry sets ambitious abatement goals. This action shifts the burden for taking action to the regulated industry. Second, when the regulated industry fails to meet its commitments, its reputation may suffer minor damage, but it cannot be held accountable because the agreement was voluntary.

Hansen (1999) presents a meta-study based on a broad sample of European voluntary agreements to test this model. The study failed to produce statistically significant results in support of the model.

Maxwell (1999) offers a political economic model of the U.S. experience based in part on Hansen's model. Maxwell notes that the advantages of voluntary agreements typically cited -- particularly flexibility, speed and economic efficiency, are time independent. Why then, he asks, have these agreements emerged only recently? Maxwell argues that voluntary agreements constituted an institutional change. This change, he argues, reflects a shift in the relative power among the legislative body (Congress), the regulatory agency (EPA), the regulated industry, and national environmental groups. During the 1980's, Congress and the national environmental groups gained in power relative to the other two players. Congress had continually increased the volume and specificity of legislative requirements it imposed on EPA. As a result, EPA fell

farther and farther behind in developing regulations. The national environmental groups such as the Natural Resources Defense Council and the Environmental Defense Fund gained power steadily by suing the agency to develop stringent regulations and winning in court.

Maxwell argues that the rise of voluntary agreements in the early 1990's constituted an institutional shift in which EPA and the regulated industries effectively excluded Congress and the environmental groups from scrutinizing their actions by negotiating agreements without participation by other stakeholders. Maxwell describes this institutional shift as "agency capture".

A more convincing description of this change might be called "executive hijack". Three consecutive administrations - Reagan, Bush, and Clinton - have redirected EPA's regulatory agenda for political ends. The Reagan Administration tried very publicly, but unsuccessfully to slow the pace of regulation by appointing an administrator hostile to new regulation, and by cutting the agency's budget. The Bush Administration also attempted to slow the pace of regulation, but less overtly. As part of its attempts to look more environmentally friendly, the Bush Administration promoted several experiments with voluntary approaches. The Clinton Administration has aggressively pursued voluntary initiatives as part of its efforts to "reinvent" government. The subsequent election of an anti-environmental Congress in 1994 completed the role reversal, leaving a relatively pro-environment administration pursuing pro-environment policies actively opposed by Congress. This "executive hijack" explanation suggests that the surge of voluntary policy initiatives have in fact been motivated by a desire to thwart Congress, but that the diminished role of the national environmental groups may be an untended consequence. Further research is needed to sort out the nature of the institutional change that has occurred. But simple resort to the classic "agency capture" model does not seem justified.

Ashford and Caldart (1999) shed further light on the shift in power from Congress to the regulatory agencies in their investigation of negotiated rulemaking by EPA and OSHA. Their investigation of the process and outcomes of negotiated rule-making indicated that the agencies typically thwarted congressional intentions. Negotiation that allowed the abatement level to be chosen in the process led in every case they studied to less stringent objectives than proposed by the agency (and in some cases specified by Congress). Negotiations that focused solely on the

implementation process (with abatement levels specified by Congress or the agency) showed mixed results.

Ashford and Caldart's results are difficult to interpret in light of Segerson and Micelli's predictions, because the economic efficiency of different abatement levels is not readily apparent. Two conflicting interpretations could fit the same results.

1. The reduced abatement levels resulting from the negotiated rule-making process could indicate that the negotiation process followed the predictions of the Segerson- Micelli model, and produced the economically efficient outcome.

2. The reduced abatement levels could reflect more closely Segerson's (1999) model. In this interpretation, firms would exploit information asymmetries to reduce the costs they would bear under the voluntary agreement. As a result, the voluntary agreement would result in relatively less efficient policy outcome.

These uncertainties reflect the immaturity of the research framework for assessing voluntary policies, compared with longer established policy instruments such as regulations or taxes.

V. EVALUTING VOLUNTARY INITIATIVES

How then, should we evaluate voluntary initiatives as policy instruments for sustainability? Evaluating their usefulness will require a more comprehensive set of criteria than any of the studies to date have employed. This section presents several necessary -- but possibly not sufficient -- conditions for voluntary initiatives to contribute effectively to the pursuit of long-term sustainability.

Cabuegiera (1999) suggests three basic criteria -- environmental effectiveness, economic efficiency, and equity. The European Environmental Agency (EEA, 1997) adds transparency as an additional criterion. Although this list is not exhaustive, it provides a reasonable starting point for this analysis.

Environmental effectiveness refers to the ability of a policy instrument to achieve its intended results. The record of voluntary initiatives on this dimension has been inconclusive so far.

European experience has shown that the objectives of many negotiated agreements were not sufficiently precise to permit evaluation. Where measurable environmental improvements have occurred, evaluators have been unable to demonstrate that they have resulted from the agreements.

The U.S. experience with voluntary programs has had mixed results. Individual programs such as 33/50, Green Lights, and Energy STAR appear to have met or exceeded their objectives. However, the US climate change policy, based almost exclusively on voluntary "partnerships", has failed to achieve its interim objectives. The US Climate Change Action Report (1997) candidly admits that the voluntary efforts incorporated in the original Climate Change Action Plan will not be sufficient to fulfill the U.S. emissions reduction commitments as originally predicted. Budget cuts by Congress, higher than expected electricity demand, and cheaper than expected fuel prices appear to be the key factors leading to these lowered expectations. These mixed results reflect the critical importance of the framework of policies, budgets and policy implementation practices in determining the success or failure of voluntary approaches.

The Japanese Voluntary Action Plan coordinated by Keidanren sets specific targets and requires annual reporting. The first results of the first reports have been released, but little

evaluation has occurred yet. Evaluation of at least initial trends should be possible within the next few years.

Almost universally, efforts to evaluate the efficiency and environmental effectiveness have been frustrated by the inadequacy of data. In some instances the objectives of the program are not sufficiently quantified to permit evaluation. In other instances, the objectives are clear, but the program or negotiated agreement does not require participants to provide data on their actual performance.

The lack of a clear "business as usual" baseline to compare results of the policy instrument against is a pervasive problem. For example, data on the US EPA's 33/50 program clearly indicated that the program had achieved its results ahead of schedule, and eventually far surpassed the original objectives. However, both the General Accounting Office and independent research reports expressed concern that they could not demonstrate that similar results would not have occurred without the program. Future programs need to be based upon clear improvements relative to a clearly defined "business as usual" baseline.

These mixed results appear to reflect problems in the design and implementation of the voluntary policies, to date, rather than any flaws in the concept itself. A more complete analysis of the inherent suitability of voluntary approaches to achieve their objectives must wait upon results from more carefully designed policy experiments.

Economic efficiency. Several of the studies cited above argue that voluntary approaches may -- under carefully specified conditions -- create efficiency gains relative to regulations. Although the models provide valuable insights, the conditions under which voluntary approaches may increase or decrease economic efficiency remain poorly understood. Further modeling, along with empirical tests of the models' predictions will be required before policy makers can place much confidence in predictions concerning the economic efficiency of specific voluntary approaches.

Glachant stressed the importance of comparative analysis in assessing the economic efficiency of policy instruments. He argued that the Coasean framework -- which places special emphasis on transaction costs -- provides a more appropriate framework for analysis than the Pigouvian tradition -- which considers alternatives under ideal conditions and ignores transaction costs. He argued that the relative efficiency of a particular institutional arrangement -- such as a

negotiated agreement -- should only be assessed in comparison with other actual institutions. He argues that under carefully specified conditions, voluntary agreements may improve economic efficiency *relative to regulations* because they allow firms to allocate emissions reduction burdens within an industry in the most efficient way.

The principal efficiency gains from voluntary approaches may come from their ability to address barriers to change within the firm. A small body of literature has focused on behaviors within organizations that create economic efficiencies.[2] These studies offer plausible mechanisms to help explain how voluntary agreements can increase efficiency by overcoming the detrimental economic effects of these behaviors. Further investigation of these opportunities and incorporation into economic models can potentially improve the accuracy of policy assessments.

Equity refers to the distributional effects of a policy instrument. Little if any analysis so far has focused on the equity of voluntary approaches. Literature on the economics of sustainability focuses on two types of equity -- intergenerational and intragenerational.

Intergenerational equity refers to the fairness in allocation of resources between current and future generations. Static efficiency analyses neglect this dimension of equity, by ignoring the impacts of current decisions on the options available in future time periods. The single period optimization typically used in economic efficiency analyses is a very poor approximation of the economic optimization problem most relevant to sustainability -- economic efficiency over multiple generations. The misplaced emphasis on static efficiency obscures the intergenerational equity issues.

Intragenerational equity refers to the fairness in allocation of resources between competing interests at the present time. In particular, this perspective emphasizes the disparities in wealth and access to resources between developed and developing countries. Because all of the studies discussed in this paper have focused on programs implemented within a single country, the intragenerational equity effects of voluntary approaches have been largely ignored. This dimension may become more important as voluntary codes of conduct begin to focus on the international behavior of multinational firms[3].

[2] See for example, DeCanio, 1993,1998; Haddad et al, 1998; Howarth et al, forthcoming; and Paton, 1999.
[3] See, for example, the Keidanren principles for international conduct of business (Keidanren, 1997).

This inattention to the equity dimension, so far, in the literature on voluntary approaches, seriously limits our ability to assess their appropriateness as policy instruments for sustainability. Interaction with the field of ecological economics to investigate the equity dimensions of voluntary approaches should be a top research priority.

Transparency. Transparency refers to the ability of parties outside the voluntary initiative to observe both the process and the outcomes of a policy. Both the empirical studies and the political economy papers cited above raise concerns about the transparency of negotiated agreements. These concerns focus on two issues – participation in negotiations, and ability to monitor results. The empirical studies document that negotiated agreements have permitted significantly less participation by community and non-government organization participants than previous regulatory policies.

The political economy studies argue that both industry and regulatory agencies have favored voluntary approaches precisely because they reduce the influence of both legislative bodies and environmental groups on policy outcomes. Ashford and Caldart's (1999) detailed studies of negotiated rule making indicates that in all of the cases in which objectives were set by the negotiations, the results were less stringent than the objectives originally established by the U.S. Congress.

These concerns suggest that future voluntary approaches -- particularly negotiated agreements -- must be designed with greater attention to the tradeoffs between broader or narrower participation. Ashford and Caldart, (1999) for example, found that in US negotiated rulemaking processes, excluding third parties increased the flow of information between the regulators and the regulated community. However, the exclusion of third parties significantly increases the risks of agency capture.

All four of the evaluation criteria suggest that voluntary initiatives are more complex than they might initially appear. Simple rules of thumb have not emerged from the investigations to date that would permit generalizations about the appropriateness of voluntary approaches as policy instruments. Considerably more investigation and synthesis is required in this field.

VI. CONCLUSIONS

American, European and Japanese experience indicates that voluntary approaches to environmental policy possess characteristics that make them attractive as potential policy

instruments to promote sustainability. Despite the potential advantages of voluntary initiatives, however, considerable uncertainty exists concerning their environmental effectiveness and economic efficiency relative to other policy instruments. Existing voluntary approaches suffer in many instances from poorly specified objectives and inadequate performance data.

Voluntary approaches appear to be particularly appropriate in addressing emerging issues for which no policy framework exists yet. They can help define what is feasible and efficient for industry to achieve given the state of their technologies. Under appropriate circumstances, they may also help stimulate innovation, rather than locking in existing abatement technologies. In circumstances where the political will to impose regulations or taxes is absent, voluntary policy programs can generate momentum toward a solution and demonstrate what is possible to achieve. Voluntary policies in many European countries act as a precursor to regulatory or tax-oriented approaches. But several of the American programs, such as Energy STAR, seem to have emerged as viable long-term alternatives to regulatory approaches.

Given the complexities and uncertainties inherent in moving toward more sustainable industrial systems, voluntary approaches may be a valuable policy option. But as Segerson and Micelli argue, in the absence of a credible threat of regulation or taxation, objectives will be less ambitious and less efficient economically than would be expected under regulation. Voluntary policies therefore, will probably not be adequate by themselves to drive the transition to sustainability. European experience indicates, however, that voluntary policies can effectively complement other policy instruments such as regulation, taxes, or tradable permits.

The transition from existing industrial systems to sustainable systems can't be accomplished independently by business or government. Neither sector has sufficient knowledge or sufficient capacity to act to achieve this complex transformation. These limitations virtually guarantee that existing adversarial regulatory approaches will not lead us to sustainability. Clearly, cooperation between government, industry and civil society will be required. Voluntary initiatives are a necessary, but probably not sufficient, element in the mix of policy instruments to move us toward the objective of sustainable industrial systems.

VII. ACKNOWLEDGEMENTS

The author gratefully acknowledges financial support from the Atmospheric Pollution Prevention Division of the U.S. Environmental Protection Agency, and helpful comments from Richard Howarth.

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