

# **An Incentives-Based Analysis Of Pollution Prevention Regulation in The United States**

*William Henry Clune*

*Stockholm University, Programme In European Law*

*Bastugatan 37, Stockholm 118 25, Sweden*

*william@clune.us*

## **Abstract**

Pollution prevention stands at the forefront of industry's potentiality and practice of ecological responsibility. Yet, business and industry have not always lived up to this potential on their own, and there is still an important role for governments to play in establishing regulatory baselines. This paper explores some of the key relationships between good corporate practices and efficient governance to help conceive of ways for the two to work together more effectively. An examination of industry's incentives and barriers to voluntarily undertake pollution prevention projects is the first step in the analysis of optimal or preferable regulatory forms. The regulatory regimes considered in this study are then categorized as either more intrusive (less voluntary) or less intrusive (more voluntary). A theoretical framework is created in the form of a taxonomy that relates several possible incentive states to preferred regulatory regimes (no regulation, less intrusive, or more intrusive). This type of structure for classifying and using information is an important, functional step in bringing social, cultural, and organizational considerations within the fields of information technology and informatics.

## **1. Introduction**

Encouraging voluntary environmental protection initiatives is now an important part of mainstream regulatory policy and planning. The version of pollution prevention regulation society prefers (if any) will depend upon whether that regulation is effective and efficient at producing desired levels of environmental benefits. This, in significant part, depends upon the incentives and barriers businesses have to voluntarily undertake pollution prevention projects, including: 1) economic incentives; 2) the prevalence of institutional and management barriers to implementation; 3) assumptions about the availability and quality of information; and 4) observations about the benefits to society as regulatory beneficiary.

Industry is likely to require a more intrusive (less voluntary) or less intrusive (more voluntary) regulatory structure depending upon the assumptions made about these incentives and barriers. The goal of this type of study is to produce more pollution prevention in The United States (and other countries) by conceiving of ways to select more effectively supportive regulations. Specifically, given the complex and conditional nature of the factors involved in this analysis, a model is developed to assist with decision-making under uncertainty. This taxonomy relates assumptions about possible states of incentives and barriers to preferred regulatory regimes.

## **2. Pollution Prevention**

Pollution prevention advocates a more efficient and environmentally mindful use, allocation, handling, recycling, and disposal of all input, process, and energy resources by employing redesigned systems and innovative approaches. Although pollution prevention has been defined precisely in a number of different contexts, this paper uses an expansive definition in order both to assist with the analysis of incentives and avoid entanglements about which environmental strategy is being referenced.

## **3. More Voluntary or Less Voluntary Regulatory Structures**

In response to the argument that governments cannot or should not regulate every aspect of environmental protection, polluters and potential polluters are being called upon to undertake their own initiatives. For this investigation, “voluntary” actions are narrowly defined as those that are not specifically required or mandated by law, but that may be undertaken anyway because of other preferences (like goodwill or altruism) or incentives (like profit or cost savings). The use of the term “voluntary pollution prevention” is meant to refer to existing statutes in order to determine whether a given set of environmental protection goals can be achieved only with additional prescriptive measures, or whether these ends can be reached in a “more voluntary” manner without additional mandates.

In other words, the use of these terms acknowledges incentives created by existing regulatory structures. It goes further, however, and asks the focused question of under what circumstances one would expect pollution prevention goals to be achieved “voluntarily” with no new mandates beyond the previously existing regulatory baseline. In fact, pollution prevention is already being regulated in many jurisdictions throughout the United States in a variety of “more voluntary” or “less voluntary” forms.

## **4. Analysis and Procedures**

### **4.1 Economic Incentives**

There is substantial evidence enumerating various economic benefits available to industries practicing pollution prevention. This economic value has been measured in terms of cost savings for raw materials and inputs. Pollution prevention’s emphasis on conservation and making better use of inputs on hand, followed by the reuse and recycling of materials and energy, reduces inefficient wastefulness and decreases the need to purchase additional inputs. Similarly, the concept of Industrial Ecology, which advocates an efficient “closed loop” process, attempts to imitate the efficiency of biological organisms, thereby reducing the requirements for new energy and inputs. Process design changes can streamline production and create products that require less materials and energy to construct, store, and transport. New profits have also been captured through pollution prevention when materials formerly disposed of as wastes are conceived of as new products useful to someone else.

Pollution prevention’s waste minimization results in other direct savings through reductions in the costs of waste handling, treatment, storage, and disposal. In addition, reducing pollution and waste may result in less regulatory oversight, which can save businesses the costs of gathering information, filing permits, and negotiating with regulators. Similarly, reducing the volume of wastes produced, and limiting the amounts of toxic chemicals employed, is a way to reduce the costs of legal liabilities for personal injury, clean-up, and remediation actions.

There is also evidence that companies have profit incentives to undertake pollution prevention because it helps them in "green marketing" efforts, thereby improving their public images and potentially increasing sales. Certainly, it may allow for market penetration, maintenance, or dominance for companies that have successfully achieved "green" product differentiation. In addition, these positive reputational effects may be extensive as many companies are, themselves, large-scale input consumers; this allows them to positively influence environmental performance within entire supplier industry chains at little or no monetary cost to themselves. There is also evidence that fostering a positive environmental image is beneficial to stock valuations and attaining access to capital markets as many investors positively correlate environmental performance and effective corporate management.

A competing school of thought, however, suggests that the gains from pollution prevention are greatly exaggerated. It has been alleged that industry has over-invested in pollution control in ways that will not only fail to increase profits and reduce costs but might be fiscally irresponsible. Pollution prevention gains that result in "win-win" situations (that is, simultaneous increases in both environmental quality and corporate profits) have been described as "low hanging fruit" for the following reason: only the initial projects provide easy and readily observable cost savings and benefits, eventually leaving industry with hard trade-offs between environmental protection and profits.

With respect to scale, it has been suggested that only the largest companies have the capital and resources necessary to make continuous profitable gains using pollution prevention, while smaller companies unable to afford expensive research, re-investment, and process changes will quickly run out of profitable opportunities. In addition, it has been noted that some pollution prevention efforts are related to the business cycle; companies may be most generous, innovative, and ambitious with their expenditures on environmental programs when the economy is strong, while these expenditures may shrink drastically during periods of economic contraction. Not only does this phenomenon appear contradictory to the notion that these projects have been providing tangible, profitable advantages all along, but it also presents challenges for policy makers who would like to rely upon steady levels of environmental protection.

## **4.2 Institutional Barriers**

Identifying institutional barriers to the implementation of pollution prevention projects bears directly on choosing a regulatory structure. Because it has been observed in a variety of contexts that firms may not institute even sound business policies for reasons related to corporate inertia or managerial reluctance, these factors must be weighed against other assumptions about existing incentives in order to determine the level of regulatory intervention appropriate to meet policy goals. These institutional barriers may include factors that impede the discovery, analysis, or implementation of pollution prevention projects.

Institutional barriers have been attributed to rigid corporate cultures that may result from an inability to effectively cope with fast-changing and specialized sectors of importance (like environmental protection, technology, and regulation). In some cases, barriers result from more basic managerial (or cultural) characteristics that create a disconnectedness between process and design, on the one hand, and manufacturing and environmental concerns on the other hand. Not surprisingly, many firms have already effectively integrated an environmental sensitivity into their design and manufacturing processes, and, in so doing, have minimized institutional barriers. The importance of setting specific goals and objectives seems to be important to creating an environmentally responsive, innovative, and capable company. Moreover, the companies that are most successful at integrating environmental innovation and responsiveness into their

operations have embedded an impressive array of information and interpretive structures into their operational frameworks.

In short, the presence of positive economic incentives to undertake pollution prevention is not, on its own, a guarantee that firms will have the institutional capability or competence to implement potentially beneficial projects. As such, the prevalence and importance of these implementation barriers should also be considered in the analysis of preferred regulatory structures.

### **4.3 Information**

Even economically motivated and institutionally capable companies may not be able to implement potentially beneficial and profitable pollution prevention initiatives if they don't have sufficient information about relevant technologies, processes, and methods. Potential information barriers are a necessary addition to the examination of economic incentives and institutional barriers.

For the sake of analysis, we start with the (unrealistic) assumption that a state of perfect information exists, in which any firm desiring to undertake a pollution prevention project can effortlessly and without cost access the information required. However, contrary assumptions must also be made, in order to consider what effects this would have on our regulatory preferences. Examining these varying cases has merit because actual states of information will vary greatly in the real world, existing along all points of the spectrum over time, industry-specific, or project-specific contexts.

In fact, it has been observed that while there are many sources of information about pollution prevention that a firm can potentially access (from governments, universities, trade associations, suppliers, and competitors), the usefulness and appropriateness of information and its sources also changes depending upon the project-specific question or the party desiring the information. For instance, industry may have a strong preference for process information that comes from other industrial sources, and may find government or academic insight limited in this area.

Moreover, industries may have competitive reasons for not sharing information; the trend towards aggressive environmental innovation has also had an impact upon how many businesses compete. Companies may purposely restrict the amount and types of information they share regarding their pollution prevention methods because it gives them a competitive cost and regulatory advantage. There may or may not be reasons to be concerned about companies that are using environmental innovation, regulation, and lobbying to drive competitors out of business. However, to the extent businesses are restricting the flow of socially beneficial information, regulatory intervention may be useful.

At the same time, firms may profit from pollution prevention information they develop in cases where a patent or product can be produced. In summary, the flow and availability of good information is likely to change across many variables, and this variability must be accounted for in our modeling.

### **4.4 Benefits to Society**

In addition, society (as regulatory beneficiary) must also attempt to balance preferences like the environmental benefits of pollution prevention against any potentially resulting dis-benefits. As with the other factors examined thus far, the benefits to society of pollution prevention are complicated by the fact that they involve multiple preferences that both interact dynamically and may become counterproductive.

For instance, society promotes pollution prevention because it produces environmental benefits; taken in isolation, then, we may prefer a regulatory scheme that produces as much pollution prevention as possible. However, excessive amounts of regulation or pollution prevention activities (including research, development, process changes, and self-auditing) will create unacceptable economic drag. In fact, even the most optimistic “win-win” economic scenarios have limits, after which more expenditures of time and resources for pollution prevention activities would be of diminished or marginal value compared to the benefits.

Another element of this net benefit calculus should include ways in which pollution prevention strategies may actually reduce value or cause dis-benefits. For instance, it has been suggested that less polluting industrial processes that produce environmentally safer products may also be producing products that are less desirable or effective, resulting in the potential wastage of other types of scarce resources. In a criticism of the regulatory oversight process, itself, it has been noted that some pollution prevention programs have resulted in lowered expectations for pollution reduction that have allowed more pollution to occur.

In turn, the dynamic nature of this inquiry depends, for example, upon which version or state of the world policy makers accept with respect to industry's barriers and incentives. For example, “win-win” economic opportunities align preferences for a cleaner environment with profitable business enterprises, affording policy makers an expanded choice set.

## **4.5 Statutory Examples**

As a point of comparison for the analysis that follows, two examples of U.S. pollution prevention regulations were examined to understand how existing legislative efforts address important areas of concern. Specifically, the Federal Pollution Prevention Act (“FPPA”) is the model for a less intrusive piece of legislation, while the New Jersey Pollution Prevention Act (“NJPPA”) is the model for a more intrusive law.

## **4.6 Taxonomy**

Given uncertainty and variability in the incentives and barriers related to the determination of social preferences for the regulation of pollution prevention, the following taxonomy was developed to assist with the creation, collection, and classification of relevant information. This taxonomy relates assumptions about possible states of incentives and barriers to preferred regulatory regimes (no regulation, less intrusive, or more intrusive). The tool is as much a proposed methodology as a decision-making guide: without sacrificing specificity about relevant inputs and considerations, there is no loss in the generality necessary to adapt it to a variety of context-specific circumstances. In fact, one of the purposes of this project was to begin development of a flexible, informatics tool that would remain useful and relevant even as assumptions change and information is updated.

In its current form, the various cells recommend different regulatory results when our input assumptions are relaxed or reversed. For example, the top-most cell indicates that society may prefer no regulation of pollution prevention where all our positive assumptions are held true (strong economic incentives, no significant barriers to implementation, good information, and positive benefits to society). That is, if policy makers accept that industry has sufficient incentives and capabilities for more voluntary action, a less intrusive version of pollution prevention regulation may be preferred: one such as the FPPA that provides information, guidance, and assistance, but leaves the main job of implementation to the parties with the most knowledge about specific industrial processes.

Consider, on the other hand, cell number three, which recommends a more intrusive regulatory solution. If policy makers accept that in certain contexts pollution prevention does not provide reliable economic incentives to industry, combined with the fact that industry might be otherwise unwilling or unable to institute the necessary changes, then a more intrusive version of regulation might be preferable: one such as the NJPPA that seeks to capitalize on pollution prevention's efficiency advantages by mandating certain actions, reviews, and even processes that would not otherwise be "voluntarily" undertaken.

<p>1) <u>No</u> Regulation When:</p> <ul style="list-style-type: none"> <li>· Industry Has Strong Economic Incentives</li> <li>· Industry Has No Barriers to Implementation</li> <li>· Perfect Information</li> <li>· Positive Benefit To Society</li> </ul>
<p>2) <u>Less</u> Intrusive Regulation When:</p> <ul style="list-style-type: none"> <li>· Industry Has Strong Economic Incentives</li> <li>· Industry Has <u>Some</u> Barriers to Implementation</li> <li>· <u>Imperfect</u> Information</li> <li>· Positive Benefit To Society</li> </ul>
<p>3) <u>More</u> Intrusive Regulation When:</p> <ul style="list-style-type: none"> <li>· Industry Has <u>Some</u> Economic Incentives</li> <li>· Industry Has <u>Some</u> Barriers to Implementation</li> <li>· <u>Imperfect</u> Information</li> <li>· Positive Benefit To Society</li> </ul>
<p>4) <u>No</u> Regulation When:</p> <ul style="list-style-type: none"> <li>· Industry <u>Does Not</u> Have Strong Economic Incentives</li> <li>· Industry Has <u>Some</u> Barriers to Implementation</li> <li>· <u>Imperfect</u> Information</li> <li>· No Significant Benefit To Society</li> </ul>

Figure 1: Taxonomy

## 5. Conclusions

As it is summarized by a taxonomy, this paper developed a framework and methodology for examining various combinations of assumptions and circumstances important to determining efficient and effective pollution prevention regulatory structures. Uncertainty and variation within the relevant factors and input criteria suggests that the decision-making process should be conditional and flexible: that is, dependent upon assumptions about industry's incentives and barriers, fully capable of being updated and adapted, and careful to avoid oversimplifications of complex questions and relationships.

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