

October 2007 ■ RFF DP 07-10 REV

Can Voluntary Environmental Regulation Work in Developing Countries?

Lessons From Case Studies

Allen Blackman

1616 P St. NW
Washington, DC 20036
202-328-5000 www.rff.org



Can Voluntary Environmental Regulation Work in Developing Countries: Lessons From Case Studies

Allen Blackman

Abstract

Hamstrung by weak institutions that undermine conventional environmental regulatory tools, policymakers in developing countries are increasingly turning to voluntary approaches. To date, however, there have been few evaluations of these policy experiments. To help fill this gap, we summarize arguments for and against the use of voluntary regulation in developing countries, review the nascent literature on the topic, and present case studies of agreements negotiated between regulators and leather tanners in an industrial city in Mexico, a national environmental audit program in Mexico, and a national public disclosure program in India. Admittedly few in number, these three case studies nevertheless suggest that although voluntary environmental regulation in developing countries is a risky endeavor, it is by no means doomed to failure. The risks can be minimized by emphasizing the dissemination of information about pollution and pollution abatement options and by avoiding voluntary approaches in certain situations—those where regulatory and nonregulatory pressures for improved environmental performance are weak and where polluters can block quantified targets, individual sanctions for noncompliance, and other widely accepted prerequisites of effective initiatives.

Key Words: voluntary regulation, environment, developing country, Mexico, India

JEL Classification Numbers: Q28, O13

© 2007 Resources for the Future. All rights reserved. No portion of this paper may be reproduced without permission of the authors.

Discussion papers are research materials circulated by their authors for purposes of information and discussion. They have not necessarily undergone formal peer review.

Contents

1. Introduction.....	1
2. Literature Review	5
2.1. Negotiated Agreements.....	5
2.2. Public Programs	6
2.3. Public Disclosure	7
3. Negotiated Agreements in Mexico.....	8
3.1. Background.....	8
3.2. The Impetus for Voluntary Regulation.....	8
3.3. The Four Agreements	9
4. A Public Program in Mexico.....	11
4.1. Background.....	11
4.2. Do Only Clean Plants Join?	12
4.3. Impacts on Environmental Quality	14
5. Public Disclosure in India	15
5.1. Background.....	15
5.2. Impact on the Pulp and Paper Sector	16
6. Discussion.....	21
7. Conclusion	24
References.....	27

Can Voluntary Environmental Regulation Work in Developing Countries: Lessons From Case Studies

Allen Blackman*

1. Introduction

The conventional approach to industrial pollution control is to establish laws requiring firms to cut emissions. Voluntary regulation, by contrast, provides incentives—but not mandates—for pollution control. The four main types of voluntary regulation are: environmental agreements negotiated between regulators and industry; public programs (administered by regulators or third parties) that individual firms are invited to join; public disclosure initiatives that collect and disseminate information on participants' environmental performance; and unilateral commitments made by firms (Khanna 2001).¹ In industrialized countries, such regulation has become quite popular (OECD 1999, 2003). Less well known is that environmental authorities in developing countries, particularly those in Latin America, also have embraced this approach and are rapidly putting initiatives in place. For example, over the past decade, regulatory authorities in Colombia, Chile, and Mexico have negotiated dozens of high-profile voluntary “clean production agreements” with dirty industrial sectors (Jiménez 2007; Hanks 2002). Other types of voluntary regulation, including state-run voluntary audit, labeling, and public disclosure programs, are also increasingly common (Rivera 2002; Blackman et al. 2007; García, Sterner and Afsah In Press).

Although voluntary environmental initiatives in industrialized countries share many features with those in developing countries, their objectives are generally different. Policymakers in industrialized countries typically use voluntary regulation to encourage firms to overcomply with mandatory regulations; those in developing countries generally use it to help remedy rampant noncompliance with mandatory regulation. For example, an explicit goal of national

* I'm grateful to Peter deLeon, Jorge Rivera, three anonymous reviewers, and seminar participants at Catholic University of Chile, Johns Hopkins University School for Advanced International Studies, and Monterrey Institute of Technology for helpful comments and suggestions. Thanks are also due to Bidisha Lahiri, Tom Lyon, Carlos Muñoz, Urvashi Narain, Billy Pizer, Nick Powers, Marisol Rivera, and Nick Sisto for collaborating on the three case studies summarized in this paper.

¹ Taxonomies of voluntary regulation differ but typically include these four categories. See also Lyon and Maxwell (2002), Higley, Convery, and Lévêque (2001), and OECD (1999, 2003).

clean production initiatives in both Chile and Colombia has been to foster compliance with mandatory regulation (Jiménez 2007; Blackman et al. 2006). Given that voluntary regulation in developing countries is usually a frontline compliance strategy rather than an effort to move beyond compliance, the stakes for its success are high.

But is voluntary regulation likely to have significant environmental benefits in developing countries? Two opposing views are emerging in the nascent literature on the topic. Some argue that voluntary regulation holds considerable promise for developing countries (Hanks 2002; World Bank 1999). As is well known, policymakers in the global south face an array of barriers to enforcing mandatory regulation, including weak institutions, incomplete legal foundations, and limited political will (Russell and Vaughn 2003; Eskeland and Jimenez 1992). According to its proponents, voluntary regulation sidesteps these constraints because, by definition, it does not depend directly on mandatory regulation to motivate polluters to improve their environmental performance. Rather, it relies on at least two other types of incentives. First, by raising the profile of firms' environmental performance, voluntary regulation can boost pressures placed upon polluters by consumers, capital markets, nongovernmental organizations, and community groups. For example, a firm participating in a negotiated voluntary agreement could, in principle, receive positive publicity that increases its sales, enhances its access to financial capital, and deflects criticism from environmental advocates. Second, voluntary initiatives often subsidize investments in pollution abatement. These subsidies can be pecuniary—for example, grants or loans for pollution control equipment—but more often they are informational—for example, seminars, brochures, and one-on-one interactions that provide technical assistance in pollution abatement. Such nonpecuniary subsidies are reputed to be a leading “soft” benefit of voluntary regulation.

Notwithstanding those arguments, there are at least four reasons to doubt that voluntary regulation can be effective in developing countries.

(i) *Weak regulatory pressure.* Case studies suggests that a “background threat” of mandatory regulation is often a critical motivation for firms to participate in and comply with voluntary regulatory initiatives (Khanna 2001; Lyon and Maxwell 2002). This finding implies that voluntary regulatory instruments are unlikely to perform well in countries where mandatory regulation is weak.

(ii) *Weak nonregulatory pressure.* Many of the nonregulatory factors that reputedly motivate firms to participate in and comply with voluntary regulation—including pressure from consumers, capital markets, nongovernmental organizations, and community groups—are

relatively anemic in developing countries. Niche markets for “green” products are smaller than in industrialized countries; capital markets, including stock markets, are thinner; and environmental nongovernmental organizations and advocacy groups are relatively weak and scarce (Fry 1988; Wehrmeyer and Mulugetta 1999).

(iii) *Regulatory capture.* Because environmental management institutions and private sector advocacy groups are relatively weak, regulatory processes and programs in developing countries are often heavily influenced by industrial interests, a phenomenon often referred to as regulatory capture (Russell and Vaughn 2003). This is likely to be a particular problem with initiatives that are the outcome of a negotiation between regulators and industry, such as clean production agreements. Where regulatory capture is a problem, polluters will be able to block monitoring and enforcement mechanisms, third-party participation, individual penalties for noncompliance, quantified baselines and targets, and other measures that are widely seen as prerequisites for effective voluntary initiatives (OECD 1999). A closely related concern is that in developing countries, voluntary regulation can be used to preempt or delay effective mandatory regulation by creating an “environmental Potemkin Village”—a false impression that regulators and polluters are making progress on environmental problems. If this is the case, one cannot argue that, whatever its weaknesses, voluntary regulation can only improve environmental quality. Rather, voluntary regulation can have real environmental costs, which must be weighed against any possible benefits.

(iv) *Preponderance of small-scale firms.* Small-scale and informal (unlicensed and unregistered) firms are more prevalent in developing countries than in industrialized countries (Blackman 2006). Using voluntary regulation to control pollution from such firms is problematic. Small firms may be less susceptible to many of the regulatory and nonregulatory pressures that create incentives for compliance with voluntary initiatives, including those generated by green consumers and capital markets. Also, they may be more likely to free-ride on the activities of larger participants in voluntary initiatives.

How have those arguments for and against the use of voluntary regulation in developing countries played out in practice? The literature on the topic is quite thin, and to my knowledge, a broad assessment has yet to appear. Among the studies that have been published, all but two focus on evaluating a single initiative, and none have compared and contrasted different types of

initiatives to shed light on the advantages and disadvantages of each.² Related research on industrialized countries may not generalize to developing countries, where voluntary regulation is often used for different purposes and where the institutional and socioeconomic context is dissimilar.

To help fill this gap, this paper presents case studies of three voluntary initiatives: a series of negotiated agreements in Mexico, a public program in Mexico, and a public disclosure scheme in India. Two criteria were used to select the three case studies. First, we chose case studies of three types of voluntary regulation to facilitate comparison. The disadvantage of this cross-cutting focus is, of course, a more limited understanding of each type of initiative. Second, we chose case studies that could be extracted from recently completed or ongoing research. The three case studies are drawn from more detailed analyses (Blackman and Sisto 2006; Blackman et al. 2007; Powers et al. 2007). The additional contributions of the present paper are to compare and contrast the three initiatives focusing on broad themes (including the four “concerns” discussed above) rather than methodological details, to place them in context via a review of the literature, and to distill policy and research prescriptions.

Because three case studies constitute a small nonrandom sample of voluntary initiatives, we need to be cautious in drawing conclusions. That said, our analysis suggests that although voluntary environmental regulation in developing countries is a risky endeavor, initiatives that are carefully designed and deployed can be effective. The risks can be minimized by emphasizing the dissemination of information about pollution and pollution abatement options and by avoiding voluntary tools in certain situations—those where regulatory and nonregulatory pressures for improved environmental performance are weak and where polluters can dictate the terms of the initiative.

The remainder of the paper proceeds as follows. The second section presents a review of existing case studies of voluntary regulation in developing countries. The third section presents a case study of negotiated voluntary agreements between regulatory authorities and leather tanneries in Guanajuato, Mexico. The fourth section offers a case study of Mexico’s Clean Industry Program, a national voluntary audit program. The fifth section presents a case study of India’s Green Ratings Project, a public disclosure program. The sixth section compares and

² Hanks (2002) and Utting (2002) compare cases studies of voluntary regulation in developing countries. Both are limited to one type of voluntary regulation: the former examines negotiated agreements, and the latter mainly examines unilateral commitments.

contrasts the three initiatives, and the last section presents policy prescriptions and suggestions for future research.

2. Literature Review

Although the growing popularity of voluntary regulation worldwide has spurred a boom in research on the topic (for reviews, see Harrison 1999; Khanna 2001; Lyon and Maxwell 2002; and Morgenstern and Pizer 2007), only a few studies have focused on developing countries. This section reviews this thread of the literature. We restrict attention to the three types of voluntary regulation represented by our case studies—negotiated agreements, public programs, and public disclosure—paying particular attention to the four concerns discussed in the introduction.³

2.1. *Negotiated Agreements*

Case studies of voluntary environmental agreements negotiated between regulators and industry highlight the importance of both regulatory pressure and regulatory capture in explaining success and failure: they suggest that such agreements are more effective when accompanied by a credible threat of mandatory regulation, and less effective when polluters are able to block design elements aimed at holding them to environmental performance targets. Jiménez (2007) analyzes Chile's extensive experience with sector-wide negotiated voluntary agreements, the result of a 2001 national policy aimed at improving compliance with mandatory regulation. The negotiated agreements complemented a reasonably effective mandatory regulatory system and included specific environmental performance targets, clear deadlines, third-party monitoring, sanctions for noncompliance, and pollution abatement subsidies. Jiménez uses rigorous policy evaluation ("matching") techniques along with detailed plant-level survey data to compare the environmental performance of plants that participated in voluntary agreements with similar plants that did not participate. He concludes that the voluntary agreements did in fact spur environmental performance.

Esterling Lara's (2003) evaluation of negotiated agreements in Colombia is far less positive. These agreements grew out of an effort to improve compliance with 1993 laws that completely overhauled the nation's environmental regulatory system. Virtually all the agreements lacked specific targets, deadlines, third-party monitoring, sanctions, and subsidies.

³ See Utting (2002) and Haslam (2004) for reviews and case studies of the fourth main type of voluntary regulation (unilateral commitments) in developing countries.

The specific targets that industry committed to in the agreements were overwhelmingly procedural—for example, holding meetings, forming committees, and generating reports. Even so, Esterling Lara found that in a sample of 13 voluntary agreements, on average industry kept only about a third of these low-level commitments.

Both Dvořák, Lisa, and Sauer (2002) and Freitas and Gereluk (2002) present case studies of voluntary agreements intended to preempt more-stringent mandatory regulations. Dvořák, Lisa, and Sauer analyze a 1995 agreement between the Ministry of the Environment and a national trade association of washing powder producers in the Czech Republic that was used by the trade association to head off mandatory rules on phosphate content. The targets set under the agreement were relatively lax, and the authors conclude that as a result, the agreements probably had few environmental benefits. Freitas and Gereluk evaluate a 1995 Brazilian agreement negotiated among the national government, representatives of industry, and labor unions to limit workplace exposure to benzene, a carcinogen. The agreement revamped an unrealistic 1994 regulation that mandated zero exposure: it set less stringent industry-specific standards, established rules for handling and storing benzene, and set up monitoring procedures. According to Freitas and Gereluk, notwithstanding some shortcomings, investment in benzene abatement, benzene exposure, and the incidence of benzene-related occupational illness have all declined significantly since the agreement was signed.

2.2. Public Programs

The handful of studies of developing country voluntary public programs—that is, programs administered by regulators or third parties that require participating firms to meet environmental performance or procedural standards—suggest that they can have environmental benefits, and that external pressures applied by regulators and other stakeholders motivate firms to participate. Rivera (2002, 2004) analyzes the Costa Rican Certification for Sustainable Tourism program, a voluntary initiative that aims to reduce the adverse environmental impacts of hotels. Using detailed data on more than 150 hotels, Rivera finds that government monitoring, trade association membership, and an orientation toward green consumers drive participation. Furthermore, he finds that only those participating hotels that overcomplied with program standards were rewarded with higher room prices and more customers, a result that suggests that nonparticipants are not able to free-ride on the investments of participants.

Blackman and Bannister (1998) evaluate an early-1990s voluntary program aimed at persuading managers of more than 300 small-scale brick kilns in Ciudad Juárez, Chihuahua (Mexico) to substitute clean-burning propane for dirty traditional fuels, including used tires and

scrap wood. Roughly half the kilns in the city joined the program, even though switching to propane dramatically increased production costs. Blackman and Bannister attribute the program's success partly to stepped-up pressures applied by regulators, trade associations, and community organizations, and to subsidies paid to propane adopters.

Several papers examine International Standards Organization (ISO) 14001 certification, a voluntary program that requires participating plants to identify their negative environmental impacts, establish goals for reducing them, and design an environmental management plan to meet these goals. Using survey data from more than 200 Mexican manufacturing plants, Dasgupta, Hettige and Wheeler (2000) find, among other things, that plants that are frequently inspected by regulators, are publicly owned, and have more educated employees are more likely to obtain ISO 14001 certification. They also find that certified plants are more likely to comply with mandatory regulation. Christmann and Taylor (2001) use similar methods to examine ISO 14001 certification in a sample of more than 100 Chinese firms. They find that firms that are owned by or sell to multinationals and those that export to developed countries are more likely to be certified. Finally, Roht-Arriaza (1997) examines the potential for ISO 14001 certification to generate significant improvements in environmental performance in the 18 countries that belong to the Asian Pacific Economic Corporation. She concludes that in isolation, this voluntary program is unlikely to lead to such improvements because it requires firms only to adopt management procedures, not to meet performance standards, and has weak information, reporting, and accreditation requirements.

2.3. Public Disclosure

Only a few published studies examine developing country voluntary programs that collect, verify, and disseminate information on firms' environmental performance. All present positive evaluations. García, Sterner, and Afsah (In Press) and Blackman, Afsah, and Ratananda (2004) analyze Indonesia's widely acclaimed Program for Pollution Control, Evaluation, and Rating (PROPER), a quasi-voluntary initiative (at first, participation was mandatory) that assigns plants easy-to-understand color-coded rankings and disseminates these rankings to create incentives for compliance through "honor and shame." García, Sterner, and Afsah use econometric techniques to demonstrate that the program led to significant reductions in polluting emissions. Blackman, Afsah, and Ratananda present plant-level survey results that suggest the program spurred pollution reductions mainly by providing the managers with new information about their plants' emissions and abatement opportunities. Finally, Wang et al. (2004) describe pilot public disclosure programs in two Chinese cities: Zhenjiang, Jiangsu, and Hohot, Inner

Mongolia. These “GreenWatch” programs also assign participating facilities simple color-coded rankings. The authors find that the two pilot programs have had significant positive impacts and recommend expanding them to other Chinese municipalities.

3. Negotiated Agreements in Mexico⁴

This section presents a case study of four negotiated voluntary agreements used to control pollution generated by hundreds of tanneries in León, Guanajuato (Mexico). As we shall see, the agreements amounted to an almost entirely unsuccessful effort to circumvent legal, institutional, and other barriers to enforcing mandatory regulation.

3.1. Background

León, Mexico’s leather goods capital, is a sprawling industrial city of some one million inhabitants in the north-central state of Guanajuato. Approximately 1,200 tanneries are scattered throughout the city. For the most part, they supply small local shoemaking and leather wear factories. The vast majority of the tanneries employ fewer than 15 workers, and about a third are informal. They generate organic liquid wastes, inorganic liquid wastes (notably sulfur and chromium), and solid wastes (mainly sludge infused with toxic chemicals). Since 2000, the organic liquid wastes have been treated by a municipal wastewater treatment plant, but the solid wastes and inorganic liquid wastes remain uncontrolled and are a leading contributor to the severe degradation of the Lerma-Chapala watershed, one of Mexico’s largest. The number, small size, dispersion, informality, and local economic importance of León’s tanneries make them an exceptionally challenging target for environmental regulatory authorities.

3.2. The Impetus for Voluntary Regulation

Although pollution from tanneries in León has been a serious problem for decades, significant pressure for remedial action did not develop until the mid-1980s, following the launch of a campaign to improve surface water quality in the Lerma-Chapala watershed. Despite this pressure, in the 1980s and 1990s, local regulators faced severe constraints that more or less ruled out relying principally on a conventional mandatory approach and made negotiated voluntary agreements a logical choice. Specifically, regulators lacked the legal, institutional, physical, and

⁴ This section is drawn from Blackman and Sisto (2006).

civic infrastructure needed to use mandatory tools. The requisite legal infrastructure included clear regulations governing both the discharge of liquid wastes into municipal sewers and the classification, handling, and storage of hazardous wastes. The former were not promulgated until 1998. Although hazardous waste regulations were promulgated in 1993, written materials clarifying how they applied to tanneries were not available until 1997.⁵ The institutional infrastructure needed to regulate tanneries included capable state and municipal regulatory authorities. Yet Guanajuato's environmental regulatory agency was not established until the mid-1990s, León's sewer authority was not founded until 1985, and a municipal environmental authority was not established until the next decade. The physical infrastructure needed to control tannery pollution included facilities to treat inorganic liquid wastes, organic liquid wastes, and hazardous solid wastes. Of these three types of infrastructure, to date, only one—a facility to treat organic wastes—has been built, and it did not begin operating until 2000. Finally, the civic infrastructure needed to control tannery pollution included public support for regulating tanneries in León. There is virtually no evidence that citizens of León—either individually as voters and consumers or collectively via nongovernmental and community organizations—have ever placed significant political pressure on tanners to improve pollution control. One reason is that, as the leading employer in the city, the leather goods industry enjoys considerable political and popular support.

3.3. *The Four Agreements*

Starting in 1987, Mexican regulatory authorities negotiated a series of four voluntary environmental agreements with leather tanners in León. The agreements had several common characteristics. Each agreement was signed by tannery trade associations and by federal and local regulators, and each was administered by local regulators. Each committed the tanners to completing specified pollution control measures within two to four years, and each committed regulators to making investments needed to fill gaps in regulatory infrastructure and to providing

⁵ Prior to the 1988 passage of the General Law of Ecological Balance and Protection of the Environment (LGEEPA), Mexico's second comprehensive federal environmental law, regulations governing both liquid and hazardous wastes were confused, incomplete, and at least in the state of Guanajuato, roundly ignored. LGEEPA assigned local governments the responsibility of regulating liquid discharges into municipal sewer systems, the main repository for tannery liquid effluents in León. However, it was not until 1998 that León finally promulgated regulatory standards for such discharges. LGEEPA charged the federal government with regulating hazardous wastes, but the federal government did not issue implementing regulations regarding hazardous wastes until 1993 and did not clarify how these regulations applied to tanneries until four years later.

tanners with pecuniary and nonpecuniary pollution abatement subsidies. Unfortunately, the outcome of each negotiated agreement was also the same. Tanners—and to a lesser extent regulators—abrogated virtually all of their commitments.

Signed in July 1987, the first agreement committed the tanners to installing low-cost pollution prevention and control measures—namely, recycling tanning baths and sedimentation tanks—within two years. For their part, regulators agreed to promulgate standards needed to control discharges into the local sewer system. Of these provisions, only one was carried out: most tanners installed sedimentation tanks, which were urgently needed to prevent the city's sewers from clogging.

In light of the failure of the first voluntary agreement, regulators negotiated a second agreement in October 1991. It focused on a new pollution control strategy: building a series of common effluent treatment plants to control inorganic liquid wastes. Tanners committed to relocating to a series of industrial parks where the plants would be built. The city of León agreed to pass new zoning legislation that would facilitate relocation, register all tanneries, and build municipal solid and organic liquid waste treatment facilities. The agreement did not specify who would pay for relocating the tanneries and building the effluent treatment plants. The second tannery agreement spurred only one real accomplishment—city authorities set aside a plot of unimproved land for the creation of a large tanning industrial park. By 1993, efforts to control tannery pollution had once again come to a standstill.

After an international incident involving the death of thousands of migratory birds wintering at a reservoir polluted by tannery wastes in the winter of 1994–1995, pressure for tannery pollution control was revived, and a third voluntary tannery agreement was signed in June 1995. It more or less repeated the provisions of the first two agreements. In addition, federal, state and municipal authorities agreed to finance an education and research center to build public support and a scientific foundation for tannery pollution control. Again, none of these commitments were kept.

The fourth negotiated voluntary agreement to control tannery wastes was signed in March 1997. It included a new twist on the usual strategy for controlling tannery liquid wastes: the city would build a series of common effluent treatment plants as well as segregated sewer systems to transport wastes to these plants and would charge tanners fees to pay for this infrastructure. Individual tanners instead of trade association representatives were required to sign the agreements. The signatories of the fourth voluntary agreement ignored virtually all its terms with two exceptions: city authorities built a municipal wastewater treatment plant to treat organic (but

not industrial) wastes and dug an unimproved pit for the disposal of tannery sludge. Stakeholders in León have not negotiated a fifth agreement, and the environmental problems generated by tanneries persist.

4. A Public Program in Mexico⁶

This section presents a case study of the Clean Industry Program (also known as the National Environmental Auditing Program), Mexico's flagship national voluntary environmental program. The case study suggests that, unlike some voluntary public programs in industrialized countries, the Clean Industry Program does not chiefly attract already-clean plants seeking positive publicity. Rather, it attracts a significant number of relatively dirty plants and, therefore, likely has a positive impact on environmental quality.

4.1. Background

Established in 1992 as a branch of the national environmental ministry, the Federal Environmental Attorney General's Office (PROFEPA) is charged with monitoring and enforcing environmental regulations in most areas where the federal government has jurisdiction, including particularly dirty industrial sectors (e.g., petroleum), certain pollutants (e.g., air emissions), and certain geographic regions (e.g., the U.S.-Mexico border). This broad mandate is exceptionally challenging given PROFEPA's limited human and financial resources (Brizzi and Ahmed 2001).

To help overcome these challenges, in its first year of operations, PROFEPA created the Clean Industry Program. It was designed to leverage PROFEPA's limited resources by shifting some of the burden for monitoring onto the private sector. It operates as follows. Plants volunteering to join the program pay for an environmental audit by an accredited third-party, private sector inspector. The audit determines what pollution control and prevention procedures the plant has in place and what additional procedures are required to comply with all existing environmental regulations. Following the audit, the plant agrees in writing to correct all violations or deficiencies by a specified date. PROFEPA, in exchange, agrees not to penalize the plant for the identified violations until that date has passed. If the plant abides by this agreement, it is awarded a Clean Industry certificate that exempts it from regulatory inspections for two

⁶ This section is based on Blackman et al. (2007).

years. Akin to a seal of good housekeeping, this certificate is sometimes used in marketing campaigns.

Hence, the Clean Industry Program provides a basket of incentives for participation and compliance that includes both “carrots” and “sticks.” The main carrots are an enforcement amnesty and the Clean Industry certificate, which can be used as a marketing tool. The main stick is the threat of enforcement of mandatory environmental regulations for plants not in the program. The Clean Industry Program is now quite popular. The number of participating plants grew from 77 in 1992 to roughly 3,500 in 2005.

4.2. Do Only Clean Plants Join?

A pervasive concern about voluntary public programs, in both industrialized and developing countries, is that they may not actually generate significant environmental benefits. Some research suggests that such programs mostly attracts plants that are already relatively clean because clean plants pay a minimal cost to meet the programs’ environmental performance targets but can reap significant benefits. Therefore, it is said, the programs do not improve environmental quality and primarily serves as public relations vehicles—for both industry and regulators (Vidovic and Khanna 2007; Morgenstern and Pizer 2007).

Unfortunately, the credible plant-level data on the environmental performance of Mexican firms needed to test this hypothesis simply do not exist. Therefore, we use a proxy: records of PROFEPA fines. To determine whether relatively clean plants are joining the Clean Industry Program, we examine the relationship between PROFEPA fines and participation in the Clean Industry Program.

We construct a plant-level data set by merging registries of manufacturing plants compiled by the Mexican Ministry of Economics and PROFEPA. The result is a sample of 61,821 plants of which 541 participated in the Clean Industry Program and 61,280 did not. Variables include the dates and amounts of fines from 1987 through 2004 as well as the plants’ geographic location, sector, scope of market, gross sales, equity, and whether it exports, imports, and is a government supplier.

Simple summary statistics indicate a strong correlation between PROFEPA fines and participation in the Clean Industry Program (Table 1). Plants that participated in the program were fined far more often and far more heavily than nonparticipants: 20 percent of participants were fined versus only 4 percent of nonparticipants, and the average fine was 89,923 pesos for participants versus 36,530 pesos for nonparticipants.

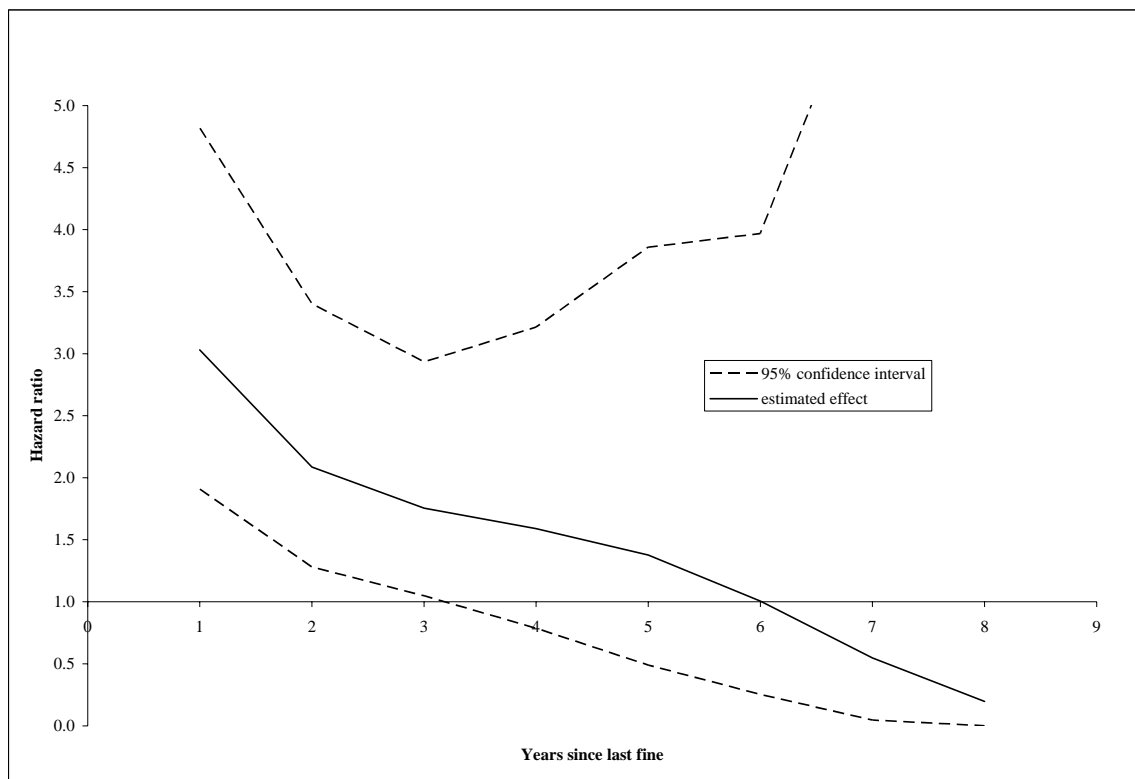
**Table 1. Mexican Environmental Attorney General's
Office (PROFEPA) fines, 1987–2004**

↓ Sample →	<i>Clean Industry participants + nonparticipants</i>	<i>Clean Industry participants</i>	<i>Clean Industry nonparticipants</i>
<i>All plants</i>	(n = 61,821)	(n = 541)	(n = 61,280)
Fined	3.17%	20.15%	3.02%
<i>Plants that were fined</i>	(n = 1,611)	(n = 98)	(n = 1,513)
Total fines (n)	2,658	155	2,503
Average fines/plant (n)	1.50	1.43	1.50
Average fine (pesos)	39,847.34	89,923.43	36,530.21

Although suggestive, this simple correlation does not prove causation. It may just reflect differences in underlying characteristics of plants. For example, it could be that large plants are more likely to be fined by PROFEPA and are also more likely to participate in the Clean Industry Program. The correlation also does not indicate whether the timing of PROFEPA fines has anything to do with participation, since we do not know the interval between the two events or even which comes first.

To control for plant characteristics and timing, we employ an econometric (duration) model, described in detail in Blackman et al. (2007). The results are summarized in Figure 1, a graph of the relationship between the effect of a PROFEPA fine—the hazard ratio—on the probability of joining the Clean Industry Program, and the number of years that have elapsed since the most recent fine. (More precisely, the hazard ratio is the ratio of the conditional probability of joining the program given a fine to the conditional probability of joining absent a fine.) The figure also includes 95 percent confidence intervals. The hazard ratio is positive and significantly different than unity (i.e., no effect on the probability of joining the program) for t between one and three. The appropriate interpretation is that a PROFEPA fine raised the probability that a plant would join the Clean Industry Program for three years following the fine. Figure 1 shows that, on average, the likelihood of joining the Clean Industry Program more than doubles for three years after a fine.

Figure 1. Hazard ratio (hazard rate with fine/hazard rate without fine) as function of time since last fine for plants participating in Clean Industry Program (Mexico)



This graph provides compelling evidence of a causal relationship between PROFEPA fines and participation in the Clean Industry Program. In particular, the temporal pattern of the effect—the fact that the closer one is in time to a fine, the greater the probability of participation—suggests that regulatory activity causes participation.

4.3. Impacts on Environmental Quality

Our results suggest that the Clean Industry Program is not simply a public relations scheme that primarily attracts already-clean firms. Rather, its participants include a significant number of dirty firms under pressure from regulatory authorities.

Official records indicate that the vast majority of firms that joined the Clean Industry Program signed agreements with PROFEPA to eliminate deficiencies identified in their audits, complied with these agreements, and were ultimately awarded Clean Industry certificates. However, our analysis cannot say whether the Clean Industry Program actually motivated these improvements in environmental performance. It could be that the plants that joined the program would have taken the same or similar actions even if they had not joined (presumably because

they were being fined by PROFEPA and wished to avoid further sanctions). Hence, our results can be interpreted as a preliminary indication—but by no means proof—that the Clean Industry Program has generated significant environmental benefits.

5. Public Disclosure in India⁷

This section presents a case study of the Green Rating Project, a public disclosure pollution control program in India. The case study suggests the program has had a significant environmental benefit by spurring abatement at particularly dirty industrial facilities.

5.1. Background

India's phenomenal economic growth during the past 15 years, averaging more than 6 percent per year, has had severe environmental consequences that, in turn, have sparked public demand for environmental protection. In the mid-1990s, the Centre for Science and Environment (CSE), arguably India's best-known and most influential environmental nongovernmental organization, began work on the Green Ratings Project (GRP), a public disclosure pollution control program. GRP background materials state that the program was inspired by the Council of Economic Priorities, a now-defunct U.S. nongovernmental organization that provided investors with annual ratings of the environmental performance of U.S. companies, and that the GRP was urgently needed to shore up India's weak environmental regulatory institutions.

To date, the GRP has rated the environmental performance of large plants in four pollution-intensive industrial sectors: pulp and paper, chlor-alkali, cement, and automobiles. Plants are assigned a numerical score ranging from 0 to 100 and are awarded symbolic "leaves" depending on their score: five leaves for scores of 75 and above, four for 50–74, three for 35–49, two for 25–34, one for 15–24, and none for 14 and below. The GRP scores are based on an evaluation of the plant's life-cycle environmental impacts, from the sourcing and processing of raw materials to the manufacture, use, and disposal of its products. The exceptionally detailed data needed to conduct this cradle-to-grave analysis are collected from questionnaires administered to participating plants, along with secondary data provided by local environmental regulatory institutions and other sources. To give plants an added incentive to respond to questionnaires, CSE assigns those that fail to do so a score of zero and a rating of no leaves.

⁷ This section is drawn from Powers et al. (2007).

According to CSE, self-reported data are carefully checked by the organization's inspectors and compared with the secondary data. Both the questionnaires used to collect the data and the methodology used to analyze it have been designed by a panel of leading technical experts in each rated sector. In addition, to ensure objectivity and transparency, the entire GRP program is supervised by a panel comprising high-level representatives of industry, government, the judiciary, academia, and nongovernmental organizations.

In addition to informing the public about plants' environmental performance, the GRP also informs plants about their pollution and pollution abatement options. CSE uses the primary and secondary data it collects to construct a detailed environmental profile of each plant that is sent to the facility for review before being released to the public. CSE also publishes specific recommendations for improving environmental performance in each sector.

5.2. Impact on the Pulp and Paper Sector

Has the GRP actually motivated participating plants to improve their environmental performance? Answering this question requires data on the environmental impacts of participating plants for several years before and several years after a rating. Such data are available for only one sector—pulp and paper, the first sector rated by GRP (in 1999) and the only sector to have been rated a second time (in 2004). CSE based these two ratings on annual survey data on India's largest pulp and paper plants for the years 1996 through 2003. All plants with a production capacity exceeding 100 tons per day in 1998 were included in the first rating. The resulting sample comprises 28 plants that collectively were responsible for 59 percent of national pulp and paper production. Of these 28 plants, 22 were rated a second time in 2004.⁸ The 1996–2002 panel data make it possible to assess the impact of the 1999 GRP rating on the environmental performance of these 22 plants.

Table 2 provides a preliminary indication of the impact of the GRP on 21 of these 22 plants.⁹ The table shows that environmental performance of the 21 plants was generally poor in

⁸ Of the six plants that were rated in the first period but not the second, five were permanently closed and one was temporarily closed after the first rating.

⁹ One plant, BILT Graphics, answered CSE questionnaires and was assigned an environmental performance score but not a "leaves rating" because it was not in operation for the entire sample period. Of the six plants that were included in the first rating but not the second, one received two leaves and five received one leaf. Six plants were rated in the second phase, but not in the first. Of these plants, three received three leaves, one received two leaves, one received one leaf, and one received zero leaves.

both 1999 and 2004. In both ratings, no plants received more than three leaves. The table does not provide a clear indication that the GRP spurred significant improvements in environmental performance: only a few plants moved from lower to higher rankings between 1999 and 2004, and several moved in the opposite direction. However, after 1999, CSE changed the GRP rating criteria to make them significantly more stringent. Therefore, the 1999 and 2004 ratings are not comparable, and it is necessary to examine the data that underpin the ratings to determine how environmental performance actually changed over time.

Table 2. Green Ratings Project (India) pulp and paper plant ratings, 1999 and 2002

2nd rating (2004)	1st rating (1999)			<i>Total</i>
	1	2	3	
1 leaf	5	2	0	7
2 leaves	2	8	1	11
3 leaves	0	2	1	3
<i>Total plants</i>	7	12	2	21

Emissions data suggest that environmental performance of particularly dirty plants—those that received one leaf in the 1999 rating—did in fact improve significantly during 1999, the year of the first GRP rating. Figures 2–4 present average annual emissions data for the 21 sample plants for the years 1996–2003. They show that emissions of the three most common measures of water pollution—biochemical oxygen demand (BOD), chemical oxygen demand (COD), and total suspended solids (TSS)—from plants that received a one-leaf rating declined dramatically in 1999.

Figure 2. Annual average emissions of biochemical oxygen demand (BOD) from 21 pulp and paper plants participating in Green Ratings Project (India), by performance rating (leaves)

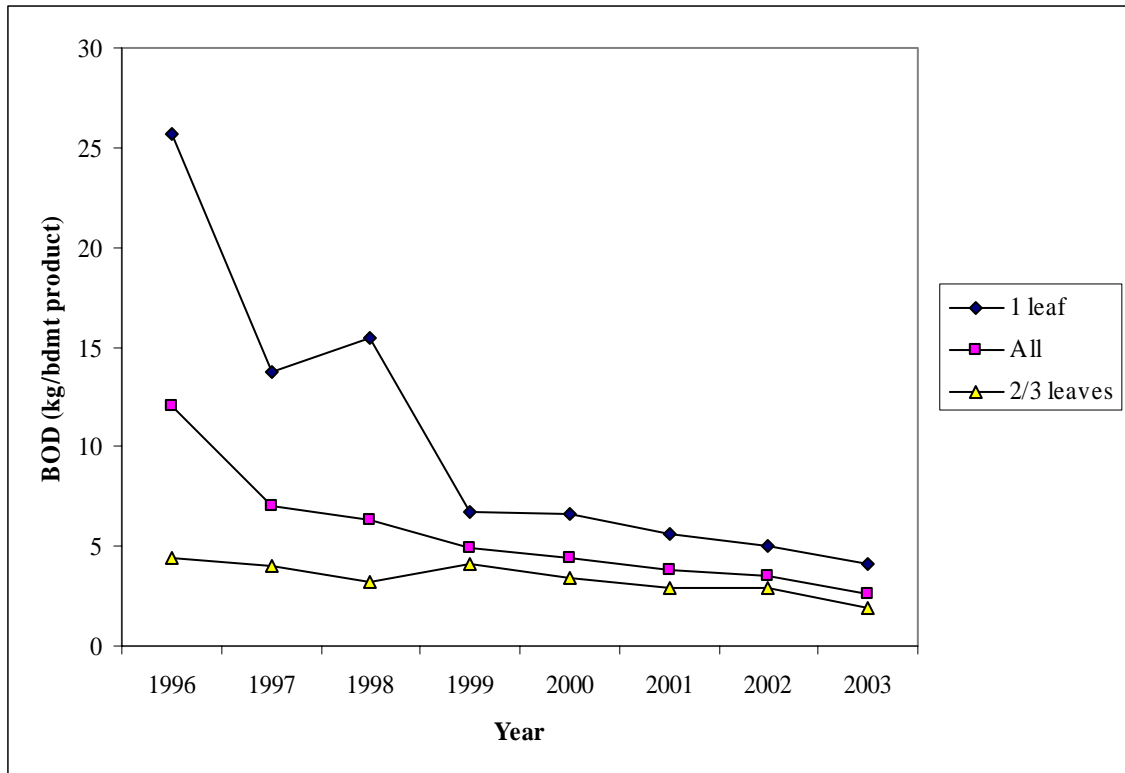


Figure 3. Annual average emissions of chemical oxygen demand (COD) from 21 pulp and paper plants participating in Green Ratings Project (India), by performance rating (leaves)

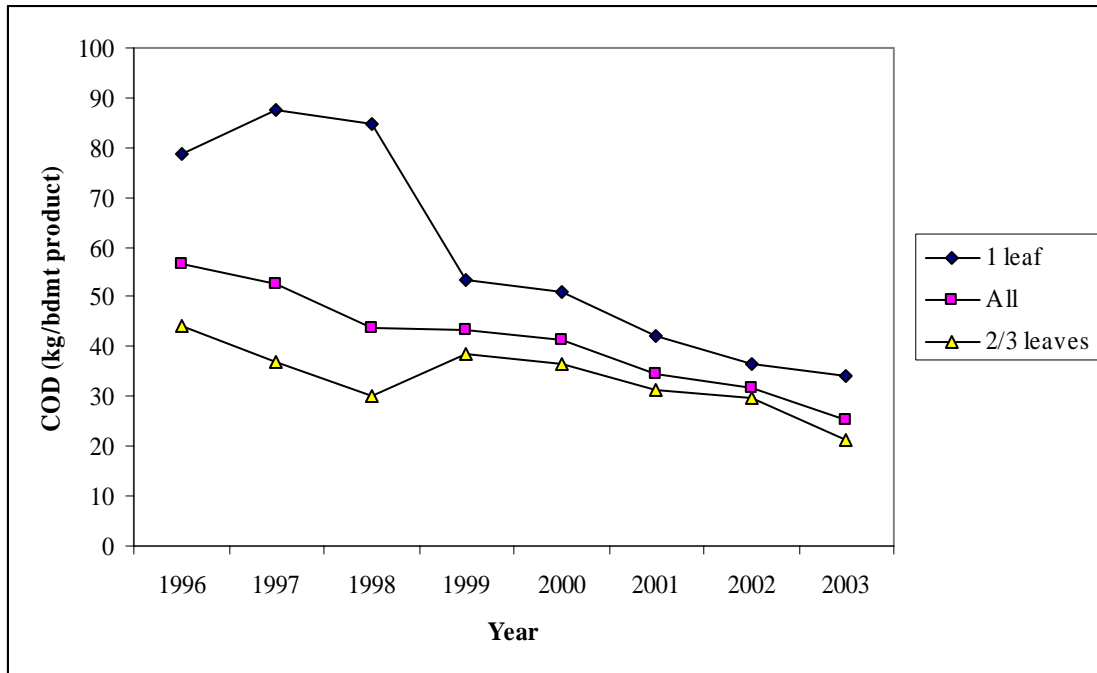
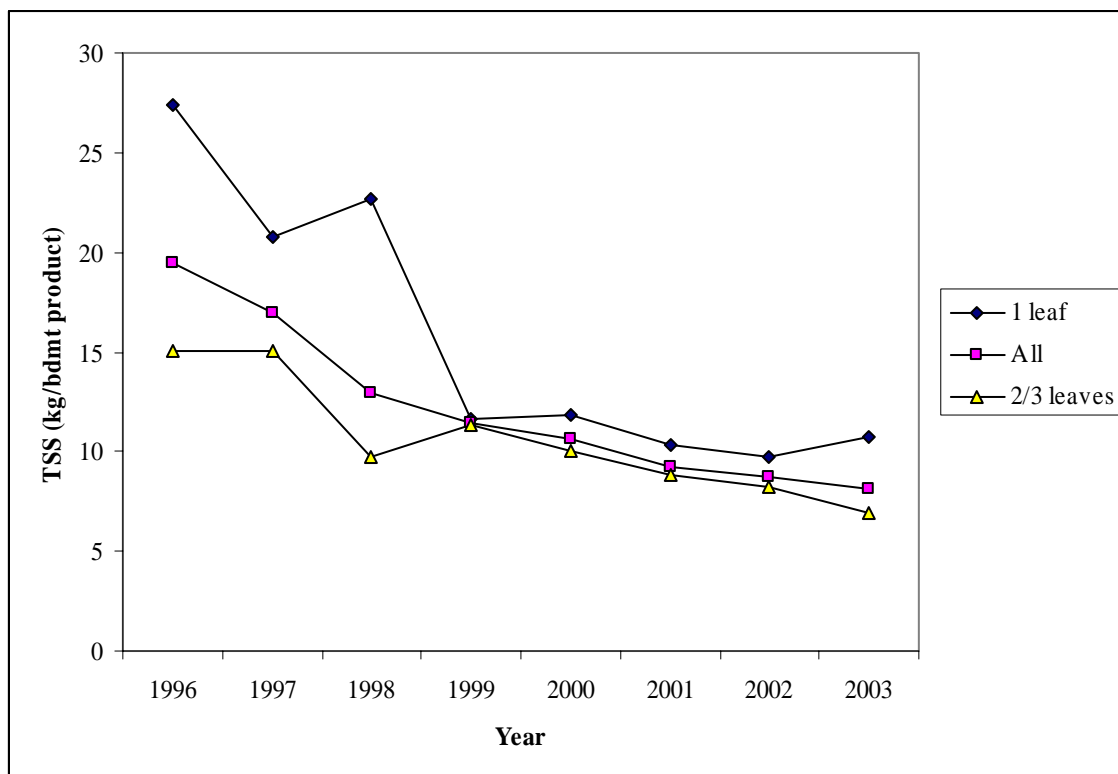


Figure 4. Annual average emissions of total suspended solids (TSS) from 21 pulp and paper plants participating in Green Ratings Project (India), by performance rating (leaves)



Although these figures demonstrate that poorly performing plants' emissions declined after the 1999, they are not definitive proof that the GRP ratings drove these reductions. The changes may have been due to contemporaneous industry-wide market and regulatory pressures. Powers et al. (2007) uses econometric techniques to control for such factors. Specifically, they control for community pressure as measured by socioeconomic characteristics of the communities surrounding participating plants, market pressure as measured by product mixes and prices of inputs and outputs, and exogenous technological change as measured by the industry-wide trend in pollution levels prior to 1999. The results strongly suggest that the GRP drove emissions reductions for plants that received a one-leaf rating in 1999. These findings comport with previous analyses of public disclosure programs in developing countries that show that disclosure has the greatest impact on poorly performing plants (García, Sterner, and Afsah In Press; Blackman, Afsah, and Ratunanda 2004). Intuition suggests that such plants would be more responsive to public disclosure because their marginal costs of controlling emissions are

relatively low (since they have not yet taken advantage of inexpensive abatement opportunities) and because the marginal benefits are relatively high (since poorly performing plants are probably under the most pressure from regulators and communities).

6. Discussion

We have presented three case studies intended to shed light on the prospects for voluntary regulation in developing countries. The case study of negotiated voluntary agreements in León, Guanajuato, paints a decidedly pessimistic picture of these prospects, while the case studies of the Clean Industry Program in Mexico and the Green Ratings Project in India provide grounds for optimism. Why were the Mexican negotiated agreements less successful? We will argue that various characteristics of the negotiated agreements made them particularly susceptible to the dangers of using voluntary regulation in developing countries—namely, weak regulatory pressures for improved environmental performance, weak nonregulatory pressures, and regulatory capture. In addition, these agreements were not effective in leveraging preexisting pressures by publicizing noncompliance.

Weak regulatory pressure

As discussed in Section 2, research on voluntary regulation in developing countries suggests that a background threat of mandatory regulation is an important driver of participation in and compliance with voluntary regulation. This research implies that voluntary regulation is unlikely to work in situations where such threats are not credible. The León case study bears out this prediction. Regulatory authorities in León were not able to threaten mandatory regulation because the legal, institutional, civic, and physical infrastructure they needed for enforcement was woefully incomplete. By the time the biggest gaps had been filled in the late 1990s, tanners had already abrogated three voluntary agreements without being punished and had little reason to believe that continued noncompliance would be sanctioned.

The institutions that administer the Clean Industry Program and the Green Ratings Project, on the other hand, carry a much bigger enforcement stick. PROFEPA, which runs the Clean Industry Program, is a national regulatory institution and likely has more capacity—including trained staff, funding, and political will—than do local regulators in the state of Guanajuato. PROFEPA regularly levies hefty fines for noncompliance, whereas local environmental regulatory authorities have sanctioned tanneries only infrequently. Although the Green Ratings Project is not a regulatory institution, the program likely brings to bear considerable regulatory pressure. It exposes and then vigorously publicizes noncompliance of the

leading polluters. The effect is to both inform national and local environmental regulatory institutions about noncompliance and generate public pressure for these institutions to take quick action to remedy the problem. Thus, one could argue that the Clean Industry Program and the Green Ratings Project have been more successful than negotiated agreements in León because the organizations that run these programs use voluntary regulation to leverage a credible enforcement threat, whereas the regulatory authorities in León tried to use it to compensate for the lack of such a threat.

Weak nonregulatory pressure

A second concern about using voluntary regulation in developing countries is that nonregulatory pressures are unlikely to take up the slack for weak mandatory regulation. In León, this appears to have been the case. Nonregulatory actors such as community groups and consumers never created significant incentives for tanners to improve their environmental performance. By contrast, these actors almost certainly generated such incentives in the Clean Industry Program and the Green Ratings Project. Both programs disseminate information about environmental performance at the national level, where pressures from external stakeholders are presumably stronger than at the local level. The Green Ratings Project was designed expressly for this purpose. Although the Clean Industry Program was not, it has a similar effect: plants that graduate from the program earn certificates and receive national publicity.

Regulatory capture

A third concern about using voluntary regulation in developing countries is that it will be captured by private sector lobby groups and may even lower environmental quality by preempting or forestalling mandatory regulation. The characteristics of the four voluntary agreements in León suggest that they were, in fact, captured by the tannery lobby. The agreements were mostly toothless, lacking quantified baselines and targets, transparency, monitoring and enforcement mechanisms, and individual penalties for noncompliance. Moreover, since the four agreements coincided with a prolonged period of negligible environmental progress, it is not unreasonable to suggest that they actually fostered this inactivity by creating the appearance—albeit less and less credible—of forward motion. In short, one could argue that the agreements did more harm than good. The evidence for regulatory capture is much less compelling in the case of the Clean Industry Program and especially the Green Ratings Project. The Clean Industry Program is administered by a national-level institution that likely has more power relative to polluters than the local regulators who

administered the León voluntary agreements, and the Green Ratings Project is administered by a nongovernmental organization.

Preponderance of small-scale firms

A fourth concern about using voluntary regulation in developing countries is that industrial sectors are often dominated by small firms that may be less susceptible to pressures applied by regulators, consumers, communities, and capital markets. This concern appears to have been well founded in the case of the León voluntary agreements. The leather tanning sector in León is dominated by small firms that have been particularly difficult for regulators to identify, monitor, and sanction; these firms rely principally on retained earnings instead of banks and stock markets for financing; they have received almost unwavering support from the local community; and they sell the lion's share of their product to small-scale local shoemakers, who have minimal incentives to vet the environmental performance of their suppliers. By contrast, both the Clean Industry Program and the Green Ratings Project focus on large-scale plants. Such plants are easier for regulators to monitor and sanction, need banks and capital markets for financing, sell their products in national and international markets (where consumers presumably care more about environmental quality), and are more likely to be targeted by environmental nongovernmental organizations and community groups.

Information dissemination

A final reason that the tannery voluntary agreements were less successful than the Clean Industry Program and the Green Ratings Project relates not to the potential dangers of using voluntary regulation in developing countries but to one of the reputed benefits—disseminating information to firms about their emissions and the various options for abating it. In general, the provision of such information is likely to fill a gap in developing countries. Firms in industrialized countries typically pay consultants to perform environmental audits, a practice that implies it is costly to collect environmental performance data. In countries like Mexico and India, where formal regulatory pressure is less stringent and factories have little incentive to pay these costs, one would expect polluters to be ill informed about their emissions and the options for reducing them. Only the third tannery voluntary agreement contained explicit provisions for fostering such informational mechanisms, and these provisions, like most others in the agreements, were more or less ignored. By contrast, both the Clean Industry Program and the Green Ratings Project emphasize disseminating information to participating firms. The Clean Industry Program does this via a third-party environmental audit, and the Green Ratings program

does it via environmental profiles and sector-wide recommendations for pollution control and prevention.

7. Conclusion

Before considering the policy implications of our case studies, a caveat is in order: our sample of three voluntary initiatives is obviously small and nonrandom and tells us little about how frequently similar programs and outcomes are observed in practice. Therefore, care must be taken in trying to distill policy lessons. Notwithstanding this limitation, the three case studies do provide some insights into the prospects for voluntary regulation in developing countries. The broad, if somewhat obvious, inference is that using voluntary regulation in developing countries is clearly risky—but not doomed to failure. The likelihood of success depends on the design and deployment of the initiatives. The case studies enable us to make four recommendations in this regard.

First, voluntary regulation is unlikely to be successful in situations where both regulatory and nonregulatory pressures for improved environmental performance are lacking. Our case studies, and those reviewed in Section 2, suggest that polluters do not make good on voluntary commitments for purely altruistic reasons. Rather, they do so to avoid present or future expected costs generated by regulators, product markets, capital markets, employees, and communities, or to reap rewards for compliance offered by these stakeholders. When these costs and rewards are minimal, compliance will be low. For example, for the leather tanneries in León, sanctions for abrogating negotiated agreements applied by regulators and others were minimal, and the outcome was predictable. It is important to point out, however, that voluntary initiatives can, if well designed, enhance regulatory and nonregulatory pressures for improved environmental performance. For example, the Clean Industry Program does this by improving PROFEPA's information about polluters via an environmental audit, and by enhancing their reputations with "green" consumers. The Green Ratings Project has similar benefits. Hence, while some preexisting pressures for improved environmental performance are a necessary condition for successful voluntary regulation, the hope is that voluntary regulation will leverage these pressures.

Second, voluntary initiatives are unlikely to be successful when they do not incorporate design features now widely viewed as prerequisites for success: quantified baselines and targets, transparency, monitoring and enforcement mechanisms, and individual penalties for noncompliance. The León negotiated agreements lacked all of these mechanisms, but the Clean Industry Program and the Green Ratings Project featured all of them. Ultimately, an absence of

these design elements may signal regulatory capture. It is probably no accident that among the three types of voluntary initiatives represented by our case studies—negotiated agreements, public programs, and public disclosure—these design characteristics were missing in negotiated agreements. As the name implies, such agreements are the result of a direct negotiation between regulators and industry, a process that naturally leads to situations where the private sector has considerable influence over the content of the agreement.

Third, national programs are more likely to be effective than local ones because they tap into a broader and deeper set of nonregulatory pressures, target large-scale firms that are relatively easy to monitor, and are run by national-level environmental authorities that usually wield a more credible threat of enforcement than local regulators. The one local initiative in our set of three case studies—negotiated agreements in León—was also the least successful. The exception to this rule, however, would be cases where regulatory and nonregulatory pressures for improved environmental performance are weak at the national level but strong in certain localities, such as capital cities or border cities (e.g., Blackman and Bannister 1998).

Fourth, the case studies indicate that disseminating information about pollution and abatement options to participating firms and the public at large can boost the effectiveness of voluntary initiatives. The two initiatives reviewed in this paper that emphasized information dissemination were more successful than the one that did not. One constraint is that in developing countries, collecting reliable plant-level environmental performance information is costly. However, the public sector need not bear all of these costs. For example, in the Clean Industry Program, these costs are shifted onto polluters, who must pay for third-party audits, and in the Green Ratings Project, they are split between participating plants and a nongovernmental organization.

Finally, our case studies and review of the literature suggest that further research on voluntary regulation in developing countries is needed. As discussed in Sections 1 and 2, research on the topic is rare, and comparative studies are even rarer. Research in several specific areas would be particularly helpful. First, more comparative studies are needed to shed light on the advantages and disadvantages of different types of voluntary regulation and to test the preliminary hypotheses presented in this section.

Second, we need to better understand whether voluntary regulation actually has measurable environmental benefits in developing countries. A major challenge in conducting such research is acquiring reliable plant-level panel data on environmental performance—information that is hard to come by in most developing countries (because it does not exist or is

tightly held) and that often must be collected via a survey. An advantage of studying public disclosure pollution control programs is that they typically generate the data needed for such evaluations. Another major challenge in evaluating the environmental benefits of voluntary regulation is determining what plants' environmental performance would have been had they not participated in the voluntary initiative—the counterfactual or baseline problem alluded to in our discussion of the Clean Industry Program and Green Ratings Project. A common tactic in quantitative research is to compare the environmental performance of participating and nonparticipating plants (Jiménez 2007) or to control for factors other than participation that may explain changes in environmental performance (Powers et al. 2007).

Third, further research is needed to identify the factors that drive the improved environmental performance of participants in voluntary initiatives. A variety of methods can be used to address this question, including regression analysis (Jiménez 2007; Blackman and Bannister 1998), survey research (Blackman et al. 2004), and choice experiments (Wernstedt et al. 2006). Finally, given that voluntary regulation in developing countries is typically used to achieve compliance with mandatory regulations rather than to move beyond them, further research is needed on the relationship between voluntary and mandatory regulation and on how this relationship creates special challenges and opportunities for regulators.

References

- Blackman, A. (ed.). 2006. *Small Firms and the Environment in Developing Countries: Collective Impacts, Collective Action*. Washington, DC: Resources for the Future Press.
- Blackman A., and G.J. Bannister. 1998. Community Pressure and Clean Technology in the Informal Sector: An Econometric Analysis of the Adoption of Propane by Traditional Mexican Brickmakers. *Journal of Environmental Economics and Management* 35(1): 1–21.
- Blackman A., and N. Sisto. 2006. Voluntary Environmental Regulation in Developing Countries: A Mexican Case Study. *Natural Resources Journal* 46(4): 1005–42.
- Blackman, A., S. Afsah, and D. Ratunanda. 2004. How Does Public Disclosure Work? Evidence from Indonesia's PROPER Program. *Human Ecology Review* 11(3): 235–46.
- Blackman, A., S. Hoffman, R. Morgenstern, and E. Topping. 2006. *Assessment of Colombia's National Environmental System (SINA)*. Report. Washington, DC: Resources for the Future.
- Blackman, A., B. Lahiri, W. Pizer, M. Rivera, and C. Muñoz. 2007. *Voluntary Environmental Regulation in Developing Countries: Mexico's Clean Industry Program*. Discussion Paper 07-36. Washington, DC: Resources for the Future.
- Brizzi, A., and J. Ahmed. 2001. A Sustainable Future. In *Mexico: A Comprehensive Development Agenda for the New Era*, edited by M. Guigale, O. Lafourcade, and V.H. Nguyen. Washington, DC: World Bank.
- Christmann, P., and G. Taylor. 2001. Globalization and the Environment: Determinants of Firm Self Regulation in China. *Journal of International Business Studies* 32(3): 459–58.
- Dasgupta, S., H. Hettige, and D. Wheeler. 2000. What Improves Environmental Performance? Evidence from Mexican Industry. *Journal of Environmental Economics and Management* 39: 39–66.
- Dvorák, A., A. Lisa, and P. Sauer. 2002. Negotiated Voluntary Environmental Agreements: Cases in the Czech Republic. In *Voluntary Environmental Agreements: Process, Practice and Future Use*, edited by P. ten Brink. Sheffield, UK: Greenleaf Publishing.
- Eskeland, G., and E. Jimenez. 1992. Policy Instruments for Pollution Control in Developing Countries. *World Bank Research Observer* 7(2): 145–69.

- Esterling Lara, A. 2003. Evaluación y Perspectivas de los Convenios de Concertación para una Producción Más Limpia En Colombia. Aplicación de un Modelo de Evaluacion Estrategica a los Convenios de Concertacion. Final Report to Colombian Ministry of Environment, Housing and Territorial Development. Bogotá.
- Freitas, N., and W. Gereluk. 2002. A National Tripartite Agreement on Benzene in Brazil. In *Voluntary Environmental Agreements: Process, Practice and Future Use*, edited by P. ten Brink. Sheffield, UK: Greenleaf Publishing.
- Fry, M. 1988. *Money, Interest, and Banking in Economic Development*. Baltimore: Johns Hopkins University Press.
- García, J., T. Sterner, and S. Afsah. In Press. Public Disclosure of Industrial Pollution: The PROPER Approach for Indonesia? *Environment and Development Economics*.
- Hanks, J. 2002. A Role for Negotiated Environmental Agreements in Developing Countries. In *Voluntary Environmental Agreements: Process, Practice, and Future Use*, edited by P. ten Brink. Belgium: Institute for European Environmental Policy.
- Harrison, K. 1999. Talking with the Donkey: Cooperative Approaches to Environmental Protection. *Journal of Industrial Ecology* 2(3): 51–72.
- Haslam, P.A. 2004. The Corporate Social Responsibility System in Latin America and the Caribbean. FOCAL Policy Paper FPP-04-1. Canadian Foundation for the Americas.
- Higley, C., F. Convery, and F. Lévêque. 2001. *Voluntary Approaches: An Introduction*. Paper prepared for CAVA International Policy Workshop on the Use of Voluntary Approaches, February 1. Brussels, Belgium.
- Jiménez, O. 2007. Voluntary Agreements in Environmental Policy: An Empirical Evaluation for the Chilean Case. *Journal of Cleaner Production* 15: 620–37.
- Khanna, M. 2001. Economic Analysis of Non-Mandatory Approaches to Environmental Protection. *Journal of Economic Surveys* 15(3): 291–324.
- Lyon, T., and J. Maxwell. 2002. *Voluntary Approaches to Environmental Regulation: A Survey*. In *Economic Institutions and Environmental Policy*, edited by M. Frazini and A. Nicita. Aldershot and Hampshire: Ashgate Publishing.
- Morgenstern, R., and W. Pizer (eds). 2007. *Reality Check: The Nature and Performance of Voluntary Environmental Programs in the United States, Europe, and Japan*. Washington, DC: Resources for the Future Press.

- Organization for Economic Co-operation and Development (OECD). 1999. *Voluntary Approaches for Environmental Policy: An Assessment*. Paris: OECD Environment Directorate.
- . 2003. *Voluntary Approaches for Environmental Policy: Effectiveness, Efficiency and Usage in Policy Mixes*. Paris: OECD Environment Directorate.
- Powers, N., A. Blackman, T. Lyon, and U. Narain. 2007. *Does Public Disclosure Reduce Pollution? Evidence from India's Pulp and Paper Industry*. Working Paper. Washington, DC: Resources for the Future.
- Rivera, J. 2002. *Assessing a Voluntary Environmental Initiative in the Developing World: The Costa Rican Certification for Sustainable Tourism*. *Policy Sciences* 35: 333–60.
- . 2004. *Institutional Pressures and Voluntary Environmental Behavior in Developing Countries: Evidence from Costa Rica*. *Society and Natural Resources* 17: 779–97.
- Roht-Arriaza, N. 1997. *Environmental Management Systems and Environmental Protection: Can ISO14001 Be Useful within the Context of APEC?* *Journal of Environment and Development* 6(3): 292–316.
- Russell, C., and W. Vaughan. 2003. *The Choice of Pollution Control Policy Instruments in Developing Countries: Arguments, Evidence and Suggestions*. *International Yearbook of Environmental and Resource Economics*, vol. VII. Cheltenham, UK: Edward Elgar.
- Utting, P. 2002. *The Greening of Business in Developing Countries: Rhetoric, Reality and Prospects*. London: United Nations Research Institute for Social Change and Zed Books.
- Vidovic, M., and N. Khanna. 2007. *Can Voluntary Pollution Control Programs Fulfill Their Promises? Further Evidence from EPA's 33/50 Program*. *Journal of Environmental Economics and Management* 53: 180–95.
- Wang, H., J. Bi, D. Wheeler, J. Wang, D. Cao, G. Lu, and Y. Wang. 2004. *Environmental Performance Rating and Disclosure: China's GreenWatch Program*. *Journal of Environmental Management* 71(2): 123–33.
- Wehrmeyer, W., and Y. Mulugetta (eds.) 1999. *Growing Pains: Environmental Management in Developing Countries*. Sheffield, UK: Greenleaf Publishing.
- Wernstedt, K., P. Meyer, A. Alberini, and L. Heberle. 2006. *Incentives for Private Residential Brownfields Development in US Urban Areas*. *Journal of Environmental Planning and Management* 49(1): 101–19.

World Bank. 1999. *Greening Industry: New Roles for Communities, Markets, and Governments*.
New York: Oxford University Press.