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Voluntary Environmental Agreements in Developing Countries

The Colombian Experience

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Voluntary Environmental Agreements in Developing Countries: The Colombian Experience

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Abstract

According to proponents, voluntary agreements (VAs) negotiated with polluters sidestep weak institutions and other barriers to conventional environmental regulation in developing countries. Yet little is known about their effectiveness. We examine VAs in Colombia, a global leader in the use of these policies. We find that the main motive for using VAs has been to build capacity needed for broader environmental regulatory reform. Their additional effect on environmental performance has been questionable. These findings suggest that in developing countries, VAs may be best suited to capacity building, not environmental management per se.

Key Words: voluntary environmental agreement, pollution, Colombia

JEL Classification Numbers: Q01, Q56, Q58

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1. Introduction

The conventional approach to pollution control is to establish laws requiring firms to cut emissions. By contrast, voluntary regulation provides incentives, but not mandates, for pollution control. The three main types of voluntary regulation are agreements negotiated between regulators and industry, public programs that individual firms are invited to join, and unilateral commitments made by firms (Lyon and Maxwell 2002). In industrialized countries, such regulation has become quite popular (de Leon and Rivera 2010; OECD 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 15 years, regulatory authorities in Chile and Mexico have negotiated hundreds of voluntary clean production agreements with various industrial sectors (Jiménez 2007; Blackman and Sisto 2006).

Although voluntary environmental initiatives in industrialized countries share many features with those in developing countries, their objectives generally differ. Policymakers in industrialized countries typically use them to encourage firms to overcomply with mandatory regulations; those in developing countries generally use them to help remedy rampant noncompliance with mandatory regulation. For example, an explicit goal of the clean production initiatives in Chile and Mexico mentioned above was to spur compliance with mandatory regulation. Given that voluntary regulation in developing countries is usually a frontline

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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 literature. Some argue that voluntary regulation holds considerable promise for poor countries (Dingwerth 2008; Hanks 2002; World Bank 2000). Enforcing mandatory regulation in such countries is challenging because of weak institutions, incomplete legal foundations, and limited political will (Russell and Vaughan 2003; Eskeland and Jimenez 1992). According to proponents, voluntary regulation sidesteps these constraints because, by definition, it does not depend directly on mandates. Rather, it relies on incentives. By spotlighting firms' environmental performance, voluntary regulation can increase pressures placed on polluters by nonregulatory agents, including consumers, capital markets, and community groups. Also, voluntary initiatives often subsidize investments in pollution abatement.

Others have pointed out reasons for caution (Blackman 2008; Roht-Arriaza 1997). First, as discussed below, many studies find that a background threat of mandatory regulation is a major reason firms participate in and comply with voluntary initiatives (Koehler 2008; Khanna 2001). The implication is that voluntary regulatory instruments are unlikely to perform well in countries where mandatory regulation is weak. Second, 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 (Fry 1988; Wehrmeyer and Mulugetta 1999). Third, because environmental management institutions and private sector advocacy groups are relatively weak in developing countries, regulatory processes, including voluntary initiatives, are often heavily influenced by private sector interests, a phenomenon often referred to as regulatory capture (Russell and Vaughan 2003). Finally, small-scale and informal firms that may be less susceptible to regulatory and nonregulatory pressures are more prevalent in developing countries than in industrialized countries (Blackman 2006).

We know relatively little evidence to support such pro and con arguments. As discussed below, the literature on this topic is quite thin. Findings from the more substantial literature on industrialized countries may not apply because the main purpose for which voluntary regulation is used and the institutional and socioeconomic context in which it is implemented are different in developing countries.

To help fill this gap, this paper examines the use of negotiated voluntary agreements (VAs) in Colombia. After Chile, Colombia is the Latin American country that has relied most heavily on voluntary regulation. Between 1995 and 2006, Colombian regulators signed 64 VAs with various groups of firms and farms, including five at the national level (MAVDT 2006). To our knowledge, ours is the first rigorous effort to evaluate this experience and distill lessons for environmental regulation in developing countries.[1]

An in-depth evaluation of all 64 Colombian VAs is beyond the scope of this paper. Instead, we present case studies of four VAs signed with the cut-flower sector, the palm oil sector, the electricity sector, and an industrial association in the greater metropolitan area of Medellín.[2] We used three criteria to select these case studies. First, we selected relatively old VAs to ensure that sufficient time had elapsed to assess their effects. Second, we selected VAs reputed to be relatively successful. As discussed below, most of Colombia's VAs are widely acknowledged to have failed, and the reasons, including meaningless commitments and lack of follow-up, are well known. We hypothesize that more can be learned by trying to understand why a handful of VAs appear to have succeeded than by confirming somewhat obvious reasons for failures. Finally, we selected VAs of different types and with a variety of industrial and agroindustrial sectors. The case studies are based on interviews with regulatory and private sector stakeholders as well as primary and secondary documents.

We address two main sets of questions. First, why were VAs used in Colombia? More specifically, what motivated regulators and industry representatives to sign them? And second, how have they performed? More specifically, have the signatories kept their commitments? Have the VAs spurred improvements in environmental quality compared with a business-as-usual scenario? And have they improved environmental management capacity within the participating regulatory institutions and the industrial sector?

[1] Although several evaluations of Colombian VAs were commissioned by the country's Ministry of the Environment, these were primarily aimed at answering short-term questions (e.g., whether and how to renegotiate specific agreements) for domestic policymakers, rather than the more general questions discussed above. See Esterling Lara (2002), MAVDT (2003), MAVDT/IDEAM (2005), and MAVDT (2006).

[2] See Blackman et al. (2009) for two additional case studies (of VAs for the oil sector and Cartagena Bay) that are omitted here to save space.

2. Literature

This section briefly reviews the literature on VAs, focusing on the two broad questions at issue in our case studies: Why do regulators and firms participate in VAs, and how have VAs performed?[3]

2.1. What Drives Participation?

The literature identifies four reasons that regulators use VAs. First, they turn to VAs when they lack the political support, scientific foundation, or institutional capacity needed for mandatory policies (Kerret and Tal 2005). For example, Harrison (1999) argues that Dutch authorities resorted to VAs to achieve long-term national environmental goals decreed in the late 1980s because they did not have the expertise to write regulations specifying how industry should achieve them. A closely related motive for using VAs is to build the regulatory capacity needed for mandatory regulation. For example, in the 1980s and 1990s, Mexican VAs with the leather tanning sector committed environmental authorities to develop new regulations, management institutions, and waste treatment facilities (Blackman and Sisto 2006). Third, regulators use VAs to reduce regulatory transaction costs (Segerson and Miceli 1998). For example, Delmas and Mazurek (2004) argue that this rationale motivated Project XL, a U.S. Environmental Protection Agency voluntary program that granted regulatory flexibility to firms with "superior" environmental performance. Finally, regulators use VAs to improve their relationships with polluters. Some research suggests that in enforcement-based regulatory regimes, firms comply with the letter of the law but do not go beyond it, often developing a "culture of resistance." Cooperative, incentive-based regulations like VAs are said to avoid this dynamic (Bradach and Kagan 1982; Ayres and Braithwaite 1992).

The literature also identifies reasons that firms participate in VAs (and other voluntary regulatory initiatives). The motive that has received the most attention is mandatory regulation: firms participate in VAs to preempt or soften it (Segerson and Miceli 1998; Maxwell et al. 2000). Firms also participate in VAs to take advantage of subsidies provided to participants, including tax breaks for environmental investments and technical assistance with pollution control and prevention (Helby 1999). Third, firms participate in VAs to boost their sales in markets in which buyers are concerned about environmental performance (Arora and Gangopadhayay 1995).

[3] For reviews of the literature on other types of voluntary regulation, including public programs and unilateral commitments, see Rivera and de Leon (2010), Koehler (2008), and Khanna (2001).

Fourth, pressures generated by communities and nongovernmental organizations create incentives for firms to participate (Blackman and Bannister 1998; Blackman 2010). Finally, some studies suggest that in certain situations, firms have a purely private financial incentive to participate in VAs because pollution control and (especially) pollution prevention can lower production costs instead of raising them, as conventional wisdom dictates (Porter and van de Linde 1995).

2.2. How Have VAs Performed?

A considerable literature examines the performance of VAs in industrialized countries.[4] Four main themes emerge. First, strong evidence of additional environmental benefits is scarce. Based on case studies and an extensive review of the literature (on voluntary regulation generally), OECD (2003, 14) finds "only a few cases where [voluntary] approaches have been found to contribute to environmental improvements significantly different from what would have happened anyway." In many cases, however, it is difficult to determine whether this scarcity of evidence is due to evaluation challenges—most notably lack of hard targets and reporting—or to poor performance of the VAs.[5] Second, in case studies where solid evidence links a VA with improvements in environmental performance, a strong background threat of mandatory regulation is usually the driver of these improvements (Lyon and Maxwell 2002; Koehler 2008). For example, in a rigorous analysis of six European VAs, De Clercq and Bracke (2005) find that good overall performance is significantly correlated with "readiness to use severe alternative instruments." Third, VAs have more effect when they require clear, specific commitments, including well-defined performance baselines and targets, timetables, monitoring, and enforcement mechanisms (EEA 1997; De Clercq and Bracke 2005; Hanks 2002).[6]

[4] For reviews, see Morgenstern and Pizer (2007), Croci (2005), OECD (2003), ten Brink (2002), and EEA (1997).

[5] For example, a European Commission review of 137 VAs found that 47 had no monitoring requirements, 67 had no provisions for verification of monitoring data, and 118 had no provisions for public reporting of monitoring data. The report concluded that "the most important deficiency of voluntary agreements … is the lack of adequate voluntary agreement performance tracking (environmental reporting), accountability, and transparency provisions" (quoted in Harrison 1999, 66). See also EEA (1997).

[6] The literature is not unanimous on the benefit of greater stringency, however. Both Morgenstern and Pizer (2007) and Coglianese and Nash (2007) note that rigor tends to reduce participation in voluntary initiatives, which in turn will reduce their impact. And both Helby (1999) and Kerret and Tal (2005) argue that "soft" agreements with modest goals may be optimal when the main objective is building capacity, not improving environmental performance.

The empirical literature on the use of VAs in developing countries is far more limited.[7] In general, it highlights the importance of both regulatory pressure and regulatory capture in explaining success and failure. Specifically, it suggests that VAs are more effective in spurring improvements in environmental performance when accompanied by a credible threat of mandatory regulation, and less effective when polluters can block design elements aimed at holding them to environmental performance targets. For example, Jiménez (2007) attributes the success of Chilean VAs partly to the fact that the agreements complemented reasonably effective mandatory regulation and included specific environmental performance targets, clear deadlines, third-party monitoring, sanctions for noncompliance, and pollution abatement subsidies.

3. Background

Drawn from Blackman et al. (2005, 2006) and Blackman and Morgenstern (2006), this section provides brief background on Colombia's environmental management system, focusing on the history of the use of VAs.

3.1. SINA: Colombia's Environmental Management System

Before 1993, environmental management in Colombia was fragmented and weak. Regulatory authority was split between a low-level national institution housed in the Ministry of Agriculture and 18 regional rural development organizations called autonomous regional corporations (*Corporaciones Autónomas Regionales,* CARs) that collectively covered a quarter of the national territory. Lines of authority among these institutions were confused, laws and regulations were riddled with gaps, and for the most part, monitoring and enforcement of written regulations were negligible.

Law 99 of 1993 completely overhauled environmental regulation by creating the National Environmental System (*Sistema Nacional Ambiental,* SINA), comprising both regulatory institutions and legal mechanisms for planning, coordination, public participation, enforcement, and financing. SINA's principal regulatory institutions are the national Ministry of Environment (*Ministerio del Medio Ambiente,* MMA) and two types of regional authorities: urban environmental authorities (*Autoridades Ambientales Urbanas,* AAUs) in large cities, and more than 30 CARs covering the entire national territory outside the AAUs. Generally speaking,

[7] For a revew, see Blackman (2010).

MMA (which was later merged with other ministries and renamed the Ministry of Environment, Housing and Territorial Development, *Ministerio del Ambiente, Vivienda y Desarrollo Territorial*, MAVDT) is responsible for setting and coordinating environmental policies and regulations, and the CARs and AAUs are responsible for implementing and enforcing them. CARs, and to a lesser extent AAUs, have considerable political and fiscal autonomy.

As in all countries, the environmental regulatory instruments used in Colombia are primarily mandatory. The principal type is command-and-control regulation, including environmental licenses and permits and emissions and technology standards. In addition, SINA relies on economic instruments, the most prominent of which are charges for the use of water and other natural resources and fees for discharges of water pollution, and on liability-based tools (Blackman 2009).

3.2. Voluntary Agreements

Law 99 of 1993 laid the legal foundation for VAs. One of its 14 "guiding principles" is that "environmental protection is a coordinated task between the state, community, NGOs, and the private sector." In keeping with this principle, the law authorizes MMA to "establish mechanisms of agreement with the private sector to fit the sector's activities to the environmental goals of the government" (Article 5, Number 32).

Following Law 99 of 1993, several official acts laid the groundwork for subsequent VAs (Hanks 2002; C. Herrera 2007; Buitrago 2007; Esterling Lara 2002): the 1994–1998 National Development Plan and the 1995 Framework for Cleaner Production, both of which encouraged the use of VAs; the Clean Production Inter-Institutional Committee, established in 1996 to negotiate VAs; and the 1997 National Policy for Cleaner Production, which set forth a national VA policy (MMA 1997a). In the wake of those acts, VAs proliferated.

4. Overview of Voluntary Agreements

Between 1995 and 2006, Colombian regulators and trade associations signed 64 VAs (Table 1) (MAVDT 2006). They fall into three broad categories: national, geographic, and sectoral. The first category comprises VAs signed with trade associations representing national industries. These were all signed in the three years between 1996 and 1998—that is, relatively early in the history of VAs in Colombia (Figure 1). In all cases, MMA was the leading regulatory signatory. The second category consists of VAs signed with trade associations representing firms in various economic sectors in defined geographic areas. Six such VAs were signed, all also

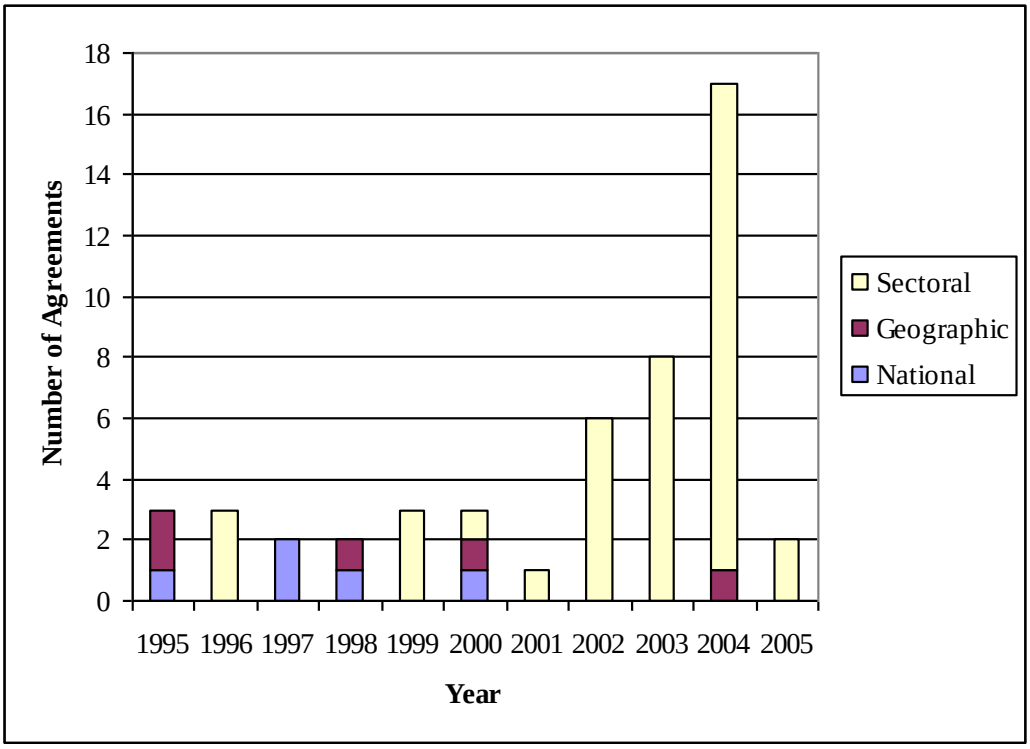
relatively early, between 1995 and 2000. In each case, MMA signed the VA, although in some cases, CARs and AAUs were the leading regulatory signatories. The last and largest category comprises 53 VAs signed with trade associations, each representing a specific economic sector in a defined geographic region. Although MMA signed some of these agreements, CARs and AAUs were the leading regulatory signatories in virtually all cases. With a few exceptions, most of these VAs were signed in 2000 or later.

Table 1. Colombian Voluntary Agreements Signed 1995–2006

Type	*Sector or region*	*Date*	*Case study?*
National (5)			
	Coal	1995	
	Oil	1997	
	Electric	1997	yes
	Palm oil	2000	yes
	Pesticides	1998	
Geographic (6)			
	Mamonal (Cartagena)	1995	
	Sogamoso (Boyacá)	missing	
	East Antioqia	1995	yes
	Barranquilla	1998	
	Northern Valley of Aburrá	2000	
	Southern Valley of Aburrá	2004	
Sectoral, geographic (53)			
Ag., livestock, agroindustry (37)			
	Poultry (9)	2004	
	Poultry	2004	
	Poultry	2002	
	Poultry	missing	
	Poultry	2003	
	Poultry	2000	
	Poultry	1999	
	Poultry	1999	
	Poultry	2002	
	Pork (8)	2004	
	Pork	2002	
	Pork	2004	
	Pork	2004	
	Pork	missing	
	Pork	2002	
	Pork	missing	
	Pork	2002	
	Hemp (3)	1996	
	Hemp	2003	
	Hemp	missing	
	Coffee (5)	2003	
	Coffee	2003	
	Coffee	2004	

	Coffee	2004	
	Coffee	2005	
	Flowers (2)	1996	yes
	Flowers	2004	
	Rice processors	1999	
	Dairy	2003	
	Mushrooms	2004	
	Tobacco	2004	
	Brown sugar	2003	
	Shrimp farming	2004	
	Small-scale producers of pancoger	2005	
	Sugar cane	1996	
	Acuícola	2001	
	Bananas	missing	
Industry (3)			
	Brick and tile makers	missing	
	Tanneries (La Maria)	missing	
	Electronics	2003	
Mining (4)			
	Small-scale gold mining	missing	
	Mining (Coquizadorese)	missing	
	Mining (Caleros, Nobsa)	missing	
	Mining (Alfareros)	missing	
Services (9)			
	Coal ports	2004	
	Service stations	2004	
	Service stations	missing	
	Hotels and restaurants	2004	
	Hotels and restaurants	missing	
	Construction	2004	
	Market plaza	2003	
	Retailer Federation	2004	
	Slaughterhouses (Guadalupe)	2002	

Figure 1. Fifty Colombian Voluntary Agreements, by Date of Signing and Type



Note: Excludes 14 VAs (listed in Table 1) for which the date of signing is missing.
Source: MAVDT 2006.

5. Previous Evaluations

MMA has commissioned four reports on VAs: Esterling Lara (2002), MAVDT (2003), MAVDT/IDEAM (2005), and MAVDT (2006). However, the main goal was not performance evaluation per se but to develop and test a method for evaluating VAs. That said, the evaluations (summarized in detail in Blackman et al. 2009) are largely negative. MAVDT (2006) is the most recent and most comprehensive. It finds that of a sample of 47 VAs analyzed, only 10—just over a fifth—made significant advances in fulfilling their voluntary commitments to improve environmental performance. The report identifies 6 VAs that were relatively successful,

including three discussed in the next section (VAs with the electricity sector, the cut flower sector, and the East Antioquia).[8]

6. Case Studies

6.1. Generic Content of the Voluntary Agreements

All four of our study VAs were modeled on the first national VA (with a trade association representing firms around Cartagena Bay) and therefore are mostly identical. To avoid repetition, it is helpful to briefly summarize the common provisions. Each VA has a term of 10 years. Averaging roughly 15 pages, the agreements contain seven sections,[9] the most substantive and lengthy of which lists the signatories' commitments to: (1) conducting a diagnosis of environmental problems in the sector and/or region (in some cases along with an in-depth study of a specific problem) and updating it during the course of the VA; (2) strengthening their environmental management institutions by creating environmental management departments, promoting the adoption of environmental management systems, and launching capacity-building programs; (3) promoting the development, diffusion, and adoption of pollution prevention and control technologies and developing contingency plans for environmental risks; (4) negotiating a deadline for compliance with all mandatory norms; (5) promoting environmental research and education by among other things, setting an agenda and holding an "ecology week" event each year; (6) promoting international cooperation on environmental management; (7) identifying sources of financing for environmental management; (8) establishing mechanisms to monitor and evaluate environmental performance; (9) modifying land-use planning to take into consideration environmental risks; and (10) developing programs to restore rivers and develop recreational

[8] The report attributes this poor performance to a lack of functioning operating committees meant to administer the VA, clear environmental performance baselines, well-defined indicators of environmental performance, MAVDT support, project financing, monitoring mechanisms, access to technical and economic information, incentives for compliance with the agreements, management of obligations in the VA, and continuity in personnel in both the regulatory institutions and the signatory companies.

[9] The seven sections are (1) a list of signatories; (2) a discussion of legal and regulatory underpinnings; (3) a statement of the objective, usually worded "… to support concrete actions that contribute to the betterment of the public environmental management and to the control and reduction of pollution through the adoption of cleaner production and operation methods that are environmentally safe and secure and aim at lowering the level of contamination, reducing relevant risks to the environment, and optimizing the rational use of natural resources …"; (4) a discussion of signatories' (nonbinding) responsibilities and the relationships to other regulatory requirements; (5) the list of substantive commitments, (6) a list of organizations represented in the operating committee and its responsibilities; and (7) a statement on the duration of the VA, which in each case is 10 years.

areas. Some VAs include one or two additional generic commitments. Each VA also lists nongeneric, "special" commitments. All commitments, both generic and special, are listed in the Appendix tables.

6.2. Measuring Compliance

To measure compliance, we listed every commitment in each VA, and then relied on stakeholder interviews and some secondary sources to determine whether they had been met. Detailed results from this exercise are presented in the Appendix. The third columns in Tables A1–A4 indicate the compliance status for each commitment: yes, partial, no, unclear. Table 2 below provides summaries, including the compliance status for the special commitments in each VA, for generic commitments, and for all commitments.

Two caveats are in order. First, as for most VAs worldwide (see Section 2), many of the commitments in our four case study VAs were vague, and monitoring procedures were weak or nonexistent. Therefore, in some cases, it is simply not possible to determine whether the signatories complied. This accounts for the significant percentage of commitments for which we conclude that compliance status is "unclear." Second, our measures of compliance do not control for the relative importance of each commitment or for the fact that some were redundant. For example, some commitments in the cut-flower VA require signatories to comply with written pollution control regulation within a specified time period, but others simply require them to "promote" community education. The former is (arguably) more important than the latter. Controlling for these factors inevitably entails ad hoc judgments and a loss of transparency. We have opted for simplicity and transparency.

6.3. Antioquia Cut-Flower Sector

6.3.1. Background

After Holland, Colombia is the world's leading producer of cut flowers. About 18 percent of Colombia's crop is grown on roughly 400 flower farms occupying 1,500 hectares in the environs of Medellín, Antioquia—the geographic area covered by the VA—and virtually all of the rest is grown in Bogotá. Almost all Colombian flowers are exported (Isaza 2007).

ASOCOLFLORES is the national trade association representing Colombia's cut-flower growers. It represents about 20 percent of all growers, mostly owners of large farms. In Medellín, where flower farms tend to be small, only about 6 percent of growers are members (Isaza 2007).

The three main environmental problems associated with flower growing in Colombia are agrochemical pollution, water use, and hazardous wastes. The regional environmental regulatory authority with jurisdiction over Medellín's flower farms is CORNARE, which is widely viewed as among the most capable and innovative CARs (Blackman et al. 2006).

6.3.2. The Cut-Flower VA

The Antioquia cut-flower VA was signed December 4, 1996, by representatives of CONARE, the Antioquia branch of ASOCOLFLORES, and 44 Medellín members of the trade association. The signatories comprised owners of relatively large and technically advanced farms (Parra 2007). Special commitments in the VA were (1) using the environmental diagnosis to develop quantitative indicators of environmental performance within a year of signing the VA; (2) creating an environmental protection fund from contributions by signatory growers; (3) developing a sector-wide integrated plan for air, water, and solid waste pollution within 10 months; (4) achieving compliance with mandatory air pollution standards within one year, water effluent standards within two years, and heavy metal standards within two and one-half years; and (5) obtaining all environmental licensing and permitting requirements within 6 months (CORNARE et al. 1996).

6.3.3. Compliance and Advances since the Voluntary Agreement

Of all 33 commitments in the VA, 61 percent were kept (Table 2). Of the 5 special commitments, 80 percent were kept, and of the 28 generic commitments, 57 percent were kept.

In total, more than a fifth of the commitments were abrogated. They included achieving compliance with pollution control regulations within a year (compliance was not achieved until 2003, six years after the VA was signed); promoting lines of credit for environmental management investments; and developing recovery programs for watersheds.

That said, more than half the commitments were kept, including six that were relatively important (Parra 2007, 2008; Aristizabal 2007). First, an environmental management fund (*Fondo de Gestion Ambiental*, FOGA)—one of five commitments unique to this VA—was established and collected roughly US$60,000 per year from members, along with matching funds from government. Second, environmental indicators were developed for solid waste, water consumption, and wastewater emissions. Third, a sector-wide pollution control plan was developed and implemented. Fourth, signatories obtained requisite environmental regulatory permits. Fifth, participants organized roughly 10 workshops per year on different environmental

issues as well as an annual sectoral public relations event called Expoflora. Finally, a mechanism for monitoring compliance and promoting environmental management was established.[10]

Table 2. Compliance with Four Voluntary Agreements: Number and Percentage of Commitments Kept, by Type

Type Commitment	Cut Flowers		Palm Oil		Electricity		East Antioquia		All	
	No.	%	No.	%	No.	%	No.	%	No.	%
Special commitments										
Yes	4	80	3	33	5	42	3	38	15	44
Partial	1	20	2	22	2	17	1	13	6	18
No	0	0	4	44	5	42	2	25	11	32
Unclear	0	0	0	0	0	0	2	25	2	6
Total	5	100	9	100	12	100	8	100	34	100
Generic commitments										
Yes	16	57	13	46	6	21	11	39	46	41
Partial	1	4	3	11	1	4	2	7	7	6
No	7	25	6	21	16	57	11	39	40	36
Unclear	4	14	6	21	5	18	4	14	19	17
Total	28	100	28	100	28	100	28	100	112	100
All commitments										
Yes	20	61	16	43	11	28	14	39	61	42
Partial	2	6	5	14	3	8	3	8	13	9
No	7	21	10	27	21	53	13	36	51	35
Unclear	4	12	6	16	5	13	6	17	21	14
Total	33	100	37	100	40	100	36	100	146	100

Source: See Appendix Tables A1–A4.

Certain environmental performance advances in the cut-flower sector coincided with, and may have been spurred by, the VA. According to CORNARE, rates of use of pesticides, category 1 and 2 chemicals, and water all fell by 40–50 percent during the term of the VA (Parra 2007). A guide to environmental management in the cut-flower sector was published (ASOCOLFLORES et al. 2003). Membership in the VA increased by 12 farms (Giraldo 2007). The FOGA environmental fund financed a solid waste incinerator and recycling center (Isaza 2007; Aristizabal 2007). Finally, approximately 10 signatory farms obtained ISO 14001 certification (Parra 2008).

[10] In 1999, an "ambassador" was appointed to the coordinating committee to serve as a liaison to the growers who had joined the VA. Together with a representative of CORNARE, the ambassador inspected each of the member farms at least once per year (and also visited some farms that did not belong to the VA). The results from these inspections are publicly disclosed (Giraldo 2007; Parra 2007).

6.3.4. Drivers for Industry

Facilitating regulation. ASOCOLFLORES-Antioquia saw participation in a VA as a means of lowering regulatory costs and risks. In the early and mid-1990s, the total number of flower farms in and around Medellín increased fourfold (Isaza 2007). This rapid growth led to two regulatory bottlenecks. Most importantly, Law 99 of 1993 had mandated environmental licensing for all new polluting facilities, including flower farms. But when the cut-flower VA was signed, licensing procedures—particularly requirements for environmental impact assessments—were ill defined. A second bottleneck concerned municipal land-use planning in the congested periurban area around Medellín's airport where most of the flower farms are located. Flower growers considered a VA a more effective mechanism for eliminating these bottlenecks than direct negotiations between ASOCOLFLORES and CORNARE because only 1 of the 17 growers in Medellín belonged to the trade association (Parra 2007; Aristizabal 2007; Isaza 2007).

Market pressure. The VA with CORNARE also was at least partly motivated by a desire to improve the image of Colombian flowers in international markets. Beginning in the early 1990s, environmental, health, and safety issues began to receive considerable attention in global flower markets, and Colombia's flower sector in particular received considerable adverse publicity. Germany and other countries initiated schemes to certify that imported flowers met environmental and health safety standards.[11] In 1996, ASOCOLFLORES responded by creating a voluntary certification program of its own, called Flor Verde, accredited by SGS, a Swiss social accountability auditing firm. ASOCOLFLORES-Antioquia management saw the VA as a means of expanding local participation in Flor Verde (Isaza 2007).[12]

The evolution of environmental management outside Medellín suggests that market pressures not only created incentives for growers to participate in a VA but also prompted many, if not most, of the improvements in environmental performance that occurred after the VA was signed. In Bogotá, where growers did not sign a VA with the local regulatory agency, the environmental performance of flower farms also improved significantly in the late 1990s (Isaza 2007).

[11] The Flower Label Program (FLP).

[12] Nationwide, 14 percent of Colombian growers were participating in the Flor Verde program in 2007, including a disproportionate share of relatively large farms. In Medellín, however, only about 5 percent of growers were participating (Isaza 2007).

6.3.5. Drivers for Regulators

Facilitating regulation. CORNARE management cites two reasons for entering into a VA with the flower sector. First, regulators, like growers, were concerned about ill-defined procedures for environmental licenses and municipal land-use regulation. CORNARE had begun informal discussions of these issues with representatives of the cut-flower sector in 1994, two years before the VA was signed. CORNARE proposed the idea of a VA to ASOCOLFLORES as a means of formalizing this dialogue. Second, CORNARE saw a VA as opportunity to implement its longstanding broad strategy of establishing a cooperative rather than a confrontational relationship with polluting facilities (Parra 2007).

6.4. Palm Oil Sector

6.4.1. Background

Colombia is the world's fifth-largest producer of palm oil, responsible for 2 percent of global output. In 2007, 316,00 hectares in Colombia were planted in oil palm and 53 mills processed raw fruit. About 40 percent of Colombian production is exported (FEDEPALMA 2011).

The Colombian Association of Palm Oil Producers (*Federación Nacional de Cultivadores de Palma de Aceite,* FEDEPALMA), is the national trade association representing growers and processors, most of whom are relatively large-scale. It represents 35 of the country's 53 mills and half of the area planted in palm oil (Morzorra 2007; Mesa 2007).

Adverse environmental effects from palm oil growing in Colombia include deforestation, water and soil pollution from agrochemicals, air pollution from the burning of crop residue, and depletion of the water supply in areas using irrigation. Processing mills generate organic water pollution, solid waste, and air pollution (Rodriguez-Becerra and Van Hoof 2005). Because palm oil production is geographically dispersed, regional authorities throughout the country are responsible for its environmental regulation.

6.4.2. The Palm Oil VA

In December 1997, FEDEPALMA, along with all 51 palm oil firms with processing facilities (16 of which did not belong to FEDEPALMA), signed a VA with MMA and with

regional environmental authorities for the principal oil palm areas (FEDEPALMA 1997).[13] The firms that signed represented more than 90 percent of national extraction and processing capacity (Morzorra 2008). Special commitments in the VA were (1) developing quantitative indicators of environmental performance based on the environmental diagnosis, within one year of signing the VA; (2) creating a network to strengthen environmental laboratories within one year; (3) quantifying the emissions of signatories within one year; (4) complying with 50 percent of the environmental regulations applicable to 51 processing plants by 1998, 75 percent by 1999, and 100 percent by 2000 (where percentages refer to the difference between the baseline level of emissions according to the sectoral diagnosis and the legal emissions standard); (6) establishing centers to disseminate information about cleaner production; (7) promoting research on integrated pest management; (8) reducing taxes on imported clean production equipment; (9) developing written terms of reference for impact assessments and management plans needed for environmental licensing; and (10) developing plans for forest restoration (FEDEPALMA 1997).

6.4.3. Compliance and Advances since the Voluntary Agreement

Of all 37 commitments in the VA, 43 percent were kept (Table 2). Of the nine special commitments, 33 percent were kept, and of the 28 generic commitments, 46 percent were kept.

Twenty-seven percent of all the commitments were abrogated, including four of the nine "special" substantive commitments: developing quantitative environmental performance indicators, creating a network of environmental laboratories, quantifying emissions from firms, and establishing clean production centers. In addition, a major procedural commitment was violated: the operating committee for the VA never actually met. Instead, the VA was managed by FEDEPALMA (Morzorra 2007; Mesa 2007).

Nevertheless, 43 percent of signatories' commitments were kept. Although most were procedural, some were more substantive (Table A2). Signatories developed written terms of reference for impact assessments and management plans needed for environmental licensing. They also conducted a qualitative diagnosis and drew up plans for forest restoration. In 1998, FEDEPALMA created an environmental management department and promoted the adoption of both environmental management and environmental risk contingency plans. Currently, all 53

[13] Two mills were built between 1997 and 2007. The regional authorities that signed the VA were CORPOMAG and CORPOCESAR on the Atlantic coastal plain, CORPONARINO on the southern Pacific coast, CORPORINOQUIA in the eastern savannas, and CAS in the inter-Andean valleys.

processing plants have environmental management plans. Finally, the research branch of FEDEPALMA developed a program on integrated pest management (Morzorra 2007, 2008; Mesa 2007).

Some environmental advances in the palm oil sector coincided with, and may have been spurred by, the VA. There is a general consensus that the environmental performance of the palm oil mills improved significantly during the course of the VA. The proportion of mills that treated their wastewater grew from 20 percent in 1997 to 100 percent in 2007 (Rodriguez-Becerra and Van Hoof 2005; Morzorra 2007; Mesa 2007). At least half of the mills adopted recycling and pollution prevention techniques virtually absent in the sector in 1997.[14] All 53 mills now have environmental management plans approved by their regional environmental authorities (Morzorra 2007; Mesa 2007). Finally, a guide to environmental management in the palm oil sector was published in 2002 (FEDEPALMA et al. 2002).

6.4.4. Drivers for Industry

FEDEPALMA initiated a discussion with MMA about a VA in order to fend off "attacks" on the sector from regional environmental regulatory authorities, local communities, and market rivals (Mesa 2007; Homez 2009).

Regulatory pressure. Law 99 of 1993 ushered in a new regulatory environment for all polluting economic sectors in Colombia. Two aspects of this change were of particular concern to palm oil producers: lack of consistency and predictability across CARs in the implementing regulation, and rent seeking. Colombia's four main palm oil–growing regions fall under the jurisdiction of different CARs. In the mid-1990s, national guidelines for implementing new regulations in specific sectors had yet to be developed, and as a result, enforcement practices varied markedly across these CARs. FEDEPALMA saw this situation as inefficient, if not untenable, particularly for large firms with holdings in multiple jurisdictions. Second, FEDEPALMA was concerned that as the largest and most visible polluters in rural areas, palm oil facilities would become the target of enforcement actions aimed at generating rents for regulatory authorities. FEDEPALMA saw a VA as a way of expediting the development of consistent enforcement practices across CARs, mediating between CARs and FEDEPALMA

[14] These include using wastewater from processing mills for irrigation instead of simply discharging it into surface waters (50 percent), capturing methane from stored organic wastes and using to fuel boilers (62 percent), and using agricultural residue to fuel boilers (Rodriquez-Becerra and Van Hoof 2005).

members when enforcement actions were taken, and preventing blatant rent seeking (Morzorra 2007; Mesa 2007).

Community and market pressure. FEDEPALMA also saw a VA as a means of managing pressures for improved environmental performance applied by local communities and markets. Local shrimp farmers and fishermen had lodged numerous complaints about water pollution from palm oil mills (Morzorra 2007; Mesa 2007; M. Herrera 2007). Moreover, in international markets during the 1980s and 1990s, concerns grew about the health and environmental effects of palm oil.[15] As in the case of cut flowers, the VA was seen a means of improving the sector's international image (Morzorra 2007; Mesa 2007; M. Herrera 2007).

Technological change. FEDEPALMA funds scientific research on palm oil, including new methods and applications for improved environmental management. According to FEDEPALMA, this research generated win-win innovations—including using wastewater for irrigation and burning agricultural residue in boilers—that growers and mills adopted to mainly to cut costs. These developments made VA commitments to improved environmental performance more palatable (Rodriguez-Becerra and Van Hoof 2005).

6.4.5. Drivers for Regulators

Example setting. Although MMA did not initiate the palm oil VA, it had strong incentives to sign the agreement (Mesa 2007; Homez 2009). Palm oil was both an important economic sector and a highly visible contributor to water pollution. Also, in 1995, MMA had signed an agreement with the Agricultural Society of Colombia *(Sociedad de Agricultures de Colombia),* the principal agricultural trade association, to promote environmental management in agriculture. As a result, two years later, MMA was inclined to accept an invitation to negotiate an environmental agreement from a leading member of that organization.

6.5. Electricity Sector

6.5.1. Background

Colombia's electric power sector has a total installed capacity of about 14 gigawatts, more than three-quarters of which is in (mostly large) hydroelectric plants. Until the 1990s, the

[15] According to FEDEPALMA, this growing concern was partly due to a successful international campaign by the American soybean lobby to convince consumers that tropical oils were unhealthy (Morzorra 2007).

sector was largely government owned and operated. However, severe electricity shortages in 1992 and 1993 precipitated by drought spurred a sweeping1994 reform that unbundled generation, transmission, and distribution and allowed private investment in each subsector. This restructuring led to significant new private investment (Uribe and Medina 2004; WWF 2007).

The principal adverse environmental effects from electricity generation are land-use change, water consumption, and disruption of ecosystem services associated with large hydroelectric plants, and air pollution and hazardous and solid waste from thermal plants (EIA 1995). Law 99 of 1993 assigns to MMA responsibility for licensing electricity-generating plants (Law 99 Art. 52). However, responsibilities for monitoring and enforcement for both generation and transmission facilities are split between MMA and regional environmental authorities, depending on facility size.[16]

6.5.2. The Electricity Sector VA

The VA was signed October 29, 1997, by MMA, the Ministry of Energy and Mines, several CARs, and 43 private firms, all but a handful of which were power plants, and all of which were transitioning from public to private control (MMA 1997b). The firms were not represented by a trade association. Special commitments in the VA were (1) conducting an inventory, inspection, and evaluation of hazardous wastes associated with the electricity sector; (2) establishing pilot projects to test self-regulation schemes like ISO 14001; (3) setting voluntary quantitative goals for pollution, recycling, and optimal use of resources based on the baseline environmental diagnosis; (4) defining criteria for land-use planning; (5) promoting applied research on renewable energy; (6) promoting environmental management on small farms around Bogotá; (7) developing a research project on hazardous wastes (particularly PCBs) in the electricity sector; (8) rewarding firms in the sector that make clear advances in environmental management; (9) developing a database on the electricity sector; (10) defining priority ecosystems to be considered in sectoral expansion plans; (11) developing written terms of reference for impact assessments and management plans needed for environmental licensing; and (12) publishing environmental guides for each of the activities in the sector by the first semester of 1998.

[16] MMA is responsible for generating facilities larger than 100 MW and transmission facilities larger than 230 KW (Concha 2008).

6.5.3. Compliance and Advances since the Voluntary Agreement

Of all 40 commitments in the VA, just 28 percent were kept (Table 2). Of the 12 special commitments, 42 percent were kept, and of the 28 generic commitments, only 21 percent were kept.

Fully 53 percent of all the commitments of the VA were abrogated. Signatories failed to comply with 5 of the 12 special commitments, including the one that received the most attention from signatories and regulators: establishing a system of quantitative environmental performance goals.[17] Signatories also failed to establish self-regulation pilot projects and define criteria for land-use planning (Bonilla 2007; Concha 2007, 2008).

Twenty-eight percent of signatories' commitments were kept. Many, if not most, were procedural, not performance related, however. In 1997, signatories constructed a database on firms and facilities in the sector. In 1999, they hired Canadian consultants to conduct an inventory and evaluation of hazardous materials in the electricity sector. Starting in 1999, they published environmental guides (MMA 1999a, 1999b). Over the course of the VA, they organized several workshops for representatives of both the signatory firms and the regulatory institutions on environmental auditing, environmental liabilities, and PCB management. Finally, according to MMA interviewees, the VA facilitated significant private sector input in the design and implementation of regulation.

Some environmental performance advances in the sector coincided with, and may have been spurred by, the VA. The number of plants with environmental management systems increased. Air emissions from thermal plants were cut, energy efficiency increased, and the use of renewables rose. Finally, devices to prevent birds from being electrocuted by transmission lines were installed (Bonilla 2007; Concha 2007, 2008).

According to MMA officials involved in the VA, virtually all of the advances that were explicit commitments in the VA or that simply coincided with it were relatively minor. Moreover, although the VA may have expedited these improvements, they probably would have happened without it because of increased participation in the electricity sector by multinational corporations with relatively stringent corporate environmental management standards,

[17] After more than a year of regular meetings, a subcommittee agreed on a list of quantitative indicators. However, subsequent efforts to define baselines for these indicators and set up a system to monitor changes foundered (Concha 2007).

technological change, economic incentives for cleaner production created by the Clean Development Mechanism of the Kyoto Protocol, and increased use of legal actions to protect the environment (Concha 2007; Bonilla 2007; Cadena 2007).

6.5.4. Drivers for Industry

Facilitating regulation. In the mid-1990s, regulatory uncertainty created by Law 99 of 1993 was a particularly pressing problem in the electricity sector. Dozens of new private plants and several major transmission projects were being built following the 1994 sectoral reforms. Law 99 of 1993 required both new and existing facilities to submit project development plans to MMA and to conduct environmental impact assessments as a condition of obtaining or retaining their licenses, but terms of reference for such plans and assessments had yet to be developed. As a result, environmental licensing involved waits as long as three years. A second problem was that transmission companies owned infrastructure that spanned the jurisdictions of multiple regional environmental authorities, each of which acted more or less independently in interpreting broad regulatory requirements. The electricity sector saw a VA as an opportunity to improve the efficiency, consistency, and predictability of environmental regulation—particularly for the multinational companies investing in the Colombian power sector for the first time—by helping shape new rules and regulations and establishing good relations with regulatory institutions (Concha 2007; Bonilla 2007; Cadena 2007; Mendez 2008).

Low marginal costs. By the mid-1990s, the electricity sector had already made significant investments in environmental management, built the relationships needed for international cooperation on environmental issues, and earned a reputation as an environmental leader. Hence, the sector's marginal costs of meeting the commitments in a VA were relatively low. The sector's strong environmental record stemmed in large part from pressures applied by the World Bank and other bilateral and multilateral lenders that had conditioned loans on improved environmental performance (Concha 2007; Bonilla 2007).[18]

Politics of privatization. The privatization of the electricity sector in the mid-1990s created political sensitivities that favored the signing of a VA. The transfer of control from public to private hands—in many cases to multinational companies based in Spain and the

[18] Toward this end, the Ministry of Energy, with World Bank backing, mandated that the principal stakeholders in the sector form the Environmental Committee for the Electricity Sector *(Comité Ambientale del Sector Eléctrico),* which developed a series of sectoral environmental management guidelines (Concha 2007).

United States—raised concern that private owners would deemphasize environmental management. Investors saw the VA as a means of signaling commitment to environmental management (Bonilla 2007; Cadena 2007; Concha 2007; Mendez 2008).

Tax breaks. The Colombian tax code provides financial incentives for energy efficiency investments. Part of the electricity sector's motivation for committing to a system of quantitative environmental indicators was to qualify for these tax breaks (Concha 2007; Mendez 2008).

6.5.5. Drivers for Regulators

Facilitating regulation. MMA had particularly strong incentives to expedite environmental regulation in the electricity sector. It did not want to be seen as creating a regulatory bottleneck that would undermine the policy of developing new infrastructure to prevent electricity shortages. In addition, it viewed a VA as an opportunity to enhance its own capacity to regulate. Under Law 99 of 1993, MMA was newly directly responsible for monitoring and enforcing command-and-control regulations in the electricity sector. However, at the time, it simply did not have the resources or expertise to perform this function. It saw a VA as a means of mitigating this problem, partly by promoting pollution prevention as an alternative to command-and-control (Bonilla 2007; Concha 2007).

6.6. East Antioquia Region

6.6.1. Background

Eastern Antioquia was targeted for regional development during the 1980s. Toward that end, national and local authorities helped establish a regional trade association called East Antioquia Business Corporation (*Corporacion Empresarial Oriente Antioqueño,* CEO) (CORNARE 2008; Ortiz 2007; CEO 2008). Today, 70 of the region's leading companies (roughly 10 percent of all companies) belong to CEO; their businesses include food, timber, pulp and paper, chemicals, textiles, services, and flowers (Ortiz 2007; Parra 2007; Tamayo 2007).

The principal environmental issues in the region are related to manufacturing, namely solid and toxic waste and air and water pollution. Food, textile, and paper industries are the main sources of water pollution, and chemical plants and wood treatment facilities are leading sources of toxic waste (Ortiz 2007; Tamayo 2007). CORNARE has regulatory jurisdiction over East Antioquia.

6.6.2. The East Antioquia VA

In December 1995, CORNARE, along with MMA, signed a VA with CEO (CORNARE et al. 1995). Thirty of the 70 companies in CEO signed the agreement individually. Special commitments in the VA (CORNARE et al. 1995) were (1) defining further commitments based on an environmental diagnosis; (2) creating a CEO environmental committee in which all affiliated businesses were to participate by the first trimester of 1996; (3) reforming CEO statutes to require new members to comply with the VA; (4) establishing a clean production information clearinghouse; (5) developing a plan for solid waste management by the first semester of 1996; (6) achieving 100 percent compliance with air pollution regulations within 2 years, 100 percent compliance with fuel prohibitions within 1 year, 30 percent reduction of water pollution relative to baseline levels within 3 years, 80 percent reduction of water pollution within 5 years, and 100 percent reduction of water pollution within 10 years, plus compliance with environmental permits governing soil erosion within six months; (7) establishing a network of air monitoring stations to support development of control strategies; and (8) creating a Foundation for the Investigation of Environmental Sciences and Technologies.

6.6.3. Compliance and Advances since the Voluntary Agreement

Of all 36 commitments in the VA, 39 percent were kept (Table 2). Of the 8 special commitments, 38 percent were kept, and of the 28 generic commitments, 39 percent were kept.

Thirty-six percent of all the commitments were abrogated. They included requiring firms joining CEO to comply with the VA, developing a mechanism to monitor firms' environmental performance, and improving land-use planning to take into consideration high-risk areas.

That said, 39 percent of signatories' commitments were kept. Most were procedural rather than performance based, reflecting the procedural orientation of the VA. Fulfilled commitments included completing an environmental diagnosis; for all 30 signatory companies, conducting a baseline study in 2003 and establishing environmental management departments by the time the VA expired in 2005; developing a program (financed by the Inter-American Development Bank) to promote the adoption of ISO 14001 environmental management systems, an effort that coincided with certification of 16 of the 30 signatory companies; establishing a network of air quality monitoring stations; developing quarterly capacity-building workshops; and creating an environmental committee with participation by all 30 signatories (MAVDT 2005, 2006; Ortiz 2007, 2008a, 2008b; Parra 2007, 2008).

Two important performance-based commitments were partially met: compliance with existing regulations and acquisition of requisite permits and licenses by defined deadlines. All signatories were in full compliance by the time the VA expired in 2005 (MAVDT 2006). All but one signatory obtained all necessary permits and licenses (Ortiz 2008b). However, it is not clear whether the intermediate deadlines were met.

Several environmental advances in East Antioquia coincided with, and may have been spurred by, the VA. Biological oxygen demand in the Rio Negro fell 57 percent between 1993 and 2002, and total suspended solids fell 74 percent while airborne particulate matter smaller than 10 microns in the municipality of San Nicolas fell 14 percent between 1998 and 2004 (CEO 2005a, 2005b).[19]

6.6.4. Drivers for Industry

Emissions fees. Colombia's national wastewater discharge emissions fee program began in 1997, two years after the East Antioquia VA was signed. CORNARE led the country in program implementation (Blackman 2009). According to CORNARE, the discharge fee program led to significant reductions in water pollution during the course of the VA. Ultimately, however, it is not possible to disentangle the relative contributions of the discharge fees and the VA (Parra 2007).

Clean production center. Medellín's National Center of Clean Production (*Centro Nacional de Produccion más Limpia*, CNPML), which provides technical assistance and training for both regional environmental authorities and private companies, was established in 1998, three years after the East Antioquia VA was signed. Importantly, CNPML did not formally participate in the VA, and it catered to firms that did not participate as well as those that did. According to CNPML directors, it helped improve environmental performance and environmental quality in East Antioquia between 1995 and 2005 (Sarasti 2007).

6.6.5. Drivers for Regulators

Cooperative relationship with industry. CORNARE approached CEO with an offer to negotiate the VA and took the lead (Ortiz 2008a). As noted above, unlike some other CARs, CORNARE has pursued a strategy of cooperating with industry (Parra 2007; Tamayo 2007).

[19] Hazardous waste indicators have not been developed (Ortiz 2007).

According to CORNARE directors, this strategy is more cost-effective than a confrontational enforcement-based approach and generates results in a far shorter time (Parra 2007).

7. Discussion

We now return to the two broad questions addressed by this study: Why were VAs used in Colombia, and how have they performed?

7.1. Why Were VAs Used?

7.1.1. Regulators

As discussed in Section 2, the literature has identified four reasons that regulators use VAs: to compensate for gaps in capacity to enforce mandatory regulations, to build that capacity, to reduce the transaction costs of mandatory regulation, and to avoid creating a "culture of resistance" to environmental regulation. Our research suggests that in Colombia, the first two motives were paramount.

As discussed in Section 3, before 1993, the legal, institutional, and political infrastructure needed for effective mandatory environmental regulation was sorely lacking. Law 99 of 1993 was meant to remedy this situation by creating, in one fell swoop, a host of new laws, regulations, and institutions, including MMA and 15 new regional environmental authorities. But implementing the new regulatory system was highly problematic, for two related reasons. First, it was incomplete. Law 99 of 1993 established relatively broad directives. The task of creating the more specific rules needed to implement these directives was left to the newly created regulatory authorities. Moreover, these rules needed to be tailored to dozens of economic sectors, each with its own environmental problems and technological solutions. In the mid-1990s, almost all of this work remained to be done. Second, in most cases, the new regulatory institutions lacked the technical expertise, data, experience, and financial resources to develop new sector-specific rules.

The result was a set of regulatory bottlenecks. For example, as discussed in Section 6, the number of farms in Medellín's cut-flower sector quadrupled during the mid-1990s, creating an urgent demand for environmental licenses. Yet CORNARE, the regional environmental authority in charge of licensing, had not yet developed the rules and processes for licensing and did not have the data or expertise to do so. A similar situation arose in the electricity sector, which was expanding rapidly in response to energy shortages and privatization.

Our case studies suggest that new national and regional regulatory agencies saw VAs as a means of managing a transition to the new environmental regulatory regime created by Law 99 of 1993. The VAs, they expected, would be a way to establish dialogues with industry representatives, gather technical information, and build the capacity needed to implement the new law. Information gathering and capacity building figured prominently in all the VAs discussed in Section 6. All the agreements committed the regulators to conducting an environmental diagnosis of the sector and establishing capacity-building programs and projects for their staff. Indeed, the palm oil and electricity VAs contained explicit commitments to develop terms of reference for environmental licensing.

There is some evidence that in addition to capacity building, Colombian regulators were motivated to negotiate VAs to avoid creating a culture of resistance to environmental regulation. In two of our case studies—cut flowers and East Antioquia—the lead regulatory authority, CORNARE, had an explicit strategy of cooperating with industry.

7.1.2. Industry

As discussed in Section 2, the literature identifies five reasons that industry participates in VAs: to preempt or soften the mandatory regulation, to obtain subsidies, to boost sales, to deflect pressures from communities and nongovernmental organizations, and to cut production costs. Like most empirical research on VAs in both industrialized and developing countries, our research suggests that factors related to mandatory regulation were the most important driver of private sector participation.

Our case studies suggest that in large part, industry signed VAs to help fill gaps and resolve inconsistencies in the new regulatory framework so that the firms would know the rules of the game and be able to adapt to them. For example, the lack of written licensing procedures created bottlenecks and stifled investment in the rapidly expanding cut-flower and electricity sectors. The VAs signed in these sectors were intended to ensure that clear, certain, reasonable procedures were quickly put in place. In addition, in the palm oil and electricity sectors, signatory firms hoped that a VA would help sort out discrepancies in rules and requirements among regional environmental authorities.

Aside from plugging gaps and resolving inconsistencies in new regulation, industry also expected that signing VAs would help them influence the writing of future rules and guidelines. For example, firms in the palm oil and electricity sectors hoped to influence new requirements for environmental licensing, and firms in the cut-flower sector hoped to influence new land-use planning rules.

Another driver of participation related to implementation of Law 99 of 1993 was a desire to minimize regulatory rent seeking. Representatives of the palm oil sector reported that one reason they signed their VA was to ensure that deep-pocketed palm oil facilities were not unfairly targeted for enforcement actions by newly created regional authorities.

A final motive for participation related to Law 99 of 1993 was a need to manage the risks associated with widespread noncompliance with mandatory regulation. Toward this end, three of the four VAs allowed a grace period during which firms could make required investments in pollution prevention and control. Only the VA for the electricity sector, where most firms were already in compliance, did not include a grace period.

Our case studies suggest that factors related to Law 99 of 1993 were not the only drivers of industry participation in VAs, however. In the cut-flower and palm oil VAs, the industries hoped that participation would improve their access to markets. ASOCOLFLORES anticipated that the agreement would help recruit farms into Flor Verde, its voluntary certification program aimed at improving the image of Colombian flowers in Europe and the United States. Similarly, FEDEPALMA expected that its VA would help improve the international image of Colombian palm oil.

Finally, community pressure appears to have played a role in spurring industry participation in at least one of the VAs. The palm oil industry hoped that its agreement would mollify local communities concerned about water pollution from processing mills.

7.2. How Have the VAs Performed?

7.2.1. Caveats

Most evaluations of VAs tend to be ad hoc and informal. A more rigorous methodology would involve assessingthe extent to which (1) the signatories complied with the terms of the VA; (2) the VA spurred improvements in environmental quality compared with a business-as-usual scenario; and (3) the VA improved environmental management capacity (Kerret and Tal 2005; De Clercq and Bracke 2005). However, the evidence needed for such an evaluation is elusive because most VAs lack quantitative baselines and targets, do not require parties to collect or report the data needed to determine whether commitments have been met, are implemented in concert with other policies, and self-select for industry participants that are already top

environmental performers (Kerret and Tal 2005; Harrison 1999; EEA 1997). Unfortunately, all of these barriers to rigorous evaluation are present in the Colombian case.[20] Given the difficulties, our evaluation of the performance of the six VAs is necessarily partly qualitative and somewhat impressionistic. That said, three broad conclusions emerge.

7.2.2. Weak Overall Performance

Available evidence suggests that based on the three criteria listed above, overall performance of all VAs in Colombia—not just the four examined here—has been poor. The main reason is that, as discussed in Section 5, most of the 64 VAs signed since the mid-1990s have resulted in minimal activity of any type, according to MMA evaluations. Our case studies focus on four VAs reputed to be among the most successful. Yet even in this sample, weak performance was common. On average, signatories kept only 42 percent of all the commitments in their VAs, even though most were procedural rather than substantive (Table 2). This statistic ranged from a low of 28 percent in the case of the electricity VA to a high of 61 percent in the case of the cut-flower VA. In several cases, important commitments were abrogated. For example, signatories to the cut-flower VA failed to create a sector-wide integrated plan for air water and solid waste pollution, and signatories to the palm oil and electricity VAs failed to develop quantitative indicators and hard targets.

7.2.3. Questionable Additionality

Often, empirical studies of voluntary regulation find that advances in environmental performance subsequent to the regulation are mostly due to unrelated factors and probably would have occurred absent the regulation. Our analyses suggest that this may have been true in Colombia. In four of the most successful Colombian VAs, we found that improvements in environmental performance were at least partly driven by pressures from export markets, local

[20] The VAs are difficult to evaluate because they mostly lacked quantitative baselines and targets and did not require collection and reporting of data needed for evaluation. Of the four VAs discussed in Section 6, all deferred the development of quantitative indicators of environmental performance and hard targets until after an environmental diagnosis had been conducted. Except in the electricity VA, the only important targets included in the VA were those related to schedules for compliance. Only the electricity VA and, to a lesser extent, the cut-flower VA contain specific commitments to systematic data collection. As discussed in Section 3, Colombian VAs coincide with implementation of a wide range of new environmental regulatory tools and institutions, including environmental licensing, emissions fees, and dozens of new regulatory institutions, and it is difficult to disentangle the effects of each. In our case studies, effluent fees are reputed to have had an important impact on performance of signatories to the East Antioquia and palm oil VAs. Finally, selection effects complicate evaluation. For example, in our sample of VAs, primarily larger, more technically advanced firms joined the cut-flower and palm oil VAs.

communities, capital markets, and regulators. Pressures from export markets helped spur improvements in environmental performance in the cut-flower and palm oil sectors. Both sectors were affected by growing concerns during the 1990s about environmental and human health effects of commodity supply chains. Pressures from communities and politicians helped spur advances in the palm oil and electricity cases. Palm oil mills were pushed by local fishermen and shrimp farmers to reduce water pollution. And electricity companies were motivated to improve their performance to head off concerns that privatization and expansion would have adverse environmental impacts. Pressures from multilateral and bilateral lenders such as the World Bank and the Inter-American Development Bank encouraged companies that signed the electricity VA to improve their environmental performance. Finally, as discussed above, VAs were a small component of a sweeping regulatory overhaul ushered in by Law 99 of 1993, and other elements of the new regulatory regime, notably wastewater emissions fees and more stringent monitoring and enforcement of all types of mandatory regulation, undoubtedly spurred investments in pollution prevention and control.

7.2.4. Capacity Building

As discussed in Section 7.1, for both regulators and industry, probably the most important motive for participating in VAs was to manage a transition to the new regulatory regime created by Law 99 of 1993 by facilitating exchanges of information between regulators and industry representatives, building environmental management expertise in regulatory agencies and the private sector, filling gaps and resolving inconsistencies in new regulations, and limiting rent seeking. Hence, broadly speaking, in the view of the signatories to the VAs, their paramount goal was building environmental regulatory capacity, not improving environmental performance. How have the VAs fared in this regard?

Clearly, VAs that were abandoned early on or that spurred little activity of any kind could not have significantly improved regulatory capacity. However, our case studies suggest that at least the apparently more successful VAs may indeed have helped build regulatory capacity. In each of the three sectoral VAs (cut flowers, palm oil, and electricity), at least one guide to environmental management was published. In all four VAs, a study diagnosing environmental issues was completed. In two VAs (palm oil and electricity), terms of reference for licensing procedures were published. All 30 companies that signed the East Antioquia VA established environmental management departments, and 16 companies obtained ISO 14001 certification. Interviews with national and regional stakeholders indicate that many of the changes would have happened regardless, but that the VAs hastened them.

8. Conclusion

To understand why VAs were used in Colombia and how well they performed, we have reviewed the literature on VAs, described the Colombian historical and institutional context, presented basic data on all 64 VAs signed before 2007, very briefly summarized previous evaluations of these VAs, and presented four in-depth case studies of relatively successful VAs. We found that although regulators and industry had various motives for signing VAs, in our case studies, the most important had to do with managing a transition from the ill-defined, lax environmental regulatory system that existed prior to 1993 to the more structured and stringent regime created by Law 99. As for the performance of the VAs, the evidence we have assembled supports three broad conclusions: the overall performance of the 64 VAs signed in Colombia between 1995 and 2006 was poor; even in cases where environmental performance improved after a VA was signed, additionality was limited; and consistent with signatories' motives for participating, the most significant benefit of the VAs probably has been to help build environmental management capacity in both regulatory institutions and the private sector.

What are the implications of these findings for environmental regulatory policy in developing countries? In the Introduction, we reviewed arguments for and against the use of voluntary regulation in developing countries. On one hand, voluntary regulation may be able to sidestep well-known barriers to mandatory environmental regulation in developing countries by amplifying nonregulatory pressures for pollution control. Also, it may help build capacity in environmental regulatory institutions and in the private sector. But on the other hand, voluntary regulation may actually require a strong background threat of mandatory regulation to be effective and may founder in countries where nonregulatory pressures for pollution control are weak, regulatory capture is common, and many firms are small. The Colombian experience supports arguments on both sides. Evidence suggests that VAs had minimal direct effects on environmental performance, for many of the reasons highlighted by pessimists. That said, the VAs helped build capacity. Moreover, it was capacity building, not improved environmental performance, that was paramount in the eyes of the participants. Hence, the Colombian experience suggests that the most appropriate role for VAs in developing countries may be to build environmental management capacity, not to improve industry performance per se.

The tension between capacity building and environmental performance merits additional comment. Although we have argued that the Colombian VAs' principal benefit was capacity building and that it was precisely this benefit that spurred industry and regulators to participate, many stakeholders in both the public and the private sectors expected the VAs would improve environmental performance. Evidence of the latter view includes the four MMA-sponsored

reviews of the Colombian VAs, which focus on the effects on environmental performance; the agreements themselves, which mostly describe activities aimed at improving environmental performance (e.g., promoting clean technological change); and the underlying policy and legal documents, which also highlight environmental performance (e.g., the 1995 Framework for Cleaner Production). Hence, there appears to have been a disconnect between the effect that most hoped the VAs would have, and the effect that they actually had. It is not hard to imagine how this disconnect arose. Many policies with a less direct connection to environmental quality—for example, ethanol subsidies in the United States—are "sold" on the basis of their green impacts, whether or not these impacts are the true motive or are likely to be significant.

Whatever its origins, the disconnect between the expected and actual benefits of Colombian VAs was costly. It likely contributed to the proliferation of VAs in Colombia in the late 1990s, growing disillusionment with VAs several years later, and the current confusion about whether and how to continue the policy. In short, unrealistic expectations about the benefits may have contributed to a misallocation of scarce regulatory and political resources to VAs. The broad lesson for environmental management in developing countries is that, although VAs may have significant benefits—namely capacity building—it is important that these benefits not be oversold or misrepresented.

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Appendix: Compliance with Colombian Voluntary Agreements

Table A1. Compliance with Cut-Flower Voluntary Agreement

CATEGORY	COMMITMENT	COMPLIANCE?	NOTES
SPECIAL COMMITMENTS			
1. Environmental diagnosis			
	S1.1. Use the environmental diagnosis to develop quantitative indicators within 1 year.	Yes	
	S2.1. Create an environmental protection fund from contributions by signatory firms.	Yes	*Fondo Gestion Ambiental* (FOGA) was created in 2000.
3. Production processes			
	S3.1. Develop a sector-wide integrated plan for air, water, and solid waste pollution within 10 months.	Yes	
4. Legal and technical norms			
	S4.1. Achieve compliance with the environmental regulations according to the following schedule: air pollution standards within 1 year; water effluent combined loads standards (governing biological oxygen demand, chemical oxygen demand, and suspended solids) within 2 years; heavy metal standards within 2.5 years	Partial	Full compliance was achieved in 2003.
	S4.2. Obtain all required environmental licenses and permits within 6 months.	Yes	Permits only; licenses are not needed in the flower sector.
GENERIC COMMITMENTS			
1. Environmental diagnosis			
	1.1. Conduct a study of environmental problems in the relevant sector or region, or validate an already-completed study.	Yes	An analysis of the impact of agrochemicals on soil and water quality, based on a random sample of 10 companies (3 big, 3 medium, 4 small), was conducted in the first year of the VA.
	1.2. Conduct a complementary study of a specific problem or a study to provide a baseline for quantitative commitments.	No	
	1.3. Update the diagnosis during the term of the VA.	No	Updated in 2007 after the VA expired.
2. Institutional strengthening			
	2.1. Create an environmental management department in the trade association and/or individual firms	Yes	All participating companies were required to have staff responsible for environmental affairs.
	2.2. Promote the adoption of environmental codes of conduct and environmental management systems by signatory firms.	Yes	During the VA, approximately 10 participating companies obtained ISO 14001 certification.
	2.3. Develop capacity-building programs and projects for the professional staff of regulatory institutions and/or signatory firms.	Yes	With FOGA funding, participants have organized roughly 10 workshops per year on environmental issues.
3. Production processes			
	3.1. Promote the development, domestic and international transfer, and adoption of pollution prevention techniques.	Unclear	International best practices used to develop sectoral environmental guide, which was published in 2000.
	3.2. Promote increased use of pollution control devices.	Partial	
	3.3. Promote water conservation.	Unclear	
	3.4. Develop contingency plans for environmental risks.	Yes	In 2002.
4. Legal and technical norms			
	4.1. Comply with specified norms in a specified time period.	No	See special commitment: compliance not achieved until 2003.
	4.2. Obtain all requisite licenses and permits.	Yes	Permits only; licenses are not needed in the flower sector.
	4.3. Substitute out of fuel sources prohibited by law.	Unclear	Roughly 10 companies substituted natural gas for crude oil in boilers used in sterilization process.
	4.4. Use only licensed providers and transporters of production inputs.	Unclear	Such licensing is not required in the flower sector.
	4.5. Respect compliance plans already negotiated with the regulator.	Yes	
	4.6. Facilitate private sector input into the design and implementation of new regulations and the revision of old ones.	Yes	Members of ASOCOLFLORES regularly meet with CORNARE to discuss new regulations promulgated

		by the national government.
5. Education and research		
5.1. Establish an annual agenda for capacity building among private firms.	Yes	With FOGA funding, participants have organized roughly 10 workshops per year on environmental issues.
5.2. Promote interactions with, and relevant research at, local universities.	Yes	Collaborations with regional universities include the Catholic University of East Antioquia (diagnosis of air and water contamination) and the University of Antioquia (study of sewage treatment).
5.3. Participate in an annual "ecology week" educational event.	Yes	VA impacts are presented in a yearly sectoral event called Expoflora.
5.4. Promote educational programs and projects in local communities.	Yes	Participating companies develop activities with the families of their employees as part of their corporate social responsibility programs.
5.5. Establish or strengthen local clean technology centers.	Yes	A National Cleaner Production Center was founded in 1998. ASOCOLFLORES has been on its board since then.
6. International cooperation		
6.1. Promote the exchange of information with international institutions and firms.	No	
7. Financing		
7.1. Create economic incentives for firms to adopt cleaner technologies.	Yes	*Fondo Gestion Ambienta*l (FOGA) was created in 2000.
7.2. Promote lines of credit to facilitate the adoption of clean technologies.	No	The National Cleaner Production Center offers "green credits." However, they are not specific to this VA.
7.3. Identify sources of finance for the activities in the VA.	Yes	*Fondo Gestion Ambiental* (FOGA) was created in 2000.
8. Monitoring and evaluation		
8.1. Formulate and implement mechanisms to monitor and evaluate environmental performance.	Yes	In 1999, an "ambassador" was appointed to the operating committee. Together with a representative of CORNARE, the ambassador inspects each signatory farm at least once per year and also visits some that are not signatories.
9. Special management zones		
9.1. Take into consideration floodplains and other high-risk zones in land-use decisions.	No	
9.2. Develop programs and projects to recover rivers and riverbanks and develop recreational areas.	No	

[a]Numbering of special commitments matches numbering of generic commitments.
Source: Parra 2008 unless otherwise noted.

Table A2. Compliance with Palm Oil Voluntary Agreement

CATEGORY	COMMITMENT	COMPLIANCE?	NOTES
SPECIAL Commitments			
1. Environmental diagnosis			
	S1.1. Develop a set of quantitative indicators of environmental performance based on the environmental diagnosis within 1 year.	No	
2. Institutional strengthening			
	S2.1. Create a network to strengthen environmental laboratories in the covered regions within 1 year.	No	
4. Legal and technical norms			
	S4.1. Quantify the emissions of firms and farms within 1 year.	No	
	S4.2. Comply with environmental regulations applicable to 51 processing plants according to the following schedule: 50% by 1998; 75% by 1999; 100% by 2000 (percentages refer to the difference between the baseline level of emissions in sectoral diagnosis and the legal emissions standard).	Partial	Industries began to comply only after 2000. Full compliance was achieved by 2004.
5. Education and research			
	S5.1. Establish centers for information about cleaner production.	No	
	S5.2. Promote research on integrated pest management.	Yes	CENIPALMA, the palm oil research center affiliated with FEDEPALMA, has a program on integrated pest management.
7. Financing			
	S7.1. Reduce taxes on imported equipment that contributes to cleaner production.	Partial	The government approved a sales tax exemption on imported clean technology, but it was for all sectors, not just palm oil.
10. TORS			
	S10.1. Develop written terms of reference for impact assessments and management plans needed for environmental licensing.	Yes	
	S10.2. Develop plans for forest restoration.	Yes	
GENERIC COMMITMENTS			
1. Environmental diagnosis			
	1.1. Conduct a study of environmental problems in the relevant sector or region, or validate an already-completed study.	Yes	In 2000, a qualitative diagnosis was conducted.
	1.2. Conduct a complementary study of a specific problem or a study to provide a baseline for quantitative commitments.	Unclear	
	1.3. Update the diagnosis during the term of the VA.	No	According to FEDEPALMA, there was no need for an update.
2. Institutional strengthening			
	2.1. Create an environmental management department in the trade association and/or individual firms	Yes	FEDEPALMA created an environmental management department in 1998.
	2.2. Promote the adoption of environmental codes of conduct and environmental management systems by signatory firms.	Yes	All 51 processing plants now have environmental management plans approved by regional environmental authorities.
	2.3. Develop capacity-building programs and projects for the professional staff of regulatory institutions and/or signatory firms.	Partial	No activities were developed with regulators because "government officials change very frequently."
3. Production processes			
	3.1. Promote the development, domestic and international transfer, and adoption of pollution prevention techniques.	Yes	FEDEPALMA's Environmental Unit promotes the adoption of clean technologies. It has a program to train the personnel of the companies in several areas, including environmental management.
	3.2. Promote increased use of pollution control devices.	Yes	FEDEPALMA's Environmental Unit promotes the adoption of clean technologies.
	3.3. Promote water conservation.	Yes	100% of the VA signatories use water-saving strategies for irrigation and processing.
	3.4. Develop contingency plans for environmental risks.	Yes	100% of VA signatories have contingency plans.
4. Legal and technical norms			
	4.1. Comply with specified norms in a specified time period.	Unclear	100% of VA signatories are complying today; it is unclear when they first complied.
	4.2. Obtain all requisite licenses and permits.	Unclear	100% of VA signatories have them today; it is unclear when they first obtained them.
	4.3. Substitute out of fuel sources prohibited by law.	Unclear	Many processing plants are moving from fossil fuels to biomass; it is unclear whether these fuels are prohibited.

4.4. Use only licensed providers and transporters of production inputs.	Yes	100% of VA signatories do this.
4.5. Respect compliance plans already negotiated with the regulator.	Yes	100% of VA signatories do this.
4.6. Facilitate private sector input into the design and implementation of new regulations and the revision of old ones.	Yes	The VA facilitates input into the design and implementation of wastewater discharge fees and water use fees.
5. Education and research		
5.1. Establish an annual agenda for capacity building among private firms.	No	Currently under discussion.
5.2. Promote interactions with, and relevant research at, local universities.	Yes	The National University has a graduate program in palm oil production. FEDEPALMA also has agreements with other universities (Unillanos; Universidad del Magalena; Universidad de Nariño; Univesidad Minuto de Dios).
5.3. Participate in an annual "ecology week" educational event.	Unclear	They are conducted today; it is unclear whether they were held in the past.
5.4. Promote educational programs and projects in local communities.	Partial	Some signatories offer training courses to local communities.
5.5. Establish or strengthen local clean technology centers.	No	
6. International cooperation		
6.1. Promote the exchange of information with international institutions and firms.	Unclear	FEDEPALMA is currently engaged in international collaborations (a program with WWF to assess environmental services in palm oil regions and ongoing discussions with the Round Table for Sustainable Palm Oil; it is unclear what activities occurred during the VA.
7. Financing		
7.1. Create economic incentives for firms to adopt cleaner technologies.	Partial	The government approved a sales tax exemption on imported clean technology, but it was for all sectors, not just palm oil.
7.2. Promote lines of credit to facilitate the adoption of clean technologies.	No	
7.3. Identify sources of finance for the activities in the VA.	No	
8. Monitoring and evaluation		
8.1. Formulate and implement mechanisms to monitor and evaluate environmental performance.	Yes	FEDEPALMA contracted with the *Organization para el Desarrollo Sostenible* (ODES) to conduct an evaluation of environmental performance, which was published in 2005.
9. Special management zones		
9.1. Take into consideration floodplains and other high-risk zones in land use decisions.	Yes	A national policy (CONPES 3477 of 2007) orders the National Geography Institute to a identify lands suitable for palm oil production, including an assessment of environmental criteria.
9.2. Develop programs and projects to recover rivers and riverbanks and develop recreational areas.	No	

[a]Numbering of special commitments matches numbering of generic commitments.
Source: Morzorra 2008 unless otherwise noted.

Table A3. Compliance with Electricity Voluntary Agreement

CATEGORY	COMMITMENT	COMPLIANCE?	NOTES
SPECIAL Commitments			
1. Environmental diagnosis			
	S1.1.Conduct an inventory, inspection, and evaluation of hazardous wastes associated with the electricity sector.	Yes	Several studies of hazmats were conducted, and a guide on PCBs was published in 1999.
2. Institutional strengthening			
	S2.1. Establish 3 pilot projects to test the applicability of self-regulation, such as ISO 14001.	No	Only 1 workshop on the implementation of ISO 14001 was organized, in 2001. About 10 (generation and transmission) companies participated.
4. Legal and technical norms			
	S4.1. Set voluntary quantitative goals for pollution, recycling, and optimal use of resources based on baseline information in the environmental diagnosis.	No	Indicators were defined, but baselines and a monitoring system were not developed (Bonilla 2007).
	S4.2. Define criteria for land-use planning.	No	
5. Education and research			
	S5.1. Promote applied research on renewable energy.	No	
	S5.2. Promote environmental management in small farms in the Bogotá corridor.	Yes	Two companies (Codensa and Empresas de Energia de Cundinamarca) evaluated their environmental liabilities.
	S5.3. Develop a research project on hazardous wastes in the electricity sector, with particular focus on PCBs.	Yes	A consultancy was funded by the Canadian government.
7. Financing			
	S7.1. Promote a means of rewarding firms in the sector that make clear advances in environmental management.	No	The only economic incentive was a tax exemption for importing clean technology. However, it was a general exemption for all sectors.
8. Monitoring and evaluation			
	S8.1. Develop a database on the electricity sector.	Yes	A database with general information on the companies in the sector was compiled in 1997.
9. Special management zones			
	S9.1. Define priority ecosystems to be considered in plans to expand the electricity sector.	Partial	A methodology to plan expansion of the sector was developed. The National Energy Planning Office (UPME) used this methodology, but the companies did not.
10. TORS			
	S10.1. Develop written terms of reference for impact assessments and management plans needed for environmental licensing.	Yes	These were completed in 1997.
	S10.2. Publish environmental guides for each of the activities in the sector by the first semester of 1998.	Partial	An environmental guide on electricity distribution was published, but not until 2002. Other guides on generation and transmission were developed but never published (Bonilla 2007).
GENERIC COMMITMENTS			
1. Environmental diagnosis			
	1.1. Conduct a study of environmental problems in the relevant sector or region, or validate an already-completed study.	Yes	An environmental diagnosis was conducted in 1994, before the VA was signed, and was updated in 2001.
	1.2. Conduct a complementary study of a specific problem or a study to provide a baseline for quantitative commitments.	No	In 2001, a methodology to develop firm-level baselines was developed, but it was never put into practice.
	1.3. Update the diagnosis during the term of the VA.	No	
2. Institutional strengthening			
	2.1. Create an environmental management department in the trade association and/or individual firms.	Yes	
	2.2. Promote the adoption of environmental codes of conduct and environmental management systems by signatory firms.	No	No explicit activities were undertaken, although roughly 5 meetings were organized to exchange best practices.
	2.3. Develop capacity-building programs and projects for the professional staff of regulatory institutions and/or signatory firms.	Yes	Workshops on environmental auditing, environmental liabilities, and management of PCBs were held with representatives of the companies and regulatory institutions.

3. Production processes		
3.1. Promote the development, domestic and international transfer, and adoption of pollution prevention techniques.	No	
3.2. Promote increased use of pollution control devices.	No	
3.3. Promote water conservation.	No	
3.4. Develop contingency plans for environmental risks.	Yes	In 1997, the Ministry of Mining developed a contingency plan for hydropower facilities.
4. Legal and technical norms		
4.1. Comply with specified norms in a specified time period.	Unclear	
4.2. Obtain all requisite licenses and permits.	Unclear	
4.3. Substitute out of fuel sources prohibited by law.	Unclear	
4.4. Use only licensed providers and transporters of production inputs.	Unclear	
4.5. Respect compliance plans already negotiated with the regulator.	Unclear	
4.6. Facilitate private sector input into the design and implementation of new regulations and the revision of old ones.	Yes	This, the VA's main objective, was accomplished.
5. Education and research		
5.1. Establish an annual agenda for capacity building among private firms.	No	Only ad hoc activities were conducted.
5.2. Promote interactions with, and relevant research at, local universities.	No	In the scope of the VA, only collaborations with business association occurred. Outside this scope, individual companies worked with universities.
5.3. Participate in an annual "ecology week" educational event.	No	Only ad hoc activities occurred.
5.4. Promote educational programs and projects in local communities.	No	
5.5. Establish or strengthen local clean technology centers.	No	
6. International cooperation		
6.1. Promote the exchange of information with international institutions and firms.	No	
7. Financing		
7.1. Create economic incentives for firms to adopt cleaner technologies.	No	The only economic incentive was a tax exemption for importing clean technology. However, it was a general exemption for all sectors.
7.2. Promote lines of credit to facilitate the adoption of clean technologies.	No	
7.3. Identify sources of finance for the activities in the VA.	Yes	The Canadian government provided approximately $100,000 for improved management of PCBs.
8. Monitoring and evaluation		
8.1. Formulate and implement mechanisms to monitor and evaluate environmental performance.	No	
9. Special management zones		
9.1. Take into consideration floodplains and other high-risk zones in land-use decisions.	Partial	A method to evaluate environmental risks was developed.
9.2. Develop programs and projects to recover rivers and riverbanks and develop recreational areas.	No	

[a]Numbering of special commitments matches numbering of generic commitments.
Source: Concha 2008 unless otherwise noted.

Table A4. Compliance with East Antioquia Voluntary Agreement

CATEGORY	COMMITMENT	COMPLIANCE?	NOTES
SPECIAL Commitments			
1. Environmental diagnosis			
	S1.1. Define VA commitments based on environmental diagnosis.	Yes	MAVDT (2006).
2. Institutional strengthening			
	S2.1. Create an "environmental topics committee" in which all signatories participate by the first trimester of 1996.	Yes	
	S2.2. Reform trade association statutes to require new members to comply with the VA.	No	Statute was developed but not signed until 2005, after the VA expired.
3. Production processes			
	S3.1. Establish a clean technology information clearinghouse.	Unclear	National Center for Cleaner Production was established in 1998 but not under the auspices of the VA.
	S3.2. Develop a plan for solid waste management, recycling, and reuse to the operations committee by the first semester of 1996.	Unclear	
4. Legal and technical norms			
	S4.1.Comply with environmental regulations according to the following schedule: 100% compliance with air pollution regulations within 2 years; 100% compliance with fuel prohibitions within 1 year; 30% reduction of water pollution relative to baseline levels within 3 years, 80% reduction within 5 years, and 100% reduction within 10 years; and compliance of environmental permits governing soil erosion within 6 months	Partial	When the VA expired, all signatories were in full compliance (MAVDT 2006); it is unclear whether the deadlines were met.
	S4.2. Establish a network of air monitoring stations and a center for atmospheric monitoring to support development of control strategies.	Yes	Network was installed in 2001 by CORNARE and Universidad Catolica del Oriente.
5. Education and research			
	S5.1. Create a Foundation for the Investigation of Environmental Sciences and Technologies.	No	
GENERIC COMMITMENTS			
1. Environmental diagnosis			
	1.1. Conduct a study of environmental problems in the relevant sector or region, or validate an already-completed study.	Yes	MAVDT (2006).
	1.2. Conduct a complementary study of a specific problem or a study to provide a baseline for quantitative commitments.	Yes	In 2003, a baseline study of all the signatory companies was conducted (see also Gonzalez 2003).
	1.3. Update the diagnosis during the term of the VA.	No	
2. Institutional strengthening			
	2.1. Create an environmental management department in the trade association and/or individual firms.	Yes	According to MAVDT (2006) and Ortize (2008), all 30 signatory firms established an environmental management department.
	2.2. Promote the adoption of environmental codes of conduct and environmental management systems by signatory firms.	Yes	16 signatory firms were ISO 14001 certified during the VA (Ortiz 2007).
	2.3. Develop capacity-building programs and projects for the professional staff of regulatory institutions and/or signatory firms.	Yes	MAVDT (2006).
3. Production processes			
	3.1. Promote the development, domestic and international transfer, and adoption of pollution prevention techniques.	Unclear	Several signatory firms, including Pintuco, Coltejer, and New Estetic, adopted clean technologies.
	3.2. Promote increased use of pollution control devices.	Unclear	Several signatories, mainly in the textile industry, established wastewater treatment plants.
	3.3. Promote water conservation.	No	
	3.4. Develop contingency plans for environmental risks.	Yes	90% of signatory firms had developed plans by the VA's expiration.
4. Legal and technical norms			
	4.1. Comply with specified norms in a specified time period.	Unclear	No violations were reported during the VA, but it is unclear whether inspections were rigorous.
	4.2. Obtain all requisite licenses and permits.	Partial	Only 1 industry did not obtain requisite permits and licenses.
	4.3. Substitute out of fuel sources prohibited by law.	Yes	Four companies substituted natural gas for crude oil.
	4.4. Use only licensed providers and transporters of production inputs.	No	

4.5. Respect compliance plans already negotiated with the regulator.	Yes	
4.6. Facilitate private sector input into the design and implementation of new regulations and the revision of old ones.	No	
5. Education and research		
5.1. Establish an annual agenda for capacity building among private firms.	Yes	The agenda was an important VA activity: 4 events per year were organized.
5.2. Promote interactions with, and relevant research at, local universities.	No	
5.3. Participate in an annual "ecology week" educational event.	Partial	Events were held in first 5 years of VA, but not thereafter.
5.4. Promote educational programs and projects in local communities.	Yes	Activities developed by local firms.
5.5. Establish or strengthen local clean technology centers.	Unclear	A National Center for Cleaner Production was established in 1998 but not under the auspices of VA.
6. International cooperation		
6.1. Promote the exchange of information with international institutions and firms.	Yes	In 2003, the Inter-American Development Bank provided roughly $400,000 to finance ISO 14001 certification of 27 signatory firms.
7. Financing		
7.1. Create economic incentives for firms to adopt cleaner technologies.	No	The only economic incentive was a tax exemption for importing cleaner technology, but it was not specific to the VA.
7.2. Promote lines of credit to facilitate the adoption of clean technologies.	No	A green credit program was offered by the National Cleaner Production Center but was not specific to the VA.
7.3. Identify sources of finance for the activities in the VA.	No	
8. Monitoring and evaluation		
8.1. Formulate and implement mechanisms to monitor and evaluate environmental performance.	No	
9. Special management zones		
9.1. Take into consideration floodplains and other high-risk zones in land-use decisions.	No	
9.2. Develop programs and projects to recover rivers and riverbanks and develop recreational areas.	No	

[a]Numbering of special commitments matches numbering of generic commitments.
Source: Ortiz 2008b unless otherwise noted.