RFF REPORT

Voluntary Environmental Agreements in Developing Countries

The Colombian Experience

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Voluntary Environmental Agreements in Developing Countries: The Colombian Experience*

Allen Blackman,† Eduardo Uribe, Bart van Hoof, and Thomas P. Lyon

Executive Summary

A. Background

The conventional approach to pollution control is to establish laws requiring firms to cut emissions. Voluntary regulation, by contrast, provides incentives—but not mandates—for pollution control. In industrialized countries, such regulation has become quite popular. 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.

Although voluntary environmental initiatives in industrialized countries share many features with those in developing countries, their objectives are generally different. Policymakers in industrialized countries typically use voluntary regulation to encourage firms to overcomply with mandatory regulations; those in developing countries generally use it to help remedy rampant noncompliance with mandatory regulation. Given that voluntary regulation in developing countries is usually a frontline compliance strategy rather than an effort to move beyond compliance, the stakes for its success are high.

But is voluntary regulation likely to have significant environmental benefits in developing countries? Two opposing views are emerging in the nascent literature. Some argue that voluntary regulation holds considerable promise for developing countries. As is well known, policymakers in the global south face an array of barriers to enforcing mandatory regulation, including weak institutions, incomplete legal foundations, and limited political will. According to proponents, voluntary regulation sidesteps these constraints because, by definition, it does not depend directly on mandatory regulation to motivate polluters to cut emissions. Rather, it relies on at least three other types of mechanisms. First, by spotlighting firms' environmental performance, voluntary regulation can increase pressures placed on polluters by consumers, capital markets, nongovernmental organizations, and community groups. Second, voluntary initiatives often

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subsidize investments in pollution abatement. Finally, voluntary regulation can help build capacity for mandatory regulation both in environmental management institutions and in the private sector.

Notwithstanding those arguments, there are at least four reasons to doubt that voluntary regulation can be effective in developing countries. First, to be effective, voluntary regulation may, in fact, require a capable regulator. Case studies suggest that a background threat of mandatory regulation is often the main reason firms participate in and comply with voluntary initiatives. This finding implies 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. Niche markets for "green" products are smaller than in industrialized countries; capital markets, including stock markets, are thinner; and environmental nongovernmental organizations and advocacy groups are relatively weak and scarce.

Third, voluntary initiatives may be more apt to be co-opted by private sector interests in developing countries where environmental management institutions and environmental advocacy groups are relatively weak. A closely related concern is that in developing countries, voluntary regulation can be used to preempt or delay effective mandatory regulation by creating an "environmental Potemkin Village"—a false impression that regulators and polluters are making progress on environmental problems. If this is the case, voluntary regulation can have real environmental costs, which must be weighed against any possible benefits.

Finally, the type of firms found in developing countries may be ill-suited to voluntary regulation. Small-scale and informal (unlicensed and unregistered) firms are more prevalent in developing countries than in industrialized countries. They may be less susceptible to many of the regulatory and nonregulatory pressures that create incentives for compliance with voluntary initiatives, including those generated by green consumers and capital markets.

We know relatively little about these arguments for and against the use of voluntary regulation in developing countries played out in practice, information needed by policy makers deciding how to allocate the scarce resources available for environmental management in developing countries. The literature on this topic is quite thin.

B. Objectives

To help fill the gap, this report 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. To our knowledge, ours is the first rigorous effort to evaluate this experience and distill lessons for the design and implementation of voluntary regulation in developing countries. 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.

C. Methods

Preliminary sections of the report review the literature on the use of negotiated voluntary agreements in industrialized and developing countries and provide background on environmental regulation in Colombia. The remainder of the report analyzes the Colombian VAs. An in-depth evaluation of all 64 VAs is beyond the scope of this report. Instead, we briefly summarize the evaluations commissioned by the Colombian Ministry of the Environment and present new case studies of VAs signed with six parties: the cut-flower sector (1996), the palm oil sector (1997), the electricity sector (1997), an industrial association in the greater metropolitan area of Medellín (1995), the oil sector (1997), and an industrial association in the greater metropolitan area of Cartagena (1995). 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 impacts. Second, we selected VAs reputed to be relatively successful. Most of Colombia's VAs are widely acknowledged to have failed, and the reasons, including meaningless commitments and lack of followup, are well known. We hypothesize that more can be learned by finding out 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 key regulatory and private sector stakeholders conducted between late 2007 and early 2009, as well as primary and secondary documents.

We address two main questions:

- Why were VAs used in Colombia? More specifically, what motivated regulators to sign them? What motivated industry to sign them?
- How have the VAs performed? More specifically, have the signatories to the VAs kept their commitments? Have the VAs spurred improvements in environmental quality compared with a business-as-usual scenario? Have they improved environmental management capacity within the participating regulatory institutions and the industrial sector?

D. Findings

D1. Why Were VAs Used in Colombia?

Regulators

The literature identifies 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 fostering a "culture of resistance" to environmental regulation. Our research suggests that in Colombia, the first two motives were paramount.

A sweeping regulatory reform, Law 99 of 1993, created a new environmental regulatory system. Prior to this reform, 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 a new Environment Ministry and more than 30 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 new regulatory authorities. Moreover, these rules needed to be tailored to dozens of economic sectors. For example, environmental licensing for the cut-flower and oil sectors had to address two different sets of environmental problems and technological solutions. In the mid-1990s, almost all of this work remained to be done. Second, in most cases, the regulatory new institutions lacked the technical expertise, data, experience, and financial resources needed to develop new sector-specific rules.

The result was costly regulatory bottlenecks. For example, the number of farms in Medellín's cut-flower sector quadrupled during the mid-1990s, creating an urgent demand for environmental licenses. Yet the regional environmental authorities 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. Similar situations arose in the electricity and oil sectors, which were 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 of our case study VAs. Indeed, the palm oil, electricity, and oil VAs contained explicit commitments to develop terms of reference for environmental licensing.

In two of our case studies—cut flowers and East Antioquia—there is some evidence that regulators also saw VAs as a means of avoiding confrontation with the private sector. In both cases, CORNARE was the lead regulatory authority. CORNARE's explicit strategy was to foster cooperative interactions with industry.

Industry

The literature identifies five reasons that industry participates in VAs: to mitigate a background threat of mandatory regulation (i.e., to preempt more stringent mandatory regulation or to soften enforcement of existing regulation), to obtain explicit or implicit subsidies, to boost sales in markets where consumers care about environmental performance, to soften pressures generated by communities and nongovernmental organizations, and to cut production costs by adopting win-win pollution prevention techniques.

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. However, in our case, it was not exactly a background threat of mandatory regulation that was decisive. Rather, it was the need to reduce uncertainty about, and to

influence the development and implementation of, new mandatory regulation ushered in by Law 99 of 1993.

Our case studies suggest that in large part, industry signed VAs to help fill gaps and resolve inconsistencies in the new regulatory framework simply so that the firms would know the rules of the game and be able to adapt to them. For example, as noted above, a lack of written licensing procedures created bottlenecks and stifled investment in the cut-flower, electricity, and oil sectors, which were expanding rapidly in the early and mid-1990s. The VAs signed in these sectors were intended to ensure that clear, certain, reasonable procedures were quickly established. In the palm oil sector, growers hoped that a VA would help sort out discrepancies in rules and enforcement among different regional environmental authorities. A similar problem drove the participation of companies involved in electricity distribution, whose networks spanned multiple jurisdictions. Finally, industries in the Mamonal zone hoped that their VA would help resolve confusion about overlapping jurisdictions of regional and urban 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, electricity, and oil 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 enhance transparency of monitoring and enforcement among the new regional environmental authorities to ensure that deep-pocketed palm oil growers and processors were not unfairly targeted for enforcement actions.

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, four of the six VAs discussed in Section 6 provided for a grace period during which firms could make the requisite investments in pollution prevention and control. The only VAs that did not include such provisions were those signed in the electricity and oil sectors, and in the electricity sector, firms were already in compliance.

Factors related to Law 99 of 1993 were not the only drivers of industry participation in VAs, however. In two cases, the cut-flower and palm oil VAs, the industries expected that participation would improve their access to markets. ASOCOLFLORES, the flower trade association that signed the VA, hoped 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, the palm oil trade association, hoped that its VA would help improve the image of Colombian palm oil in export markets.

Finally, community pressure appears to have played a role in spurring industry participation in VAs. The palm oil industry hoped that its VA would mollify local communities concerned about water pollution from processing plants. And the Mamonal Foundation hoped that participation

would help repair damage to industry's image caused by a Bhopal-like industrial accident in the 1970s.

D2. How Have the VAs Performed?

Caveats

Although the majority of evaluations of VAs that have been published tend to be somewhat ad hoc and informal, those that have attempted to develop a more rigorous methodology suggest assessing the 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. However, the literature indicates that marshaling the evidence needed for such an evaluation is usually quite difficult for several reasons. 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. Unfortunately, all of these barriers to rigorous evaluation are present in the Colombian case. Given these difficulties, our evaluation of the performance the six case study VAs is necessarily partly qualitative and somewhat impressionistic. That said, three broad conclusions emerge.

Weak Overall Performance

Available evidence suggests that overall performance of VAs in Colombia has been poor based on the three criteria listed above. The main reason is that most of the 64 VAs signed since the mid-1990s have resulted in minimal activity of any type, according to the Ministry of Environment's own evaluations. A ministry report found that in a sample of 47 VAs, only 10 made "significant advances in meeting their commitments," and 10 VAs were stillborn: regulators and industry abandoned them soon after they were signed. If the signatories of most VAs did not come close to meeting their commitments, no matter how vague, then it is doubtful that the VAs improved environmental quality relative to a business-as-usual scenario or boosted environmental management capacity.

We conducted a detailed analysis of six 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 their VA commitments, even though most were procedural rather than substantive. 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; signatories to the palm oil and electricity VAs failed to develop quantitative indicators and hard targets; and signatories to the Mamonal VA failed to develop and implement a solid waste recycling and recovery plan.

Questionable Additionality

In evaluating the performance of VAs, a critical issue is whether the VA resulted in additional benefits that would not have occurred absent the VA. Often, empirical studies of voluntary regulation find that advances in environmental performance subsequent to the regulation are mostly due to unrelated factors and very likely would have occurred regardless. Our analyses of six of the seemingly most successful VAs suggest that this may have been true in Colombia. We found that improvements in environmental performance were driven in large part by pressures from international markets, local communities, capital markets, and other regulatory programs, and by technological change.

In the cut-flower and palm oil cases, improvements in performance were at least partly driven by pressures from foreign buyers (heightened by negative advertising funded by competing foreign growers). During the term of the Medellín flower VA, growers in Bogotá who had not signed a VA made advances comparable to growers in Medellín.

In the palm oil, electricity, and Mamonal cases, pressures from communities and politicians spurred environmental advances during the term of the VA. Palm oil processing plants were pressured by local fishermen and shrimp farmers to reduce water pollution. Electricity companies had strong political incentives to improve their performance to demonstrate that privatization and expansion would not have adverse environmental impacts. And companies in the Mamonal zone were pressured by local communities affected by a serious industrial accident in the mid-1970s.

In the electricity case, signatory companies were required by multilateral and bilateral lenders such as the World Bank and the Inter-American Development Bank to improve their environmental performance. And in the palm oil and East Antioquia cases, industry representatives reported that cost-saving clean technological change helped drive environmental advances.

Finally, VAs were a small component of a sweeping regulatory overhaul ushered in by Law 99 of 1993. Other elements of the new regulatory regime, notably more stringent monitoring and enforcement of mandatory regulation, undoubtedly spurred investments in pollution prevention and control.

Capacity Building

For both regulators and industry, probably the most important motive for participating in VAs was to manage a transition to the 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 in 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 had a significant impact on regulatory capacity. However, our six case studies suggest that at least the apparently more successful VAs may indeed have helped build regulatory capacity. In each of the four sectoral VAs (cut flowers, palm oil, electricity, and oil), at least one guide to

environmental management was published. In five VAs (all except oil), a study diagnosing environmental issues was completed. In three VAs (palm oil, electricity, and oil), 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. In the Mamonal zone, environmental departments were established in 100 percent of the signatory companies. In the electricity sector, several studies of hazardous waste were completed. In the oil sector, the efficiency of environmental licensing improved dramatically. Interviews with national and regional stakeholders indicate that many of the changes would have happened regardless, but that the VAs hastened them.

E. Policy Implications

The Colombian experience supports arguments on both sides of the debate about the usefulness of voluntary regulation in developing countries. Available evidence suggests that VAs had minimal direct impact 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 industry and regulators hoped to achieve, many stakeholders in both the public and the private sectors expected the VAs would improve environmental performance. Hence, there appears to have been a disconnect between the effect that observers hoped the VAs would have, and the effect that they actually had.

Whatever its origins, the disconnect between the expected and actual benefits of Colombian VAs was costly. It likely contributed to the rapid proliferation of superfluous 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.

Voluntary Environmental Agreements in Developing Countries: The Colombian Experience

1. Introduction

The conventional approach to pollution control is to establish laws requiring firms to cut emissions. Voluntary regulation, by contrast, provides incentives—but not mandates—for pollution control. The three main types of voluntary regulation are environmental agreements negotiated between regulators and industry, public programs (administered by regulators or third parties) that individual firms are invited to join, and unilateral commitments made by firms (Lyon and Maxwell 2002). In industrialized countries, such regulation has become quite popular (OECD 1999, 2003). Less well known is that environmental authorities in developing countries, particularly those in Latin America, also have embraced this approach and are rapidly putting initiatives in place. For example, over the past decade, regulatory authorities in Chile and Mexico have negotiated dozens of high-profile voluntary "clean production agreements" with dirty industrial sectors (Jiménez 2007; Hanks 2002). Other types of voluntary regulation, including state-run voluntary audit, labeling, and public disclosure programs, are also increasingly common (Blackman 2008; Rivera 2002).

Although voluntary environmental initiatives in industrialized countries share many features with those in developing countries, their objectives are generally different. Policymakers in industrialized countries typically use voluntary regulation to encourage firms to overcomply with mandatory regulations; those in developing countries generally use it to help remedy rampant noncompliance with mandatory regulation. For example, an explicit goal of national clean production initiatives in both Chile and Mexico has been to spur compliance with mandatory regulation (Jiménez 2007; Blackman and Sisto 2006). Given that voluntary regulation in developing countries is usually a frontline compliance strategy rather than an effort to move beyond compliance, the stakes for its success are high.

But is voluntary regulation likely to have significant environmental benefits in developing countries? Two opposing views are emerging in the nascent literature. Some argue that voluntary regulation holds considerable promise for developing countries (Hanks 2002; World Bank 2000). As is well known, policymakers in the global south face an array of barriers to enforcing mandatory regulation, including weak institutions, incomplete legal foundations, and limited political will (Russell and Vaughan 2003; Eskeland and Jimenez 1992). According to proponents, voluntary regulation sidesteps these constraints because, by definition, it does not depend directly on mandatory regulation to motivate polluters to cut emissions. Rather, it relies on at least three other types of mechanisms. First, by spotlighting firms' environmental performance, voluntary regulation can boost pressures placed on polluters by consumers, capital markets, nongovernmental organizations, and community groups. For example, a firm participating in a negotiated voluntary agreement might receive positive publicity that increases its sales, enhances its access to financial capital, and deflects criticism from environmental advocates. Second, voluntary initiatives often subsidize investments in pollution abatement. These subsidies can be pecuniary, such as grants or

loans for pollution control equipment, but more often they are informational—seminars, brochures, and one-on-one interactions that provide technical assistance in pollution abatement. Such nonpecuniary subsidies are reputed to be a leading "soft" benefit of voluntary regulation. Finally, voluntary regulation can help build capacity for mandatory regulation both in environmental management institutions and in the private sector. It can do this by improving the flow of information between firms and regulators.

Notwithstanding those arguments, there are at least four reasons to doubt that voluntary regulation can be effective in developing countries. First, to be effective, voluntary regulation may, in fact, require a capable regulator. Case studies suggest that a background threat of mandatory regulation is often the main reason firms participate in and comply with voluntary initiatives (Khanna 2001; Lyon and Maxwell 2002). This finding implies that voluntary regulatory instruments are unlikely to perform well in countries where mandatory regulation is weak.

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

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

Finally, the type of firms found in developing countries may be ill-suited to voluntary regulation. Small-scale and informal (unlicensed and unregistered) firms are more prevalent in developing countries than in industrialized countries (Blackman 2006). They may be less susceptible to many of the regulatory and nonregulatory pressures that create incentives for compliance with voluntary initiatives, including those generated by green consumers and capital markets. Also, they may be more likely to free-ride on the activities of larger participants in voluntary initiatives.

We know relatively little about these arguments for and against the use of voluntary regulation in developing countries played out in practice, information urgently needed by policymakers deciding how to allocate the scarce resources available for environmental management in developing countries. As discussed below, the literature on this topic is quite thin.

To help fill the gap, this report 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 the design and implementation of voluntary regulation in developing countries. 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.

An in-depth evaluation of all 64 Colombian VAs is beyond the scope of this report. Instead, we briefly summarize the evaluations commissioned by the Colombian Ministry of the Environment and present new case studies of VAs signed with the cut-flower sector (1996), the palm oil sector (1997), the electricity sector (1997), an industrial association in the greater metropolitan area of Medellín (1995), the oil sector (1997), and an industrial association in the greater metropolitan area of Cartagena (1995). 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 impacts. 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 followup, 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 key regulatory and private sector stakeholders conducted between late 2007 and early 2009, as well as primary and secondary documents.

We address two main questions:

- Why were VAs used in Colombia? More specifically, what motivated regulators to sign them? What motivated industry to sign them?
- How have the VAs performed? More specifically, have the signatories to the VAs kept their commitments? Have the VAs spurred improvements in environmental quality compared with a business-as-usual scenario? Have they improved environmental management capacity within the participating regulatory institutions and the industrial sector?

For reasons discussed below, a purely quantitative assessment of the second broad question would be exceptionally challenging and is beyond the scope of this analysis. We rely instead on a variety of sources of mostly qualitative data to reach our conclusions.

The remainder of the report is organized as follows. Section 2 reviews the literature on VAs. Section 3 presents historical and political background on Colombian VAs. Section 4 presents a brief overview of the types and timing of all 64 of Colombia's VAs. Section 5 summarizes the three publicly available previous evaluations of these VAs. Section 6 presents our six case studies. Section 7 compares and contrasts results from these cases studies and distills policy prescriptions.

2. Literature

This section briefly reviews the literature on VAs, one of the three main types of voluntary environmental regulation.[1] The literature addresses three principal questions: Why do regulators and firms participate in VAs? How do VAs differ? How have VAs performed?

2.1. Why Do Regulators and Firms Participate in VAs?

2.1.1. Regulators

The literature emphasizes 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. For example, Harrison (1999) argues that Dutch authorities relied on VAs to achieve long-term national environmental goals decreed in the late 1980s because they believed they did not have the expertise needed to write regulations specifying how industry should achieve them. The inability to use mandatory regulation is arguably the most important motive for using VAs in developing countries. For example, in the 1980s and 1990s, Mexican environmental authorities negotiated a series of VAs with the leather tanning sector because at the time, the prerequisites for mandatory policies—regulations governing liquid and hazardous waste, local regulatory institutions, municipal waste facilities, and political support for strict enforcement—were almost completely absent. Given these constraints, VAs represented a second-best means of making progress (Blackman and Sisto 2006).

A closely related motive for using VAs is to build the regulatory capacity needed for mandatory regulation. For example, the aforementioned Mexican VAs committed environmental authorities to develop new regulations, management institutions, and public waste treatment facilities (Blackman and Sisto 2006). Similarly, Portuguese regulators resorted to a VA when the country was required to improve the environmental performance of its pulp and paper sector as a condition of its accession to the European Union in 1986. A primary outcome of the VA was stronger regulatory capacity, which ultimately led to mandatory pollution control policies (Kerret and Tal 2005).

A third reason regulators turn to VAs is to reduce the transaction costs associated with regulating (Segerson and Miceli 1998). For example, Delmas and Mazurek (2004) argue that this motive underpinned Project XL, a U.S. voluntary initiative wherein the Environmental Protection

[1] The other two types of voluntary regulation are public programs (administered by regulators or third parties) that firms are invited to join, and unilateral commitments made by firms. See Rivera and de Leon (in press), Morgenstern and Pizer (2007), Khanna (2001), and Lyon and Maxwell (2002).

Agency granted regulatory flexibility to firms that could demonstrate "superior environmental performance."

A final and often-cited reason for using VAs is to boost firms' environmental performance by improving their relationships with the regulator and each other. Some literature suggests that in confrontational, enforcement-based regulatory regimes, firms often comply with the letter of the law but do not go beyond it, and in some cases they even develop a "culture of resistance." Cooperative, incentive-based regulations like VAs are said to avoid this dynamic (Bradach and Kagan 1982; Ayres and Braithwaite 1992). Finally, VAs may increase cooperation and information flows regarding environmental management among participating firms (Harrison 1999).

2.1.2. Industry

A considerable literature examines industry's motives for participation in VAs and other voluntary regulatory initiatives. The motive that has received the most attention in the literature is the threat of mandatory regulation: firms participate in VAs to preempt more stringent mandatory regulation or to soften enforcement of existing regulation (Segerson and Miceli 1998; Maxwell et al. 2000). A second reason firms participate in VAs is to take advantage of subsidies provided to participants. These may include tax breaks for environmental investments, technical assistance with pollution control and prevention, or simple information dissemination (Helby 1999). Third, firms participate in VAs to boost their sales in markets (for either final or intermediate goods) in which buyers are concerned about environmental performance (Arora and Gangopadhayay 1995). Fourth, pressures generated by communities and nongovernmental organizations create incentives for firms to participate. Such pressures are the focus of the literature on so-called informal regulation, which mostly consists of cross-sectional, plant-level econometric analyses of environmental performance in developing countries (see Blackman 2009a for a review). Finally, some literature suggests 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 Do VAs Differ?

VAs differ in four principal dimensions (Storey et al. 1997). The first is participation. By definition, VAs are signed by regulators and firms, but different permutations are possible. For example, the regulator may be at the national or subnational level and may represent various institutions (such as the ministry of the environment or the executive branch of government), and industry may be represented by a trade association or by individual firms. In addition, nongovernmental organizations, representatives of communities, international agencies, and academia may participate in some capacity. Second, the terms of the VA may be a legally binding contract or a nonbinding "gentlemen's agreement." In Europe, where VAs are most common, the terms are typically nonbinding (EEA 1997).[2] Third, some or none of the terms may be

[2] Well-known Dutch covenants are an important exception, however.

predetermined. For example, in Dutch covenants, environmental performance goals are predetermined but plans and deadlines for achieving these goals are negotiated (Harrison 1999). Finally, VAs differ in their relationship with other environmental policy instruments. For example, they may be intended to complement or substitute for a system of standards and permits, pollution charges, tradable permits, or liability rules (OECD 2003). The United Kingdom's system of linking VAs and carbon taxes is an example.

All of those distinctions are easily observed. Kerret and Tal (2005) draw a more subtle distinction between "complementary" and "capacity-building" VAs. Used in situations where regulators are relative strong, complementary VAs are meant to provide incentives for firms to overcomply with mandatory regulations. Examples are the Belgian Agreement upon the Collection and Recycling of Batteries, and the Dutch Covenant Regulating the Reduction of Sulfur Dioxide and Nitrogen Oxide Emissions by Power Generation Industry. Used in situations where regulators are relatively weak, capacity-building VAs are meant to be a transition to a mandatory regime. The Portuguese Pulp and Paper VA falls into this category, as do most VAs signed in developing countries. Kerret and Tal (2005) warn that such VAs may linger indefinitely, becoming an unintended permanent substitute for mandatory regulation.

2.3. How Have VAs Performed?

2.3.1. Evaluation Challenges

Evaluating the performance of a VA is inherently problematic, for a number of reasons (Kerret and Tal 2005; Harrison 1999; EEA 1997). First, VAs' aims may involve improving environmental performance, reducing the costs of environmental management, transitioning to mandatory regulation, or improving relations between regulators and industry. Evaluations need to take this heterogeneity into consideration. For example, it would be misleading to evaluate a VA meant to facilitate a transition to mandatory regulation solely on the basis of its impacts on environmental performance.

Another challenge is measuring the impacts. To determine whether the VA has had additionality—that is, has spurred improvements above and beyond what would have happened absent the VA—one needs to compare various measures of performance (e.g., emissions of specified pollutants, compliance with mandatory regulation, the functioning of regulatory institutions) under the VA with performance without the VA. The problem, of course, is that the business-as-usual case is never actually observed, so the evaluator needs to simulate it by, for example, examining the performance of nonparticipants or projecting trends in pre-VA performance measures.

Third, data on the environmental performance of VA participants are typically scarce, particularly in developing countries. A further complication is that many VAs do not include clear targets and deadline. Moreover, participants have strong incentives to exaggerate their accomplishments to create the appearance of compliance with their commitments.

Yet another challenge is that VAs are seldom used in isolation. Rather, they are part of a policy mix that typically involves emissions and technology standards, and sometimes economic instruments. It is difficult to disentangle the impact of each individual policy.

Finally, VAs may involve selection bias. Firms and industrial sectors that are already relatively clean often have particularly strong incentives to participate in VAs, since their costs of meeting environmental standards are relatively low. Failure to account for this effect can result in overestimating of the beneficial impact of the VA.

2.3.2. Performance Measures

Virtually all ex post evaluations of VA performance are qualitative and somewhat informal. A few comparative studies have attempted to develop a more systematic methodology. Leading examples are Kerret and Tal (2005) and the European Commission's NEAPOL project (De Clercq and Bracke 2005). Both argue that evaluations need to consider the extent to which (1) the signatories complied with the terms of the VA (including those concerning both environmental performance and the procedure such as meetings and reports); (2) the VA spurred improvements in environmental quality compared with a business-as-usual scenario; and (3) the VA improved environmental management capacity in the industrial sector, the regulatory institution, or the broader political setting.

2.3.3. Evaluations in Industrialized Countries

A considerable literature examines the performance of VAs in industrialized countries (for reviews, see EEA 1997; ten Brink 2002; OECD 2003; Croci 2005; and Morgenstern and Pizer 2007). Several themes emerge. First, evidence of clear environmental impacts 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, it is difficult to determine whether this paucity of evidence is due to the evaluation challenges discussed above—most notably lack of hard targets and reporting—or to poor performance of the VAs. 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).

Similarly, the European Environmental Agency (1997) conducted rigorous case studies of six VAs to measure the environmental impact relative to a reference year, a business-as-usual baseline, and alternative policy instruments. The VAs were chosen partly because they included reporting requirements. Yet the agency (1997, 9) concluded that "in most cases it was not possible to make a quantitative assessment of the environmental effectiveness of the agreements due to the lack of reliable monitoring data and consistent reporting."

Second, in case studies where solid evidence links a VA with significant improvements in environmental performance, a strong background threat of mandatory regulation is often, if not usually, the driver of these improvements. Lyon and Maxwell (2002) includes a German example. In 1995, the German government began to discuss the imposition of carbon taxes. In response the German Federation of Businesses, the country's overarching industrial trade association, negotiated voluntary CO_2 emissions reductions to preempt the proposed tax.[3] Similarly, de Muizon and Glachant (2004) describe the complex U.K. Climate Change Programme, which combines VAs with taxes and emissions trading. Firms in energy-intensive industrial sectors had strong incentives to join the VA to avoid the carbon taxes. Based on six extensive case studies of VAs, the European Environmental Agency (1997, 85) concluded, "Wherever environmental improvement was noted, the Environmental Agreement was accompanied by other measures or incentives."

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." Finally, in a discussion of whether the carrots or the sticks associated with voluntary initiatives motivate improved environmental performance, Harrison (1999) concludes,

> … if the donkey has its own reasons to pull the cart, ear stroking and gentle persuasion should not be problematic (although they may not add much). However, if it is not the ear stroking so much as the implied threat of the stick that is motivating the donkey, maintaining a credible threat of the stick is essential. (67)

Third, VAs tend to have more effect when they include clear, specific commitments, including well-defined performance baselines and targets, timetables, monitoring, and enforcement mechanisms. The European Environmental Agency (1997, 9) advises that if VAs are to be used more widely, "it is necessary to improve their credibility and accountability. This calls for the setting of clear targets, for greater transparency during the negotiation, implementation and evaluation of [VAs] and for introduction of reliable monitoring and reporting arrangements."

In their analysis of six European VAs, De Clercq and Bracke (2005) find that better overall performance is correlated with the inclusion of such terms in the VA (see also Krarup 2001; OECD 1999; and Hanks 2002).

However, the literature is not unanimous on the benefit of greater stringency. 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. 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.

Finally, some research suggests that VAs are more successful when the industrial sector involved is cohesive and homogeneous and has an accessible representative, such as a trade

[3] Subsequently, the tax proposal was withdrawn. Presumably the German government found the VA to be less costly than mandating carbon taxes. In practice, it is difficult to distinguish whether VAs are motivated by transaction cost savings or an inability to implement mandatory regulation, since in the latter case, almost by definition, the costs of mandatory regulation exceed those of a VA.

association. In such cases, the transaction costs of negotiating a VA are relatively low, and firms in the sector all face similar incentives (Hanks 2002; EEA 1997; Caburrgueira 2002). However, Kerret and Tal (2005) argue that such industry characteristics are not required for VAs intended to build capacity: the industry need only be "mature" and "interconnected."

2.3.4. Evaluations in Developing Countries

The nascent empirical literature on the use of VAs in developing countries highlights the importance of both regulatory pressure and regulatory capture in explaining success and failure: it suggests that such agreements are more effective in spurring improvements in environmental performance when accompanied by a credible threat of mandatory regulation, and less effective when polluters are able to block design elements aimed at holding them to environmental performance targets.

Jiménez (2007) analyzes Chile's extensive experience with sector-wide negotiated voluntary agreements, the result of a 2001 national policy aimed at improving compliance with mandatory regulation. The negotiated agreements complemented a reasonably effective mandatory regulatory system and included specific environmental performance targets, clear deadlines, third-party monitoring, sanctions for noncompliance, and pollution abatement subsidies. Jiménez uses rigorous policy evaluation ("matching") techniques along with detailed plant-level survey data to compare the environmental performance of plants that participated in voluntary agreements with similar plants that did not participate. He concludes that the voluntary agreements did in fact spur environmental performance.

Blackman and Sisto (2006) evaluate a series of four VAs between Mexican national and state regulatory authorities and trade associations representing the country's leather tanning sector. The VAs, which spanned the years 1987–2000, focused both on improving the tannery sector's environmental performance and on filling gaps in the regulatory infrastructure that precluded mandatory policies. The VAs were technically nonbinding gentlemen's agreements, although many of the commitments amounted to promises to comply with mandatory regulations, albeit confused and incomplete ones. The VAs' signatories abrogated most of their commitments, and as a result, the agreements had minimal environmental impact. Regulatory capacity did improve significantly during the period covered by the VAs, although it is not clear whether the agreements or the simple evolution of institutions and law drove these improvements.

Hu (2007) evaluates Chinese VAs with two iron and steel companies in Shandong Province. The VAs were pilot projects for a national policy adopted in 2003 that established guidelines for using VAs to promote cleaner production. The three-year VAs aimed at enhancing energy efficiency and included commitments to meet hard performance targets, establish new management systems, and issue periodic progress reports. Virtually all of the commitments were kept. Nevertheless, several factors raise doubts about whether these pilot projects can be scaled up: national government pressure, not local pressure, was the main driver of the experiment; involvement of sector associations was minimal; the two companies that participated were selected specifically on the basis of their superior environmental performance; requisite environmental performance data are scarce; and complementary environmental policies are lacking.

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

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. The legal foundation for environmental regulation was riddled with gaps. 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, 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, MMA, which has since been 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, which is meant to insulate them from interest group pressures.

As in all countries, the environmental regulatory instruments used in Colombia are primarily mandatory. The principal type is command-and-control regulation. For example, under Law 99 of 1993, any facility whose activities have the potential to significantly alter the environment must obtain a one-time environmental license, a process that involves an environmental impact assessment and public hearing. In addition, facilities that emit pollution must obtain permits, which must be renewed every few years. Both air and water polluters must meet emissions standards, and generators of hazardous wastes must adhere to technology standards. Legal mandates against specified land uses and extractive activities in designated "protected areas" are used to protect forests.

In addition to command-and-control regulation, SINA relies on economic instruments. The most important economic incentive policy is a system of charges for the use of water and other natural resources and emissions fees for discharges of water pollution (Blackman 2009b). SINA also employs liability-based environmental management tools. The Constitution and Law 99 of 1993 create three causes of action that citizens can use to ensure their constitutional right to a healthy environment.

3.2. Changing Priorities

In Colombia, as in other Latin American countries, the president has enormous influence on public policy, including environmental policy (Mance 2008). Colombia has had five presidential administrations since the approval of Law 99 of 1993, and the emphasis of environmental policies has changed with them. President Gaviria's (1990–1994) priority was the design, creation, and implementation of the new national environmental system. President Samper's government (1994–1998) continued to build the institutional capacity needed to consolidate the new environmental system (Uribe 2005). President Pastrana's administration (1998–2002) focused on the design of national parks and conservation policies. During this period, the budget allocations to the implementation and development of environmental policy began to decline. President Uribe's government (2002–present) weakened national environmental institutions and reduced environmental budgets further and deliberately relaxed the command-and-control instruments (Uribe 2005; Mance 2008).

3.3. Voluntary Agreements

One of the 14 "guiding principles" of Law 99 of 1993 is that "environmental protection is a coordinated task between the state, community, NGOs, and the private sector." In keeping with this principle, the law provides an explicit legal foundation for VAs. Article 5, Number 32 authorizes MMA to

> … establish mechanisms of agreement with the private sector to fit the sector's activities to the environmental goals of the government; define the situations where it is appropriate to execute … agreements with public or private companies concerning the adoption of technologies and mitigation or elimination of pollution; establish rules for the fulfillment of commitments derived from such agreements; promote the planning of industrial development tied to

> the adoption of environmentally friendly technologies; and take steps toward decontamination, recycling, and reuse of wastes.

The inclusion of VAs in Law 99 reflected the growing popularity of voluntary environmental management tools in the 1990s, particularly as a means of promoting cleaner production (i.e., pollution prevention and clean technological change) to complement end-of-pipe pollution control. Several specific experiences with these policies may have had an especially important influence: the 1989 Montreal Protocol, to which Colombia acceded; the 1992 Rio Conference, in which Colombia had a significant role; the expansion of the chemical industry's Responsible Care program into Latin America in the late 1980s; and the 1989 Dutch plan that gave rise to Holland's covenants system, well known in Colombia as a result of Holland's strong bilateral ties to the country (Olivero 2007; Bonilla 2007).

Following Law 99 of 1993, several official acts reinforced the government's commitment to VAs and laid the groundwork for the actual agreements. The first was the inclusion of language encouraging the use of VAs in the Samper administration's 1994–1998 National Development Plan, a document that spelled out government policy priorities for this period. The second was the Framework for Cleaner Production, a document pledging cooperation between industry and government to promote cleaner production, signed in June 1995 at a high-profile ceremony by top-level stakeholders in Colombia's environmental sector, including representatives of MMA, the CARs, nongovernment organizations, universities, and 20 of the largest industrial trade associations (C. Herrera 2007). Third, in 1996, MMA established the Clean Production Inter-Institutional Committee (COMIS), an advisory group comprising representatives from the ministry and industry, to coordinate the negotiation of VAs. Finally, in 1997, the government officially approved a policy for negotiating VAs, the National Policy for Cleaner Production (MMA 1997a) (Hanks 2002; C. Herrera 2007; Buitrago 2008; Esterling Lara 2002).

In the wake of those events, VAs proliferated rapidly. At first, the focus was large industries of critical economic importance. Eventually, however, MMA was deluged with requests for VAs from industry associations (C. Herrera 2007). As a result, the final two years of the Samper administration were the heyday of VAs in Colombia. By the end of Samper's presidency in 1998, MMA had signed more than 40 VAs.

Although VAs were included in the four-year National Development Plan of the next administration, President Pastrana was less enthusiastic about them. MMA began to push for more stringent terms, including quantified baselines and commitments, and monitoring. In addition, an economic crisis led to cuts in MMA staffing, and the ministry team devoted to negotiating and monitoring VAs was disbanded. Many existing VAs were left without MMA supervision or support. Nevertheless, CARs and AAUs negotiated VAs with local industries, using as a model the agreements signed with MMA during the Samper administration. Many, if not most, of the VAs signed during the Pastrana administration were regional and included small-scale agricultural sectors.

Under the first Uribe administration (2002–2006), which was elected on promises to improve security and economic conditions, all manner of environmental issues were deemphasized. For

example, in 2003, MMA was merged with the Ministry of Housing and the Ministry of Development to create MAVDT (Blackman et al. 2006). Nevertheless, VAs received continued support, which some have interpreted as a deliberate strategy of moving away from strict enforcement of command-and-control regulation (Uribe 2005). The Uribe administration's National Development Plan set as a goal negotiating 30 new VAs, and a major reform effort was undertaken. MAVDT commissioned a comprehensive review (Esterling Lara 2002, discussed below), which was mostly critical. In 2003, MAVDT promulgated guidelines aimed at developing a new generation of agreements with shorter time spans and more specific objectives and commitments.

The second Uribe administration (2006–2010) has continued the reform effort. A joint report by MAVDT and the Institute of Hydrology, Meteorology, and Environmental Studies (*Instituto de Hidrología, Meterología y Estudios Ambientales*, IDEAM) evaluated the experience to date with VAs and proposed a methodology for evaluation (MAVDT/IDEAM 2005). A third MAVDT-commissioned evaluation in 2006 followed; it also proposed an evaluation methodology.

4. Overview of Voluntary Agreements

Between 1995 and 2006, Colombian regulators and trade associations signed 64 VAs (Table 1) (MAVDT 2006). The VAs 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). This group includes agreements with producers of coal, oil, electricity, palm oil, and pesticides. In all cases, MMA was the leading regulatory signatory.

The second category consists of VAs signed with trade associations representing firms in a variety of economic sectors located 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 six trade associations are in Mamonal (Cartegena), Sogamoso (Boyocá), East Antioquia, Barranquilla, the Northern Valley of Aburrá, and the Southern Valley of Aburrá.

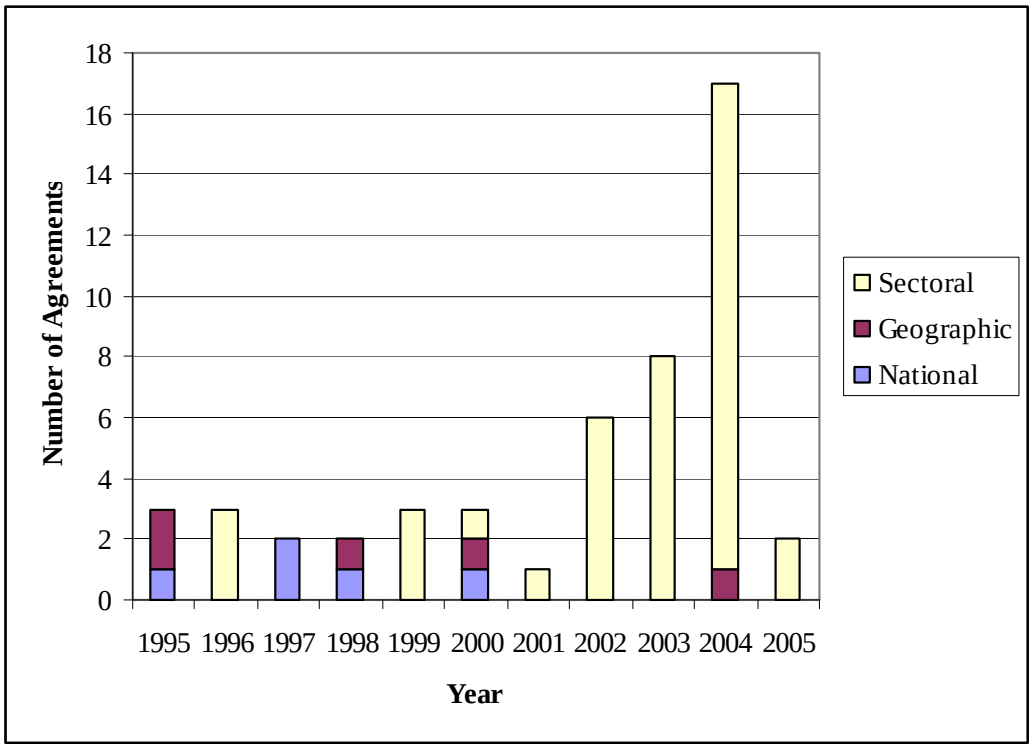
The last and largest category comprises 53 VAs signed with trade associations, each representing a specific economic sector in a defined geographic region. Although MMA signed some of these agreements, CARs and AAUs were the leading regulatory signatories in virtually all cases. With a few exceptions, most of these VAs were signed in 2000 or later. Several economic sectors signed multiple VAs in multiple geographic areas. The poultry sector signed 9 VAs, the pork industry 8, the coffee sector 5, the hemp sector 3, and the flower sector 2. Ten other agroindustrial sectors in various regions signed VAs, including rice mills, slaughterhouses, dairy farms, mushroom farms, tobacco plantations, brown sugar facilities, shrimp farms, sugar cane plantations, fish farms, and banana plantations. Three industrial sectors signed VAs: ceramics plants, tanneries, and electronics facilities. Four mining sectors signed VAs, and 9 service sectors signed them, including service stations, hotels and restaurants, coal shipping ports, a construction sector, and retail merchants.

Table 1. Colombian Voluntary Agreements Signed 1995–2006

Type	*Sector or region*	*Date*	*Case study?*
National (5)			
	Coal	1995	
	Oil	1997	yes
	Electric	1997	yes
	Palm oil	2000	yes
	Pesticides	1998	
Geographic (6)			
	Mamonal (Cartagena)	1995	yes
	Sogamoso (Boyacá)	missing	
	East Antioqia	1995	yes
	Barranquilla	1998	
	Northern Valley of Aburrá	2000	
	Southern Valley of Aburrá	2004	
Sectoral, geographic (53) *Agriculture, 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

The 1995 Framework for Cleaner Production that set the stage for the use of VAs in Colombia expressly called for VAs to be evaluated. Toward that end, MMA commissioned four reports: Esterling Lara (2002), MAVDT (2003), MAVDT/IDEAM (2005), and MAVDT (2006). The goal was to develop a method for evaluating VAs and either test it or, in the case of MAVDT (2006), apply it broadly. In each report, the evaluations have been largely negative.

5.1. Esterling Lara (2002)

The quantitative method developed by Esterling Lara (2002) is complicated but boils down to three fairly simple conceptual steps. The first is to assign each written provision of the VA a percentage weight that corresponds its importance relative to all other provisions in the VA. For example, a provision in the national coal VA that the operating committee meet once a month might be assigned a weight of 5 percent. The weights are assigned according to complex rules designed to

control for differences in the VAs' content and exposition.[4] The second step is to assign each VA provision a percentage implementation score that reflects the extent to which the provision has been successfully completed. For example, a provision in the national coal VA that the operating committee meet once a month might be assigned a score of 50 percent, indicating that half the planned meetings actually took place. Finally, for each provision, the weights are multiplied by the implementation scores and the resulting products are summed across all of the VA's provisions to arrive at a final weighted average implementation score for the entire VA. This average purports to measure the overall effectiveness of the VA. Esterling Lara applies this method to a sample of 13 VAs: all 5 national-level VAs, 4 geographic VAs, and 4 regional VAs. He derives an overall average score of 33 percent. Esterling Lara also examines qualitative and historical evidence for the 13 sample VAs.

Based on quantitative and qualitative analysis, Esterling Lara reaches several general conclusions. First, the VAs lack clear, quantifiable targets and deadlines partly because policymakers lack basic information about environmental issues and mitigation options in the economic sectors covered. As a result, the VAs are difficult to implement and evaluate. Second, the commitments in the VAs are not prioritized—another factor that tends to make them difficult to implement. Third, the VAs tend to emphasize activities aimed at expediting regulatory mandates such as environmental licensing, versus activities aimed at actually improving environmental performance. Fourth, in most cases, third-party monitoring of compliance is lacking, a gap that created incentives for industries to exaggerate their accomplishments. Fifth, the VAs typically lack concrete provisions for financing the signatories' commitments. Finally, in the national-level VAs, the role of MMA in relation to regional environmental authorities is not clear. Often, MMA has played an important role early on but has had minimal involvement thereafter, a pattern that has created perverse incentives for CARs and AAUs to minimize their roles.

To mitigate those six deficiencies, Esterling Lara proposes defining specific goals, metrics ("indicators"), and timelines; prioritizing goals; commissioning reports on the major pollution problems and abatement strategies in the covered sectors; requiring annual evaluations; and establishing intersectoral committees to share best practices and speed learning.

5.2. MAVDT (2003)

In 2003, MAVDT commissioned a second report aimed at developing a method for evaluating expired or soon-to-expire VAs signed by MAVDT so that they might be reactivated. This report is not publicly available. According to MAVDT/IDEAM (2005), although the methods and

[4] The weights are structured so that all individual provisions are placed into five broad categories, each with an aggregate weight of 20 percent: (1) instruments of planning, monitoring, and evaluation; (2) strategies for strengthening institutional and corporate capacity; (3) strategies for promoting cleaner production and ecosystem recovery; (4) instruments of environmental regulation; and (5) financial and administrative incentives. Thus, all the provisions that fall into the first category on instruments of planning monitoring and evaluation have weights that sum to 20 percent. In addition, provisions within each of these five categories are divided into three subcategories corresponding to planning, implementation, and monitoring. This complex structure presumably was intended to control for differences in how VAs are written—that is, how much language in each is devoted to different topics.

recommendations of this 2003 report were never implemented per se, many were subsumed in MAVDT/IDEAM (2005).

5.3. MAVDT/IDEAM (2005)

MAVDT/IDEAM (2005) found Esterling Lara's (2002) proposed quantitative method overly subjective because a third-party evaluator needs to make ad hoc judgments about both the relative importance of each commitment and the extent to each has been fulfilled. The report also found the method unnecessarily complex, costly, and rigid and concluded that its broad application would be impractical. In light of these deficiencies, MAVDT/IDEAM (2005) developed a new method based partly on MAVDT (2003). Although this new method is simpler than Esterling Lara's, it also relies on subjective assessments. Essentially, the operating committee of the VA, comprising representatives of the trade association, regulators, and other stakeholders, is required to answer a uniform set of quantitative and qualitative questions. The quantitative questions concern the percentage of commitments in the VA that were actually kept and their environmental impact. The qualitative questions have to do with the extent to which the sector has kept the commitments and the ways in which the VA could be improved. Commitments and activities undertaken in the VA are grouped into four broad categories: development and implementation of cleaner production, management of environmental impacts, institutional strengthening, and development and implementation of policy instruments.

MAVDT piloted this new evaluation method for a sample of 12 VAs with minimal overlap with Esterling Lara's. MAVDT did not evaluate any of the national or geographic VAs, which accounted for the lion's share of Esterling Lara's sample, and it examined only one of the same sectoral VAs. Also, 11 of its 12 sample VAs had been signed relatively recently, between August 2002 and October 2004.

Based on the results of the pilot evaluations, MAVDT/IDEAM (2005) offers several broad conclusions, many of which echo Esterling Lara's findings. First, VAs lack specific goals, deadlines, and monitoring and often focus on process (e.g., meetings of the operating committee) rather than outcomes. In many cases, the signatories have been more interested in signing the agreement for political purposes than in actually implementing it. Second, policymakers lack basic information about environmental issues and mitigation options in the covered economic sectors. As a result, the VAs are difficult to implement and evaluate and are often focused on conducting the studies needed to define these goals. Third, policymakers do not have guidelines for the development or implementation of VAs and therefore usually simply adapt previous agreements to their needs. Fourth, the VAs often involve by a wide range of stakeholders, including multiple CARs, and as a result, coordination problems arise. Finally, regulatory authorities lack expertise in cleaner production and the use of VAs.

In light of these findings, MAVDT/IDEAM (2005) offers a number of policy prescriptions. In general, reforms to VAs should aim to establish incentives to reward compliance with VAsand punish noncompliance. More specifically, it recommends that MAVDT develop clearer rules for VAs, including guidelines governing participation, implementation, local reporting, and national reporting. Furthermore, it recommends that MAVDT craft a plan to build capacity among regulators

in the use of VAs and undertake a periodic review of VA evaluations. To avoid discrediting the reputation of VAs as a policy instrument, poorly performing VAs should be shut down and the performance targets of each reactivated VA should be more stringent than those of the initial VA. The relationship between VAs and compliance with command-and-control regulations needs to be clarified so that VAs focus on moving beyond compliance. Finally, regulators should step up monitoring and enforcement of facilities that are not party to VAs to ensure that VAs do not have anticompetitive impacts.

5.4. MAVDT (2006)

MAVDT (2006) applies the method developed and piloted in MAVDT/IDEAM (2005) to a sample of 47 VAs, roughly three-quarters of all VAs that had been signed when the effort was undertaken. The bulk of the report consists of a summary of the results for each VA. The conclusion echoes the negative assessments of earlier evaluations but is more damning, given the larger sample. MAVDT (2006) finds that of the 47 VAs analyzed, only 10—just over a fifth—made significant advances in fulfilling their voluntary commitments to improve environmental performance.[5] The report attributes this poor performance to a lack of functioning operating committees, 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.

The report places special emphasis on the lack of well-functioning operating committees. In many cases, after the VA was signed, no actions were taken to form an operating committee, so most VAs do not have one. The report recommends that existing operating committees be strengthened by more clearly defining their responsibilities, assigning specific responsibilities to each member, and requiring periodic reports. The report recommends that if no operating committee has been formed within a year after the VA is signed, the VA be terminated. The report also recommends buttressing VAs with complementary regulatory instruments and policies (which are described in only general terms: stronger monitoring, technical assistance, economic and financial instruments, permanent support by MAVDT, and support of trade associations).

MAVDT (2006) concludes by citing a handful of agreements that were relatively successful: the national electricity sector VA with MMA, the sectoral cut-flower VA with CORNARE, the sectoral poultry VA with CORNARE, the geographic East Antioquia VA with CORNARE, unspecified sectoral VAs with AMVA, and sectoral mining agreements with Corpoboyacá.

[5] Literally, the report states that only 10 VAs "presented a consolidated report of actions intended to fulfill their obligations to improve environmental performance."

6. Case Studies

Each of our case studies covers six topics: (1) background on the sector and/geographic area covered in the VA; (2) the principal pollution and natural resource problems addressed by the VA and the responsible regulatory institutions; (3) the content of the VA; (4) the main advances in environmental management and performance in both the public sector and the private sector after the VA was signed, including those that may not have resulted from the VA; (5) industry's motives for participation in the VA and for improving its environmental performance; and (6) regulators' motives for participation in the VA. We preface the case studies with a brief discussion of the generic content of the VAs and the method we use to evaluate compliance.

6.1. Generic Content of the Voluntary Agreements

To avoid redundancy, it is helpful to describe the content of all six VAs because five of them were modeled after the sixth (the Mamonal Foundation VA), the first national VA, and therefore all use the same basic framework, include many of the same provisions, and often have same exact same language. As noted above, the majority of the provisions in the VAs are general and noncommittal.

Tables A1–A6 in the Appendix list the provisions of each of the six VAs. What follows is a brief summary of the topics and provisions common to all or virtually all of them. In the following subsections, we highlight provisions that are unique to each. Averaging roughly 15 pages, the VAs all contain the following seven sections:

- Actors. This section presents a list of the parties that signed the VA and, in several cases, a list of "supporting" institutions and individuals.
- Considerations. This section describes the legal and regulatory underpinnings of the VA (discussed in Section 3 above).
- Objective. In each case, the stated objective is a slight variation on the following language, which was included in the 1995 Mamonal VA:

> … 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 …

- Scope. This section presents a general discussion of the nonbinding nature of the VA, the signatories' responsibilities, and the VA's relation to other regulatory requirements.
- Commitments. In each case, this section accounts for the bulk of the VA. Below, we summarize the general commitments included in all six VAs.
- Operating committee. This section includes a list of the organizations to be represented in the operating committee, and of the committee's responsibilities. The latter typically include overseeing implementation of the VA; monitoring, evaluating, and reporting progress;

developing specific projects and policies to implement general commitments; and serving as a repository for information and data.

- Duration. In each case, the VA lasts 10 years.

The "commitments" in the VA are organized into the following 10 sections in all but one VA. Several VAs include 1 or 2 additional sections. The parties commit to the following:

- Environmental diagnosis
    - conduct a study of environmental problems in the relevant sector and/or region, or validate an already-completed study;
    - in some cases, conduct a complementary study of a specific problem (for example, of hazardous wastes in the electricity sector) or a study meant to provide a baseline for quantitative commitments; and
    - update the diagnosis during the course of the VA.
- Institutional strengthening
    - create an environmental management department in the signatory trade association and/or individual firms;
    - promote the adoption of environmental codes of conduct and environmental management systems in the signatory firms; and
    - develop capacity-building programs and projects for professional staff of regulatory institutions and/or signatory firms.
- Production processes
    - promote the development, domestic and international transfer, and adoption of pollution prevention techniques, including cleaner technologies, cleaner energy sources, and the recycling and reuse of residuals and discharges;
    - promote increased use of pollution control devices;
    - promote water conservation; and
    - develop contingency plans for environmental risks.
- Legal and technical norms
    - comply with specified norms in a specified time period;
    - obtain all requisite licenses and permits;
    - substitute out of fuel sources that are prohibited by law;
    - use only licensed providers and transporters of production inputs;
    - respect compliance plans already negotiated with the regulator; and
    - facilitate private sector input into the design and implementation of new regulations and the revision of old ones.

- Education and research
    - establish an annual agenda for capacity building among private firms;
    - promote interactions with, and relevant research at, local universities;
    - participate in an annual "ecology week" educational event;
    - promote educational programs and projects in local communities; and
    - establish or strengthen local clean technology centers.
- International cooperation
    - promote the exchange of information with international institutions and firms.
- Financing
    - create economic incentives for firms to adopt cleaner technologies;
    - promote lines of credit to facilitate the adoption of clean technologies; and
    - identify sources of finance for the activities in the VA.
- Monitoring and evaluation
    - formulate and implement mechanisms to monitor and evaluate environmental performance;
- Special management zones
    - take into consideration floodplains and other high-risk zones in land-use decisions; and
    - develop programs and projects to recover rivers and riverbanks and develop recreational areas.

6.2. Measuring Compliance

The third columns in Tables A1–A6 indicate the compliance status for each provision of the VA: yes, partial, no, unclear. Tables 2–8 below provide summaries, including the compliance status for the "special" (nongeneric) commitments in each VA, for generic commitments, and for all commitments. Although these summary statistics provide a measure of overall compliance, two caveats are in order. First, as for most VAs worldwide (see Section 2), many of the commitments in our six 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 of the commitments in the cut-flower VA require signatories to comply with written pollution control regulation within a specified time period while others simply require them to "promote" community education. The former is (arguably) more important than the latter. Unfortunately, as MAVDT criticism of Esterling Lara (2002) demonstrated, efforts to control for these factors

inevitably entail ad hoc judgments and a loss of transparency. We have opted for simplicity and transparency.

6.3. Cut-Flower Sector

6.3.1. Background

After Holland, Colombia is the world's leading producer of cut flowers. Colombian growers generate roughly $900 million in annual revenues and employ 100,000 workers on 7,000 hectares of land. Virtually all Colombian flowers are exported. Over five-sixths are sold in the United States and the rest in Europe and Japan. About 18 percent of Colombia's crop is grown on farms in and around Medellín—the geographic area covered by the VA discussed in this section—and virtually all of the rest is grown in Bogotá. Collectively, Medellín's 400 flower farms occupy roughly 1,500 hectares (Isaza 2007).

ASOCOLFLORES is the national trade association representing Colombia's cut-flower exporting sector. Nationally, ASOCOLFLORES represents about a fifth of all growers and about half of the country's total annual sales. Members are mainly owners of relatively large farms. In Medellín, where flower farms tend to be small, only about 1 in every 17 growers belongs to ASOCOLFLORES (Isaza 2007).

6.3.2. Environmental Issues

The three main environmental problems associated with flower growing in Colombia are agrochemical pollution, water use, and hazardous wastes. Historically, floriculture has relied heavily on chemical fertilizers, pesticides, and fungicides, which contribute to workers' health problems and surface water and groundwater contamination. Floriculture is also water intensive, although water scarcity is a far less serious problem in Medellín than in Bogotá. The principal hazardous wastes are crop residues and packaging material tainted with agrochemicals. (Isaza 2007; ASOCOLFLORES et al. 2003)

The regional environmental regulatory authority with jurisdiction over Medellín's flower farms is CORNARE. It is widely viewed as among the most capable and innovative CARs. It has a reputation for preferring cooperative (versus confrontational) interactions with polluting facilities (Blackman et al. 2006).

6.3.3. The Voluntary Agreement

The Antioquia cut-flower VA was signed December 4, 1996, by representatives of CONARE, the Antioquia branch of ASOCOLFLORES, and 44 Medellín growers who were members of the trade association. Constituting just a fraction of all Medellín growers, the signatories represented relatively large and technically advanced farms (Parra 2007). A variety of other organizations, including MMA, the national office of ASOCOLFLORES, and the state of Antioquia signed as "validating," "supporting," or "controlling" entities. The VA established an operating committee comprising representatives of CORNARE (2), ASOCOLFLORES-Antioquia (4), a flower exporter not affiliated with ASOCOLFLORES (1), and a grower selling to the domestic market (1). The VA had the

generic organization and provisions detailed in Section 6.1. Unusual and more specific commitments included the following (CORNARE et al. 1996):

- Environmental diagnosis
    - use the environmental diagnosis to develop quantitative indicators within a year of signing the VA.
- Institutional strengthening
    - create an environmental protection fund from contributions by signatory growers.
- Production processes
    - develop a sector-wide integrated plan for air, water, and solid waste pollution within 10 months.
- Legal and technical norms
    - achieve compliance with the environmental regulations according to the following schedule: air pollution standards within one year; water effluent combined loads standards (for biological oxygen demand, chemical oxygen demand, and suspended solids) within two years; heavy metal standards within two and one-half years; and
    - obtain all environmental licensing and permitting requirements within six months.

6.3.4. Compliance and Advances Since the Voluntary Agreement

Table A1 in the Appendix details signatories' compliance with each commitment in the cut-flower VA, and Table 2 provides a summary. Of the five special commitments, 80 percent were kept, and of the 28 generic commitments, 57 percent were kept. Of all 33 commitments, 61 percent were kept.

In total, we can be fairly certain that more than a fifth of the commitments of the cut-flower VA 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 of the commitments were kept, including six that were relatively important (Parra 2007, 2008; Aristizabal 2007). First, the environmental fund—one of five commitments unique to this VA—was established. Called the Environmental Management Fund (*Fondo de Gestion Ambiental*, FOGA), it collected roughly US$60,000 per year from members, along with "matching funds" from government. Second, environmental indicators were developed for volumes of solid waste generated and water consumed, and for biological oxygen demand in wastewater emissions. Third, a sector-wide pollution control plan was developed and implemented. Fourth, signatories obtained requisite environmental regulatory permits. Fifth, with FOGA funding, participants organized roughly 10 workshops per year on different environmental issues as well as

a yearly sectoral public relations event called Expoflora. Finally, a mechanism for monitoring compliance and promoting environmental management was developed and implemented. 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 two-person team has checked farms' environmental performance and provided technical assistance for improvements. The results from these inspections are publicly disclosed.

Table 2. Compliance with Cut-Flower Voluntary Agreement: Number and Percentage of Commitments Kept, by Type

Type	*Number*	*Percentage*
Special commitments		
Yes	4	80
Partial	1	20
No	0	0
Unclear	0	0
Total	5	100
Generic commitments		
Yes	16	57
Partial	1	4
No	7	25
Unclear	4	14
Total	28	100
All commitments		
Yes	20	61
Partial	2	6
No	7	21
Unclear	4	12
Total	33	100

Source: See Appendix Table A1.

Certain environmental 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 in 2003 (ASOCOLFLORES et al. 2003) Membership in the VA increased by 12 farms (19 farms joined and 11 quit or were expelled for poor performance) (Giraldo 2007). The FOGA environmental fund financed a solid waste incinerator and recycling center (Isaza 2007; Aristizabal 2007). Finally, approximately 10 participating companies obtained ISO 14001 certification during the term of the VA (Parra 2008).

6.3.5. Drivers for Industry

Facilitating regulation. ASOCOLFLORES-Antioquia saw participation in a VA as a means of lowering regulatory costs and risks. The Medellín flower sector was growing rapidly in the early and mid-1990s. During this time, the total number of flower farms increased fourfold (Isaza 2007). This rapid growth created regulatory bottlenecks that flower growers hoped could be mitigated by negotiating a VA with CORNARE. Perhaps most important, Law 99 of 1993 had mandated environmental licensing for all new polluting facilities, including flower farms. Three years later, licensing procedures—particularly requirements for environmental impact assessments—were still poorly defined. A second bottleneck concerned municipal land-use planning. To minimize transportation costs, Medellín's flower farms have located close to the municipal airport in a periurban area where zoning and land tax issues are important. Flower growers saw the VA as a means of clarifying, simplifying, and expediting environmental licenses and initiating a dialogue with CORNARE regarding land-use planning (Parra 2007; Aristizabal 2007). They considered a VA a more effective mechanism for achieving these ends than direct negotiations between ASOCOLFLORES and CORNARE because only 1 of the 17 growers in Medellín belonged to the trade association (Isaza 2007).

Market pressure. The VA with CORNARE was also at least partly motivated by a desire to improve the perception 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. Some countries—notably Germany—initiated schemes to certify that flower suppliers met environmental and health safety standards.[6] The Colombian flower sector received adverse publicity during this period. A particular concern was exposure of female workers to pesticides.[7] In 1996, ASOCOLFLORES responded by creating a voluntary certification program of its own, called Flor Verde, in cooperation with SGS, a Swiss social accountability auditing firm. 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 in the program (Isaza 2007). ASOCOLFLORES-Antioquia management saw the VA as a mechanism to expand participation in the Flor Verde program in Antioquia (Isaza 2007).

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 improved significantly in the late 1990s (Isaza 2007).

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[6] The Flower Label Program (FLP), http://www.fairflowers.de/.

[7] According to the ASOCOLFLORES environmental affairs director, this growing concern about environmental issues and health and safety was the direct result of a campaign by European flower producers to cut into Colombia's fast-growing market share (Isaza 2007).

6.3.6. 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 just after licensing requirements were legislated and 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

Commercial palm oil production in Colombia began in the 1940s and expanded dramatically after 1960. Today, Colombia is the world's fifth-largest producer of palm oil, responsible for 2 percent of global output (Rodriquez-Becerra and Van Hoof 2005). About 40 percent of Colombian production is exported (FEDEPALMA 2008). Seventy percent of the exported oil goes to Europe (Great Britain, Spain, and Germany) and the remainder to Latin America (Morzorra 2007; Mesa 2007).

In 2004, 243,00 hectares in Colombia was planted in oil palm. The vast majority of the crop is grown in four regions. Thirty-three percent is produced in the Caribbean coastal plain, 31 percent in the eastern savannas, 25 percent in the inter-Andean valleys, and 13 percent in the southern alluvial valleys of the Pacific coast. Of the 51 mills in these growing areas that process raw fruit into oil, 21 are considered large, with a processing capacity of more than 25 tons of fruit per hour. In 1999, the year of the most recent palm oil census, the sector employed 10,000 permanent workers and another 16,000 temporary workers and generated gross revenues of 454 million pesos (FEDEPALMA 2008).

The Colombian Association of Palm Oil Producers (*Federación Nacional de Cultivadores de Palma de Aceite*, FEDEPALMA), is the national trade association representing palm oil growers and processors. Nationally, FEDEPALMA represents 35 of the country's 51 processing mills as well as growers that collectively manage half of the area planted in palm oil. The mills and growers that belong to FEDEPALMA tend to be large. Like other agroindustry trade associations, FEDEPALMA provides technical assistance in production, processing, environmental management, and marketing. CENEPALMA, an affiliated research institute, provides scientific research (Morzorra 2007; Mesa 2007).

6.4.2. Environmental Issues

Palm oil growing and processing in Colombia have several adverse environmental impacts. Growing sometimes entails deforestation. According to FEDEPALMA, however, this problem is relatively minor because more than 80 percent of the oil palm in Colombia was planted on land that

had already been cleared for cattle ranching or row crops. Palm oil growing is also associated with water pollution and soil contamination from fertilizers and pesticides, air pollution from the burning of crop residues, and depletion of the water supply in areas where the plantations are irrigated. Palm oil processing mills are a notorious source of organic water pollution and solid waste. Boilers in the mills also generate 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.

6.4.3. The Voluntary Agreement

In December 1997, FEDEPALMA, along with all palm oil firms with both growing and processing facilities, signed a VA with MMA and with regional environmental authorities for the principal oil palm areas, including 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 (FEDEPALMA 1997). All of the 51 palm oil firms with mills participated in the agreement, including 16 that were not members of FEDEPALMA. In total, these firms represent more than 90 percent of extraction and processing capacity (Morzorra 2008). The growers that did not participate in the VA were mainly small in scale.

The VA established an operating committee comprising representatives of MMA (1), Ministry of Agriculture (1), regional environmental authorities that signed the VA (5), FEDEPALMA (1), and palm oil companies (4). The VA had the generic organization and provisions detailed in Section 6.1. Unusual and more specific commitments included the following (FEDEPALMA 1997):

- Environmental diagnosis
    - develop a set of quantitative indicators of environmental performance based on the environmental diagnosis, within one year of signing the VA.
- Institutional strengthening
    - create a network to strengthen environmental laboratories in the covered regions within one year.
- Legal and technical norms
    - quantify the emissions of firms and farms within one year; and
    - comply with environmental regulations applicable to 51 processing plants according to the following schedule: 50 percent by 1998, 75 percent by 1999, and 100 percent by 2000, where percentages refer to difference between the baseline level of emissions in sectoral diagnosis and the legal emissions standard.
- Education and research
    - establish centers for information about cleaner production; and
    - promote research on integrated pest management.

- Financing
    - reduce taxes on imported equipment that contributes to cleaner production.

In addition, in a separate section of the VA devoted to terms of reference and ecosystems, the signatories committed to

- develop written terms of reference for impact assessments and management plans needed for environmental licensing; and
- develop plans for forest restoration.

6.4.4. Compliance and Advances Since the Voluntary Agreement

Table A2 in the Appendix details signatories' compliance with each commitment in the palm oil VA, and Table 3 provides a summary. Of the nine special commitments, 33 percent were kept, and of the 28 generic commitments, 46 percent were kept. Of all 37 commitments, 43 percent were kept.

Table 3. Compliance with Palm Oil Voluntary Agreement: Number and Percentage of Commitments Kept, by Type

Type	*Number*	*Percentage*
Special commitments		
Yes	3	33
Partial	2	22
No	4	44
Unclear	0	0
Total	9	100
Generic commitments		
Yes	13	46
Partial	3	11
No	6	21
Unclear	6	21
Total	28	100
All commitments		
Yes	16	43
Partial	5	14
No	10	27
Unclear	6	16
Total	37	100

Source: See Appendix Table A2.

In total, we can be fairly certain that 27 percent of all the commitments of the palm oil VA were abrogated. They included 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 of the major environmental problems in the sector 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 51 processing plants have an environmental management plan. Finally, CENIPALMA developed a research 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 treat their wastewater grew from 20 percent in 1997 to 100 percent in 2007 (Rodriguez-Becerra and Van Hoof 2005; Morzorra 2007; Mesa 2007). A significant proportion of mills adopted recycling and pollution prevention techniques virtually absent in the sector in 1997. 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 it as fuel burning agricultural residues in boilers (62 percent), and burning agricultural residues in boilers. Also, all 51 processing 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)

6.4.5. Drivers for Industry

It was FEDEPALMA, not MMA, that initiated a discussion about a VA in the palm oil sector. Its motive was to fend off "attacks" on the sector from a variety of actors, including 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. As noted above, palm oil production in Colombia is geographically dispersed, and the growing regions fall under the jurisdiction of several different CARs. In the mid-1990s, national guidelines for implementing new regulatory requirements in specific sectors had yet to be developed, and enforcement practices varied markedly across these CARs. FEDEPALMA saw this situation as inefficient, if not untenable, particularly for large firms with facilities in different jurisdictions. Second, FEDEPALMA was concerned that as the largest and most visible polluters in rural areas, palm oil plantations and mills 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 members when enforcement actions were taken, and preventing blatant rent seeking (Morzorra 2007; Mesa 2007).

Community pressure. FEDEPALMA also saw a VA as a means of managing pressures for improved environmental performance applied by local communities. For example, shrimp farmers and fishermen lodged complaints against palm oil mills, asserting that their wastewater emissions were damaging their livelihoods (Morzorra 2007; Mesa 2007; M. Herrera 2007).

Market pressure. FEDEPALMA saw a VA as a means of managing pressures for improved environmental performance applied by international markets. During the 1980s and 1990s, consumers evidenced increasing concern about health and environmental attributes of palm oil. According to FEDEPALMA, this was partly due to a successful international campaign by the American soybean lobby to convince consumers that tropical oils were unhealthy. FEDEPALMA saw a VA was a means of improving the Colombian palm oil sector's image in the international marketplace (Morzorra 2007; Mesa 2007; M. Herrera 2007).

Technological change. As noted above, FEDEPALMA funds scientific research on palm oil through CENEPALMA, including new methods and applications for improved environmental management. According to FEDEPALMA, this research generated innovations that growers and mills adopted as cost-saving measures, including the use wastewater for irrigation, and the burning of agricultural refuse in boilers (Rodriguez-Becerra and Van Hoof 2005).

6.4.6. Drivers for Regulators

Example setting. Although MMA did not initiate the palm oil VA (Mesa 2007; Homez 2009), it had strong incentives to sign the agreement (Homez 2009). Palm oil was both an important economic sector and a highly visible contributor to water pollution: at the time the VA was signed, very few palm oil processing plants were treating their wastewater. Moreover, in 1995, MMA had signed an agreement with the Agricultural Society of Colombia (Sociedad de Agricultures de Colombia, SAC), Colombia's 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. Over three-quarters this capacity is in hydroelectric plants (most of which are large-scale), and virtually all of the remainder is in coal- and gas-fired thermal plants. Until the 1990s, the sector was largely government owned and operated. Its current structure reflects a sweeping 1994 reform aimed encouraging private investment and competition to prevent a reoccurrence of the electricity shortages in 1992 and 1993, which were precipitated by an El Niño-related drought. Laws 142 (the Law of Public Services) and 143 (the Electricity Law) of 1994 unbundled generation, transmission, and distribution and allowed for private investment in each subsector. This restructuring spurred significant new private investment in generation (mainly large thermal plants), transmission, and distribution (Uribe and Medina 2004; WWF 2007).

6.5.2. Environmental Issues

The principal environmental impacts associated with electricity generation are air pollution, hazardous and solid waste from thermal plants, land-use change, water consumption, and disruption of ecosystem services associated with large hydroelectric generation (EIA 1995). Although Law 99 of 1993 assigns to regional environmental authorities the responsibility for licensing almost all facilities, it gives MMA responsibility for licensing those that have "national impacts," including transportation infrastructure (such as seaports and airports) and electricity-generating plants (Law 99 Art. 52). Responsibilities for monitoring and enforcement of generation and transmission facilities are split between MMA and regional environmental authorities, depending on the facility size.[8]

6.5.3. The Voluntary Agreement

The electricity sector 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 generation enterprises, and all of which were transitioning from public to private control (MMA 1997b). The firms were not represented by a trade association. Rather, they signed the VA individually. The VA established an operating committee comprising representatives of MMA (2), the Ministry of Energy and Mines (2), private companies that signed the VA (4), and regional environmental authorities (3). The VA had the generic organization and provisions detailed in Section 6.1. Unusual and more specific commitments included the following:

- Environmental diagnosis
    - conduct an inventory, inspection, and evaluation of hazardous wastes associated with the electricity sector.
- Institutional strengthening
    - establish three pilot projects to test the applicability of self-regulation schemes, such as ISO 14001.
- Legal and technical norms
    - set voluntary quantitative goals for pollution, recycling, and optimal use of resources based on baseline information in the environmental diagnosis; and
    - define criteria for land-use planning.
- Education and research
    - promote applied research on renewable energy;
    - promote environmental management on small farms in the Bogotá corridor; and
    - develop a research project on hazardous wastes in the electricity sector, with particular focus on PCBs.

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

- Financing
    - promote a means of rewarding firms in the sector that present clear advances in environmental management.
- Monitoring and evaluation
    - develop a database on the electricity sector.
- Special management zones
    - define priority ecosystems to be considered in plans to expand the electricity sector.

In addition, in a section of the VA devoted to terms of reference, the signatories committed to

- develop written terms of reference for impact assessments and management plans needed for environmental licensing; and
- publish environmental guides for each of the activities in the sector by the first semester of 1998.

6.5.4. Compliance and Advances Since the Voluntary Agreement

Table A3 in the Appendix details signatories' compliance with each commitment in the electricity VA, and Table 4 provides a summary. Of the 12 special commitments, 42 percent were kept, and of the 28 generic commitments, only 21 percent were kept. Of all 40 commitments, just 28 percent were kept.

In total, fully 53 percent of all the commitments of the electricity 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. 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. Signatories also failed to establish ISO 14001 certification 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 management of PCBs. Finally, according to MMA interviewees, the VA facilitated significant private sector input in the design and implementation of regulation.

Table 4. Compliance with Electricity Voluntary Agreement: Number and Percentage of Commitments Kept, by Type

Type	*Number*	*Percentage*
Special commitments		
Yes	5	42
Partial	2	17
No	5	42
Unclear	0	0
Total	12	100
Generic commitments		
Yes	6	21
Partial	1	4
No	16	57
Unclear	5	18
Total	28	100
All commitments		
Yes	11	28
Partial	3	8
No	21	53
Unclear	5	13
Total	40	100

Source: See Appendix Table A3.

Some environmental advances in the sector coincided with, and may have been spurred by, the VA. The number of plants adopting 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—including publishing environmental guides, analyzing hazardous waste, adopting environmental management systems, and installing bird deflectors—were relatively minor. Moreover, although the VA probably expedited these improvements, they probably would have happened regardless because of increased participation in the electricity sector by multinational corporations with relatively stringent corporate environmental management standards, 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).

The electricity sector VA expired in 2007 and is not likely to be replaced by a new agreement. In November 2007, MAVDT and the Ministry of Mining signed an agenda to improve environmental performance of the electricity sector. However, no private companies or trade associations signed this agenda (MAVDT/MME 2007).

6.5.5. Drivers for Industry

Facilitating regulation. As discussed above, Law 99 of 1993 established far-reaching new regulatory requirements, often without providing specific guidance on how they were to be implemented. In the mid-1990s, this problem was particularly pressing in the Colombian electricity sector. Dozens of new plants and several major transmission projects were being built following the sectoral reform that legalized private investment to prevent electricity shortages. Law 99 of 1993 required the new facilities both to submit project development plans to MMA and to conduct environmental impact assessments as a condition of licensing. Furthermore, it required existing facilities to submit environmental management plans to MMA as a condition of retaining their licenses. Yet terms of reference for electricity sector environmental management plans and impact 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 environmental licensing, by helping shape new rules and regulations and establishing good relations with regulatory institutions. This was especially true for the multinational companies investing in the Colombian power sector for the first time after the 1994 privatization (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 and had built the links needed for joint action on environmental issues. Hence, the sector's marginal costs of meeting the commitments in a VA were relatively low. The electricity sector's relatively 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. 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, CASEC), which developed a series of sectoral environmental management guidelines. By the mid-1990s, the electricity sector had developed a reputation as a environmental leader in Colombia (Concha 2007; Bonilla 2007).

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 the Spain and the United States—inevitably met opposition, some of which grew from fears that private owners would deemphasize environmental management. Investors saw the VA as a means of signaling their intention to maintain solid 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).

6.5.6. Drivers for Regulators

Facilitating regulation. MMA had particularly strong incentives to expedite environmental regulation in the electricity sector. First, it did not want to be seen as creating a bottleneck in new investments that might undermine the larger policy effort 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 directly responsible for monitoring and enforcement of command-and-control regulations in the electricity sector. However, in the mid-1990s, the ministry 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

Located in a mountain range about 50 kilometers from the city of Medellín, the eastern part of the state of Antioquia was targeted for regional development during the 1980s. Toward that end, national and local authorities helped to establish a regional trade association called East Antioquia Business Corporation (*Corporacion Empresarial Oriente Antioqueño*, CEO) (CORNARE 2008; Ortiz 2007; CEO 2008). Today, roughly 70 of the region's leading companies (roughly 10 percent of the total population) belong to CEO. They are drawn from a variety of sectors, including food, timber, pulp and paper, chemicals, textiles, services, and flowers. CEO serves as a mechanism for collaboration with government institutions, a long-standing theme of the political economy of the state of Antioquia. CEO's main activities are conducting training, providing technical assistance, fostering community development, promoting environmental management, and enhancing security (Ortiz 2007; Parra 2007; Tamayo 2007).

6.6.2. Environmental Issues

The principal environmental issues in the region are related to manufacturing, primarily solid waste disposal, water pollution, and air pollution. Water use is also an important environmental issue. Food, textile, and paper industries are the main sources of water pollution, and chemical plants and wood treatment facilities are leading generators of toxic waste. Mining for cement manufacturing is also is blamed for soil erosion (Ortiz 2007; Tamayo 2007).

CORNARE is the regional environmental authority with jurisdiction over East Antioquia. It is widely viewed as among the most capable and innovative CARs and has a reputation for preferring cooperative (versus confrontational) interactions with polluting facilities (Blackman et al. 2006). It was founded in 1983, 10 years before Law 99 created the majority of the Colombia's CARs.

6.6.3. The Voluntary Agreement

In December 1995, CORNARE, along with MMA, signed a VA with CEO (CORNARE et al. 1995). It was the second VA signed in Colombia (Table 1) and has served as a model for many subsequent agreements (Tamayo 2007). Thirty of the 70 companies in CEO signed the agreement individually.

CORNARE, a member of CEO, approached CEO with an offer to negotiate the VA and took the lead. MMA's role was to provide political support (Ortiz 2008a). The VA established an operating committee comprising representatives of MMA (1), CEO (4), and CORNARE (2). The VA had the generic organization and provisions detailed in Section 6.1. Unusual and more specific commitments included the following (CORNARE et al. 1995):

- Environmental diagnosis
    - define commitments under the present VA based on environmental diagnosis.
- Institutional strengthening
    - create an "environmental topics committee" in which all affiliated businesses will participate by the first trimester of 1996; and
    - reform trade association statutes to require companies joining the trade association to comply with the commitments in the VA.
- Production processes
    - establish a clean technology information clearinghouse; and
    - develop a plan for solid waste management, recycling, and reuse by the first semester of 1996.
- Legal and technical norms
    - comply with environmental regulations according to the following schedule: 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 within 5 years, and 100 percent reduction within 10 years; and compliance with environmental permits governing soil erosion within six months; and
    - establish a network of air monitoring stations and a center for atmospheric monitoring, to support development of control strategies.
- Education and research
    - create a Foundation for the Investigation of Environmental Sciences and Technologies.

6.6.4. Compliance and Advances Since the Voluntary Agreement

Table A4 in the Appendix details signatories' compliance with each commitment in the East Antioquia VA, and Table 5 provides a summary. Of the eight special commitments, 38 percent were kept, and of the 28 generic commitments, 39 percent were kept. Of all 36 commitments, 39 percent were kept.

In total, we can be fairly certain that 36 percent of all the commitments of the East Antioquia VA 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 a study diagnosing and evaluating environmental problems among signatory firms and proposing potential solutions; 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 regional network of air quality monitoring stations; developing quarterly capacity-building workshops for staff of regulatory institutions and signatory firms; and creating an environmental committee with participation by all 30 signatories (MAVDT 2005, 2006; Ortiz 2007, 2008a, 2008b; Parra 2007, 2008).

Table 5. Compliance with East Antioquia Voluntary Agreement: Number and Percentage of Commitments Kept, by Type

Type	*Number*	*Percentage*
Special commitments		
Yes	3	38
Partial	1	13
No	2	25
Unclear	2	25
Total	8	100
Generic commitments		
Yes	11	39
Partial	2	7
No	11	39
Unclear	4	14
Total	28	100
All commitments		
Yes	14	39
Partial	3	8
No	13	36
Unclear	6	17
Total	36	100

Source: See Appendix Table A4.

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

Several environmental advances in East Antioquia coincided with, and may have been spurred by, the VA. Biological oxygen demand (BOD) in the Rio Negro River fell 57 percent between 1993

and 2002, and total suspended solids (TSS) fell 74 percent (CORNARE 2005). Airborne particular matter smaller than 10 microns (PM10) in the municipality of San Nicolas fell 14 percent between 1998 and 2004 (CEO 2005a, 2005b). Hazardous waste indicators have not been developed (Ortiz 2007).

In January 2007, CORNARE, CEO, and 22 CEO members signed a new five-year VA (CORNARE et al. 2007). Themes included expanding ISO 14001 certification, reducing climate change impacts and carbon footprints, and developing new toxic waste management regulation.

6.6.5. Drivers for Industry

Emissions fees. Colombia's national wastewater discharge emissions fee program began in 1997, two years after the VA with CEO was signed. Implementation of the program was quite uneven. As one of the strongest CARs, CORNARE led the country in program implementation. It was the first CAR to complete all the processes needed to set up the program, including conducting baseline studies and setting watershed-specific goals for reducing emissions, and the first to begin invoicing for discharge fees in 1997 (Blackman 2009b). According to CORNARE, the discharge fee program led to reductions in BOD and TSS 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), a clean production technical assistance and training institute, was established in 1998, three years after CORNARE signed the East Antioquia VA. CNPML is hired by regional environmental authorities and private companies to provide technical assistance. It 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).

6.6.6. Drivers for Regulators

Cooperative relationship with industry. As noted above, CORNARE was established 10 years before Law 99 of 1993. Unlike some other CARs, it has pursued a strategy of cooperating with industry (Parra 2007; Tamayo 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). It is likely to have been one among several reasons that CORNARE sought to negotiate a VA.

6.7. Oil Sector

6.7.1. Background

Oil exploration, drilling, refining, and distribution are economically important in Colombia. The country has proven reserves of 1.45 billion barrels and produces more than 500,000 barrels of oil per day, half of which is exported. Oil exports generate more than a quarter of Colombian export earnings. Oil-related activities are split between the public and private ownership. The most important public sector players have been ECOPETROL, a state oil exploration, refining, and

distribution company that was privatized in 2007, and the National Oil Agency (*Agencia Nacional de Hidrocarburos*, ANH), which took over some of ECOPETROL's responsibilities in 2003. These entities have encouraged foreign investment, particularly in oil exploration, to boost supply. More than 70 private companies are involved in oil exploration and another 50 focus on other services. ECOPETROL has retained a monopoly on refining and owns the five refineries, the largest of which are in Barancabermeja and in the Mamonal zone outside Cartagena. The country has five major oil pipelines, more than three-quarters of which are owned in full or in part by ECOPETROL (EIA 2008; UPME 2006).

6.7.2. Environmental Issues

A host of environmental issues arise in different phases of Colombian oil production. Oil exploration, drilling, and distribution are associated with surface and groundwater contamination due to improper disposal of sludge and domestic wastes, and building access roads causes deforestation. These problems are exacerbated by the location of the bulk of Colombia's crude oil production in the highly biodiverse foothills of the Andes and eastern Amazon jungles. The targeting of oil distribution pipelines by guerrilla forces (including 71 incidents in 1999 alone) has had serious environmental impacts. Finally, refineries are notoriously dirty: they generate air pollution, water pollution, and hazardous waste. Toxic discharges from Barancabermeja refinery into the Magdalena River (which flows through Cartegena) have been a particular problem (UPME 2006; IDEAM 2001; MMA 1999c).

Several institutions are involved in regulating the oil sector. MMA is responsible for environmental licensing for oil exploration, drilling, transportation, storage, and shipment. Regional environmental authorities are responsible for enforcing water, air, and waste management regulations within their jurisdictions. At the federal level, the Planning Unit for Mining and Energy Affairs in the Ministry of Mines, ECOPETROL and ANH (since 2003) are responsible for sectoral planning and development policies, which often affect environmental regulation (MMA et al. 1999; MMA 1999d).

6.7.3. The Voluntary Agreement

The oil VA was signed March 4, 1997, by the Ministry of Environmental Affairs, the Ministry of Mining and Energy (*Ministerio de Minas y Energía*, MME), ECOPETROL, and the Colombian Association of Oil Companies (*Asociacion Colombiano del Petroleo*, ACP). The VA established an operating committee comprising representatives of MMA (2), Ministry of Mining and Energy (2), ECOPETROL (2), ACP (2), and regional environmental authorities from the principal oil exploration and drilling regions (3) (MMA 1997c). The VA had the generic organization and provisions detailed in Section 6.1. Unusual and more specific commitments included the following:

- Production processes
    - promote field trials of pollution prevention alternatives through the Colombian Oil Research Center.

- Education and research
    - establish an environmental information system for the oil sector within eight months of signing the VA; and
    - establish an annual prize for the best environmental research related to the oil sector.

In addition, in a separate section of the VA devoted to terms of reference the signatories committed to

- develop written terms of reference for impact assessments and management plans needed for environmental licensing; and
- publish an environmental guide for each activity in the sector, focusing first on seismic exploration, drilling, and pipelines, by the second semester of 1997.

6.7.4. Compliance and Advances Since the Voluntary Agreement

Although the oil VA officially expired in 2007, formal activities under the VA ended three to four years after it was signed because the signatories lost interest and stopped participating. Reasons mentioned by interviewees include changes in MMA management and priorities (Buitrago 2007) and industry's achievement of its main objective: improving the efficiency of environmental licensing (Martinez 2008).

Table A5 in the Appendix details signatories' compliance with each commitment in the oil VA during the years it was active, and Table 6 provides a summary. Of the 5 special commitments, 40 percent were kept, and of the 28 generic commitments, 39 percent were kept. Of all 33 commitments, 39 percent were kept.

In total, 36 percent of all the commitments of the oil VA were abrogated. They included two of the five special commitments: establishing an environmental information system and awarding an annual research prize. In addition, signatories did not conduct a diagnosis of environmental problems in the sector, hold an annual sector-wide educational and capacity-building event, or formulate mechanisms to monitor and evaluate environmental performance.

That said, 39 percent of signatories' commitments were kept, including developing terms of reference for environmental licensing, which, as discussed below, many consider to have been industry's main motive for participating in the VA. Partly as a result, licensing became much more efficient. Wait times for licensing fell from 17 to 6 months (Martinez 2008). The VA also facilitated industry input into regulation, including the development of terms of reference for licensing and management plans, preventing some potentially "catastrophic" regulations that ignored technical information, and preventing inordinate "discretionary enforcement" by regulatory authorities (Martinez 2008). Finally, the signatories published environmental guides for all the activities in the sector and created an ACP environmental department (MMA 1997d, 1998, 1999d, 1999e).

Table 6. Compliance with Oil Voluntary Agreement: Number and Percentage of Commitments Kept, by Type

Type	*Number*	*Percentage*
Special commitments		
Yes	2	40
Partial	1	20
No	2	40
Unclear	0	0
Total	5	100
Generic commitments		
Yes	11	39
Partial	6	21
No	10	36
Unclear	1	4
Total	28	100
All commitments		
Yes	13	39
Partial	7	21
No	12	36
Unclear	1	3
Total	33	100

Source: See Appendix Table A5.

Several environmental advances in the oil sector coincided with, and may have been spurred by, the VA. Our interviewees mentioned three in particular: improvements in technical capacity in public and private oil sector enterprises due to the new requirements for periodic reporting to regulatory authorities (Martinez 2008); a portfolio of cleaner production, pollution control, and restoration projects (MMA et al. 1999); and improved environmental management in refining and exploration, exemplified by a 6 percent reduction in airborne emissions and a 60 percent reduction in liquid effluents from ECOPETROL's Barancabermeja refinery, a 50 percent reduction in raw materials use and a 95 percent reduction in water use in its associated Naphtha plant, and installation of a water treatment plant in a Chevron oil exploitation field (MMA et al. 1999). The MMA representative to the operating committee stated that these advances probably could have been achieved regardless but that the VA facilitated and expedited them by providing a framework of meetings and negotiations (Buitrago 2007).

The oil sector VA expired in Spring 1997, and a new VA was signed in December 2007. This nonbinding agreement focuses on many of the same issues as the original VA, with two important differences: it places less emphasis on environmental licensing (due to significant improvements in that area over the past decade), and it includes commitments to develop quantitative indicators of environmental performance and set targets using those indicators (MAVDT et al. 2007; Martinez 2008).

6.7.5. Drivers for Industry

Regulatory uncertainty. The broad concern that motivated industry's participation in the VA was uncertainty about the implications of the new environmental regulatory system created by Law 99 of 1993. A particular concern was new environmental licensing requirements, which in the mid-1990s were causing long and costly delays in new projects and stifling new investment. The fact that industry involvement in the VA tailed off once environmental licensing became more efficient suggests that licensing was the chief driver of industry's participation. More generally, the oil sector viewed the VA as a means of improving its ability to learn about and influence future environmental regulation (Martinez 2008).

6.7.6. Drivers for Regulators

Capacity building. Regulators' main motive for participating in the VA was to help build its own capacity to develop and implement regulation for a sector considered an important source of environmental problems. When Law 99 of 1993 was passed, regulation of the oil sector was widely acknowledged to be inadequate. Yet MMA lacked the capacity, particularly the technical expertise, to quickly develop and enforce new regulations. The VA helped MMA develop the requisite capacity. In short, it was seen as providing a framework for a transition from lax to stringent regulation (Buitrago 2007; Rodriquez 2008).

6.8. Mamonal Region

6.8.1. Background

The Mamonal Foundation *(Fundación Mamonal)* is a trade association that in the late 1990s comprised roughly 50 large formal industrial enterprises in the greater metropolitan area of the Cartagena—Colombia's principal Atlantic seaport and a center of tourism (Fundación Mamonal 2008; Fernandez 2008).[9] Established in 1975 after an accidental release of deadly ammonia gases at a local manufacturing plant, its aim is to promote environmental and social projects in and around Cartagena (Fundación Mamonal 2008). Members include petrochemical, leather tanning, and electronics manufacturing facilities (20), fish and meat processing plants (6), electricity generators (4), and cement and other manufacturers (13). Collectively, these enterprises generate about 40 percent of the city's income (Chacon and Moreno 1999; Fernandez 2008). Historically, the members of the Mamonal Foundation have played an important role in the development of national environmental regulation. Several participated in the advisory board that oversaw the drafting of Law 99 of 1993 and developed the national cleaner production policy (Fernandez 2008).

6.8.2. Environmental Issues

The principal environmental problems in the Mamonal region are related to local industrial plants, particularly those in the petrochemical sector, and to upstream sources of water pollution

[9] In 2008, 32 firms belonged to the foundation (Fundación Mamonal 2008).

on the Magdalena River. The main local sources of water pollution are petrochemical refineries and fish and meat processing plants; the main sources of air pollution are electric power and petrochemical plants; and the main sources of solid and hazardous waste are metal and plastic processing operations and leather tanneries (Fundación Mamonal 1999; MMA 1999c). The 1975 industrial accident, along with declining fish stocks in Cartagena Bay, have triggered significant public and political pressures for improved environmental management (Fernandez 2008).

Three environmental regulatory institutions are active in the Mamonal zone: MAVDT, the national environmental ministry; CARDIQUE, the regional environmental authority for Mamonal; and DAMARENA, the municipal environmental authority for Cartagena.[10]

6.8.3. The Voluntary Agreement

Signed on September 29, 1995, the Mamonal VA was among Colombia's very first and has served as a model for subsequent agreements (Tamayo 2007). It was signed by MMA, CARDIQUE, DAMARENA, and the Mamonal Foundation and 51 of its affiliates. It had a 10-year term and was a nonbinding agreement (MMA et al. 1995). The VA established an operating committee comprising representatives of MMA (1), CARDIQUE (1), DAMARENA (1), the Mamonal Foundation (1), and the Environmental Committee of the Mamonal Foundation (Comité Asuntos Ambientals de Mamonal, CAAM) (2). The operating committee was headed by the last two representatives (MMA 1995; Salom 2008). The VA had the generic organization and provisions detailed in Section 6.1. Unusual and more specific commitments included the following (MMA 1995):

- Environmental diagnosis
    - develop a risk map of the industrial zone with the problematic sectors of the area: petrochemicals, manufacturing, and fishing.
- Institutional strengthening
    - increase participation by its affiliates in the Environmental Committee of the Mamonal Foundation, from 45 to 100 percent.
- Production processes
    - present a management plan for solid wastes, recyclables, and reuse by the first semester of 1996 so that by the end of 1998, 100 percent of these materials are recovered; and
    - create a program of awareness and attention to emergencies.

[10] Law 99 of 1993 dictates that Urban Environmental Authorities (*Autoridades Ambientales Urbanas,* AAUs) be established in all cities with a population exceeding 1 million. Because the population of Cartagena had exceeded this limit, in 2002, DAMARENA was replaced by an urban environmental authority for Cartagena called *Establecimiento Publico Ambiental* (EPA). EPA has not participated in the Mamonal VA (Fernandez 2008).

- Legal and technical norms
    - improve compliance with all applicable environmental regulations according to the following schedule: 10 percent by 1996, 50 percent by 1997, 70 percent by 1998, and 100 percent by 1999;
    - clarify the jurisdictions of CARDIQUE and DAMARENA in a document signed by both parties and prepared within 60 days after signing the VA; and
    - review and revise existing land-use regulations.

  In addition, in a separate section of the VA devoted to ecosystems, the signatories committed to
    - develop a plan for reforesting the "green zones" by the first semester of 1996; and
    - conduct at least one project per year on environmental restoration, starting with a project to recover mangrove areas.

6.8.4. Compliance and Advances Since the Voluntary Agreement

The Mamonal VA's operating committee met every three to four months for the first four years after the VA was signed in 1995, generating regular progress reports. However, its activities declined dramatically after 2000. The three regulatory institutions appointed to the coordinating committee (MMA, CARDIQE, and DAMARENA) have not participated since that time, and no progress reports have been produced. The Mamonal Foundation has continued with its environmental management programs, but the impacts are difficult to identify, given the lack of progress reports (Fernandez 2008; Tamayo 2007; Salom 2008).

Table A6 in the Appendix details signatories' compliance with each commitment in the Mamonal VA, and Table 7 provides a summary. Of the 9 special commitments, 33 percent were kept, and of the 28 generic commitments, 46 were kept. Of all 37 commitments, 43 percent were kept.

In total, at least 30 percent of all the commitments of the Mamonal VA were abrogated. They included developing contingency plans for environmental risks, using only licensed transporters of waste, and establishing an annual agenda for capacity building.

That said, at least 43 percent of signatories' commitments were kept. Participating firms obtained all requisite permits and licenses. One important commitment, full compliance with environmental regulations, was mostly but not completely achieved. According to MMA (1999c), 90 percent of participating firms were complying by 1999. In addition, the signatories fulfilled their commitments to develop a risk map of the Mamonal industrial zone focusing on petrochemicals, manufacturing, and fishing; an emergency awareness plan; a land-use plan; a baseline study of environmental performance for all signatory firms; capacity-building programs for the staff of environmental regulatory institutions; and an annual ecology awareness public event. Finally, 100 percent of the signatory companies established environmental departments, up from just 20 percent when the VA was signed (Fernandez 2008).

Some environmental advances in the Mamonal sector coincided with, and may have been spurred by, the VA, even though the agreement did not specify the improvements. The signatories made significant cuts in liquid discharges, including a collective 58 percent reduction in discharges of organic material (BOD), a 77 percent reduction in discharges of solids, a 28 percent reduction in discharges of greases, and an 81 percent reduction in discharge of phenols (MMA 1999c). They developed regulatory guidelines for the content of environmental management plans for several industrial sectors (including chemicals, plastic processing, leather tanning, ceramics, food processing, dairy facilities, carbonated soft drinks, meat processing, fish processing, and metal processing), and by September 1999, 80 percent of the industrial facilities in the Mamonal zone had submitted environmental management plans to CARDIQUE (MMA 1999c). And an airborne emissions monitoring network was installed (Chacon and Moreno 1999).

Table 7. Compliance with Mamonal Agreement: Number and Percentage of Commitments Kept, by Type

Type	*Number*	*Percentage*
Special commitments		
Yes	3	33
Partial	2	22
No	0	0
Unclear	4	44
Total	9	100
Generic commitments		
Yes	13	46
Partial	1	4
No	11	39
Unclear	3	11
Total	28	100
All commitments		
Yes	16	43
Partial	3	8
No	11	30
Unclear	7	19
Total	37	100

Source: See Appendix Table A6.

The Mamonal VA expired in September 2005. Regular formal contact between the Mamonal Foundation and regulatory authorities has ended, partly because the VA has expired and partly because of changes in personnel and political priorities (Salom 2008; Tamayo 2007). Recently, however, discussions among the Mamonal Foundation, MMA, and CARDIQUE about a new VA have begun (Difilippo 2008a; Fernandez 2008). Possible foci include air pollution and waste management (Difilippo 2008a). A political dispute over authority in the Mamonal zone have stalled progress in negotiating a new VA, however (Fernandez 2008).

6.8.5. Drivers for Industry

Regulatory uncertainty. Industry's principal motive for participating in the VA was to reduce costs, risks, and uncertainties associated with the new regulatory regime created by Law 99 of 1993. Industry hoped that the VA would create opportunities to learn about, shape, and improve the efficiency of regulation. Particular concerns included environmental licensing, negotiating a grace period that would allow firms to gradually achieve compliance, and improving consistency of coordination among MMA, CARDIQUE, and DAMARNEA (Fernandez 2008).

Public pressure. During the 1970s and 1980s, industry in the Mamonal zone received considerable negative publicity because of fatal industrial accidents, worsening local environmental quality, and growing environmental consciousness. This publicity concerned firms' owners, managers, and boards of directors. The Mamonal Foundation hoped that closer collaboration with regulatory institutions would improve its public image (Fernandez 2008).

6.8.6. Drivers for Regulators

Pilot program. MMA, not local regulators, initiated the VA. MMA's main motive was to successfully pilot the new regulatory mechanism included in the Samper administration's 1994–1998 National Development Plan. It chose to focus on the Mamonal zone for several reasons: it was among the most important industrial regions of the country, industry there was represented by a trade association with a demonstrated environmental bent, and leaders of this association had strong ties to MMA (Fernandez 2008; Tamayo 2007).

Capacity building. For CARDIQUE, participation in the VA created an opportunity to strengthen its institutional capacity in terms of both technical expertise and political capital (Difilippo 2008a). The VA helped the institution learn important details about environmental management in specific industrial sectors, and it created a channel for communication with the private sector and MMA (Tamayo 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 fostering a "culture of resistance" to environmental regulation. Our research suggests that in Colombia, the first two motives were paramount.

As discussed in Section 3, prior to Law 99 of 1993, the legal, institutional, and political infrastructure needed for effective mandatory environmental regulation were all 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 more than 30 regional environmental authorities. But for these new institutions, 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 regulatory new institutions lacked the technical expertise, data, experience, and financial resources to develop new sector-specific rules.

The result was costly 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. Similar situations arose in the electricity and oil sectors, which were 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, electricity, and oil VAs contained explicit commitments to develop terms of reference for environmental licensing.

In two of our case studies—cut flowers and East Antioquia—there is some evidence that regulators also saw VAs as a means of avoiding confrontation with the private sector. In both cases, CORNARE was the lead regulatory authority. As discussed in Section 6, CORNARE's explicit strategy was to foster cooperative interactions with industry.

7.1.2. Industry

As discussed in Section 2, the literature identifies five reasons that industry participates in VAs: to mitigate a "background threat" of mandatory regulation (that is, to preempt more stringent mandatory regulation or to soften enforcement of existing regulation), to obtain explicit or implicit subsidies, to boost sales in markets where consumers care about environmental performance, to soften pressures generated by communities and nongovernmental organizations, and to cut production costs by adopting win-win pollution prevention techniques.

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. However, in our case, it was not exactly a background threat of mandatory regulation that was decisive. Rather, it was the need to reduce uncertainty about, and to influence the development and implementation of, new mandatory regulation ushered in by Law 99 of 1993.[11]

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, electricity, and oil sectors. The VAs signed in these sectors were intended to ensure that clear, certain, reasonable procedures were established, and that this was done quickly. In the palm oil sector, growers hoped that a VA would help sort out discrepancies in rules and enforcement among the regional environmental authorities. A similar problem drove the participation of companies involved electricity distribution, whose networks spanned multiple jurisdictions. Finally, industries in the Mamonal zone hoped that their VA would help resolve confusion about overlapping jurisdictions of regional and urban 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, as discussed in Section 6, firms in the palm oil, electricity, and oil 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." As discussed in Section 6, representatives of the palm oil sector reported that one reason they signed their VA was to enhance transparency of monitoring and enforcement among newly created regional environmental authorities to ensure that deep-pocketed palm oil growers and processors were not unfairly targeted for enforcement actions.

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, four of the six VAs discussed in Section 6 provided for a grace period during which firms could make the requisite investments in pollution prevention and control. The only VAs that did not include such provisions were those signed in the electricity and oil sectors, and in the electricity sector, firms were already in compliance.

Our case studies suggest that factors related to Law 99 of 1993 were not the only drivers of industry participation in VAs. In two cases, the cut-flower and palm oil VAs,the industries expected that participation would improve their access to markets. As discussed in Section 6, ASOCOLFLORES, the flower trade association that signed the VA, hoped 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, the palm oil trade

[11] The difference is that in Colombia, VAs were not intended to preempt new regulation or to soften enforcement existing regulation: preempting regulation already ushered in by Law 99 of 1993 was not possible, and this regulation was new, not preexisting.

association, hoped that its VA would help improve the image of Colombian palm oil in export markets.

Finally, community pressure appears to have played a role in spurring industry participation in VAs. The palm oil industry hoped that its VA would mollify local communities concerned about water pollution from processing plants. And the Mamonal Foundation hoped that participation would help repair damage to industry's image caused by a Bhopal-like industrial accident in the 1970s.

7.2. How Have the VAs Performed?

7.2.1. Caveats

As discussed in Section 2.3.2, although most evaluations of VAs tend to be somewhat ad hoc and informal, those that have attempted to develop a more rigorous methodology suggest assessing the 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. However, our review of the literature also indicates that marshaling the evidence needed for such an evaluation is usually quite difficult for several reasons. 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.

Unfortunately, all of these barriers to rigorous evaluation are present in the Colombian case. As discussed in Section 5, all four MMA reports emphasized that VAs were difficult to evaluate because they lacked quantitative baselines and targets and did not require collection and reporting of data needed for evaluation. Of the six VAs discussed in Section 6, all but the Mamonal agreement deferred the development of quantitative indicators of environmental performance and hard targets until after an environmental diagnosis had been conducted. Except in the electricity and oil VAs, 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 impacts 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.

Given those 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 overall performance of VAs in Colombia has been poor based on the three criteria listed above (compliance with the terms of the VA, improvements in environmental quality relative to a business-as-usual scenario, and improvements environmental management capacity). 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's own evaluations. It bears repeating that MAVDT (2006) found that in a sample of 47 VAs, only 10 made "significant advances in meeting their commitments," and 10 VAs were stillborn: regulators and industry abandoned them soon after they were signed. If the signatories of most VAs did not come close to meeting their commitments, no matter how vague, then it is doubtful that the VAs improved environmental quality relative to a business-as-usual scenario or boosted environmental management capacity.

Our detailed analysis has focused on six 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 8). 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; signatories to the palm oil and electricity VAs failed to develop quantitative indicators and hard targets; and signatories to the Mamonal VA failed to develop and implement a solid waste recycling and recovery plan.

Table 8. Compliance with Six Voluntary Agreements: Percentage of All Commitments Kept

Kept?	*Cut flowers*	*Palm oil*	*Electricity*	*East Antioquia*	*Oil*	*Mamonal*	*Average (all)*
Yes	61	43	28	39	39	43	42
Partial	6	14	8	8	21	8	11
No	21	27	53	36	36	30	34
Unclear	12	16	13	17	3	19	13
Total	100	100	100	100	100	100	100

Source: See Appendix Tables A1–A6.

7.2.3. Questionable Additionality

As discussed in Section 2, in evaluating the performance of VAs, a critical issue is whether the VA resulted in additional benefits that would not have occurred absent the VA. Often, empirical studies of voluntary regulation find that advances in environmental performance subsequent to the regulation are mostly due to unrelated factors and very likely would have occurred regardless. Our analyses of six of the seemingly most successful VAs suggest that this may have been true in Colombia. We found that improvements in environmental performance were driven in large part by

pressures from international markets, local communities, capital markets, and other regulatory programs, and by technological change.

In the cut-flower and palm oil cases, improvements in performance were at least partly driven by pressures from foreign buyers (heightened by negative advertising funded by competing foreign growers). Recall that during the term of the Medellín cut-flower VA, growers in Bogotá who had not signed a VA made the same advances as comparable growers in Medellín.

In the palm oil, electricity, and Mamonal cases, pressures from communities and politicians spurred environmental advances during the term of the VA. Palm oil processing plants were pressured by local fishermen and shrimp farmers to reduce water pollution. Electricity companies had strong political incentives to improve their performance to demonstrate that privatization and expansion would not have adverse environmental impacts. And companies in the Mamonal zone were pressured by local communities affected by a serious industrial accident in the mid-1970s.

In the electricity case, signatory companies were required by multilateral and bilateral lenders such as the World Bank and the Inter-American Development Bank to improve their environmental performance. And in palm oil and East Antioquia cases, industry representatives reported that cost-saving clean technological change helped drive environmental advances.

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 more stringent monitoring and enforcement 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. Therefore, Colombian VAs can be considered capacity-building VAs as defined by Kerret and Tal (2005): they were meant to bridge a transition to a mandatory regulatory regime. 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 had a significant impact on regulatory capacity. However, our six case studies suggest that at least the apparently more successful VAs may indeed have helped build regulatory capacity. In each of the four sectoral VAs (cut flowers, palm oil, electricity, and oil), at least one guide to environmental management was published. In five VAs (all except oil), a study diagnosing environmental issues was completed. In three VAs (palm oil, electricity, and oil), 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. In the Mamonal zone, environmental departments were established in 100 percent of the signatory companies. In the electricity sector, several studies of hazardous waste were completed. In the oil sector, the efficiency of environmental licensing improved dramatically. 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, summarized previous evaluations of these VAs, and presented six in-depth case studies of relatively successful VAs. We found that although regulators and industry had a multiplicity of motives for signing VAs, in our six 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. More specifically, regulators saw the VAs as a means of gathering the information and building the capacity needed to implement the new law, and industry saw the agreements as a means of reducing uncertainty about, filling gaps in, and resolving inconsistencies in the new regulatory framework.

As for the performance of the VAs, our analysis confronted the usual barriers to evaluating VA impacts, including a lack of clear baselines, quantitative targets, monitoring, and reporting; the simultaneous application of complementary regulatory policies and programs; and self-selection for top environmental performers. Nevertheless, 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, the advances were at least partly, if not principally, attributable to other factors; and, consistent with signatories' motives for participating, the most significant benefit of the VAs has been to help build 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, advocates argue that 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, pessimists have pointed out that despite appearances, 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. Available evidence suggests that VAs had minimal direct impact 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 impacts 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	Yes	FEDEPALMA’s Environmental Unit

adoption of pollution prevention techniques.		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.

Table A5. Compliance with Oil Voluntary Agreement

CATEGORY	COMMITMENT	COMPLIANCE?	NOTES
SPECIAL Commitments			
3. Production processes			
	S3.1. Promote field trials of pollution prevention alternatives through the Colombian Oil Research Center	Partial	The Colombian Association of Oil Companies (ACP) inventoried the best practices for pollution control but did not run field trials.
5. Education and research			
	S5.1. Establish an environmental information system for the oil sector within 8 months.	No	
	S5.2. Establish an annual prize for the best environmental research related to the oil sector.	No	
10. TORS			
	S10.1. Develop written terms of reference for impact assessments and management plans needed for environmental licensing.	Yes	MAVDT (1999), Buitrago (2008).
	S10.2. Publish environmental guides for each of the activities in the sector, focusing first on seismic exploration, drilling, and pipelines, by the second semester of 1997.	Yes	The guides were underwritten by ACP.
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.	No	
	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	
2. Institutional strengthening			
	2.1. Create an environmental management department in the trade association and/or individual firms.	Yes	Shortly after the agreement was signed, the environmental office of the ACP was created.
	2.2. Promote the adoption of environmental codes of conduct and environmental management systems by signatory firms.	Yes	The industry has promoted adoption of certification systems (e.g., ISO 14001), and most firms are certified.
	2.3. Develop capacity-building programs and projects for the professional staff of regulatory institutions and/or signatory firms.	Partial	Sporadic workshops were conducted to train government and industry staff.
3. Production processes			
	3.1. Promote the development, domestic and international transfer, and adoption of pollution prevention techniques.	Partial	The signatory companies have adopted new technologies for pollution prevention and control partly as a result of commercial agreements between the companies and the technology providers.
	3.2. Promote increased use of pollution control devices.	Yes	The industry has continually improved and increased the use of pollution control devices as a condition of environmental licenses.
	3.3. Promote water conservation.	Yes	Most of the companies have mandatory

		water pollution prevention and control practices. In addition, as per agreements with regional environmental authorities, all invest an amount equivalent to 1% of the costs of new investments in watershed management projects.
3.4. Develop contingency plans for environmental risks.	Yes	All companies have contingency plans and have developed capacity-building programs.
4. Legal and technical norms		
4.1. Comply with specified norms in a specified time period.	Partial	Yes in general, with a few exceptions.
4.2. Obtain all requisite licenses and permits.	Partial	Yes in general, with a few exceptions.
4.3. Substitute out of fuel sources prohibited by law.	Unclear	
4.4. Use only licensed providers and transporters of production inputs.	Partial	
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	The VA facilitated industry input into the development of terms of reference for licensing and management plans and prevented some potentially "catastrophic" regulations that ignored accurate technical information. It also prevented inordinate "discretionary enforcement" by regulatory authorities (Martinez 2008).
5. Education and research		
5.1. Establish an annual agenda for capacity building among private firms.	No	
5.2. Promote interactions with, and relevant research at, local universities.	Yes	The ACP and some companies have developed research projects with universities and research centers.
5.3. Participate in an annual "ecology week" educational event.	No	
5.4. Promote educational programs and projects in local communities.	Yes	
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.	Partial	Occasionally. Some industry employees are trained abroad.
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 a general exemption for all sectors.
7.2. Promote lines of credit to facilitate the adoption of clean technologies.	No	Existing lines of credit are not specific or relevant to the oil sector because they are relatively small.
7.3. Identify sources of finance for the activities in the VA.	No	ACP provided financing for the development of the agreements.
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	Yes	Required by environmental licenses.

	decisions.		
	9.2. Develop programs and projects to recover rivers and riverbanks and develop recreational areas.	Yes	Required by environmental licenses. Some companies have gone beyond these requirements.

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

Table A6. Compliance with Mamonal Voluntary Agreement

CATEGORY	COMMITMENT	COMPLIANCE?	NOTES
SPECIAL Commitments			
1. Environmental diagnosis			
	S1.1 Develop a risk map of the industrial zone focusing on problem sectors: petrochemicals, manufacturing, and fishing.	Yes	Mamonal Foundation completed the map in 2002.
2. Institutional strengthening			
	S2.1. Increase participation by affiliates in the Committee Asuntos Ambientals de Mamonal (CAAM) from 45% to 100%.	Partial	In 2002, an environmental committee with 43 representatives (<100%) was organized.
3. Production processes			
	S3.1. Present a management plan for solid wastes, recyclables, and reuse by the first semester of 1996 so that by the end of 1998, 100% of materials are recovered.	Unclear	By the end of 1998, all signatory companies had a waste management plan that included recycling, but the 100% goal was never checked.
	S3.2. Create a program of awareness and attention to emergencies (APELL).	Yes	Mamonal Foundation contracted a consultancy to develop this plan.
4. Legal and technical norms			
	S4.1. Improve compliance with all applicable environmental regulations according to the following schedule: 10% by 1996, 50% by 1997, 70% by 1998, and 100% by 1999.	Partial	90% were complying fully by 1999 (MAVDT 1999).
	S4.2. Clarify the jurisdictions of CARDIQUE and DAMARENA in a document signed by both parties to be prepared within 60 days.	Unclear	
	S4.3. Review and revise existing land-use regulations.	Yes	A land-use plan was developed in 2001.
10 Ecosystems			
	S9.1. Develop a plan to reforest “green zones” by the first semester of 1996.	Unclear	Signatory firms conducted activities individually.
	S9.2. Conduct at least 1 project per year on environmental recuperation, starting with a project to recover mangrove areas.	Unclear	The signatory firm Malterias de Cartagena developed a program in 1998.
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	A baseline study was conducted for the 48 original signatory firms.
	1.2. Conduct a complementary study of a specific problem or a study to provide a baseline for quantitative commitments.	Yes	
	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 in the individual firms.	Yes	All signatory firms have environmental management departments (Fernandez 2008).
	2.2. Promote the adoption of environmental codes of conduct and environmental management systems by signatory firms.	Unclear	Five signatory companies obtained ISO 14001 certification, but it is unclear whether the VA was responsible.
	2.3. Develop capacity-building programs and projects for the professional staff of regulatory institutions and/or signatory firms.	Yes	At least 6 employees of CARDIQUE completed specialization courses.
3. Production processes			
	3.1. Promote the development, domestic and international transfer, and adoption of pollution prevention techniques.	Yes	MMA (1999).
	3.2. Promote increased use of pollution control devices.	Unclear	

	3.3. Promote water conservation.	Yes	
	3.4. Develop contingency plans for environmental risks.	No	
4. Legal and technical norms			
	4.1. Comply with specified norms in a specified time period.	Yes	
	4.2. Obtain all requisite licenses and permits.	Yes	100% were complying by 1999.
	4.3. Substitute out of fuel sources prohibited by law.	Unclear	Most of the companies use natural gas. During term of the VA, 3 developed cogeneration projects.
	4.4. Use only licensed providers and transporters of production inputs.	No	
	4.5. Respect compliance plans already negotiated with the regulator.	No	
	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.	No	
	5.2. Promote interactions with, and relevant research at, local universities.	Yes	Two or 3 workshops on environmental management and evaluation were held at the Technological University of Cartagena.
	5.3. Participate in an annual "ecology week" educational event.	Yes	Annual ecology week events were held each year between 1996 and 2006.
	5.4. Promote educational programs and projects in local communities.	Yes	The Mamonal Foundation organizes such programs and projects, including school trips and ecological events.
	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.	Partial	In 1999, an international expert was hired to give advice on odor prevention.
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 a general exemption for all sectors.
	7.2. Promote lines of credit to facilitate the adoption of clean technologies.	No	The National Cleaner Production Center offers a line of green credit, but these credits are 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.	Yes	Annual site visits to monitor sewage were conducted during the VA.
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.	Yes	The firm Malterias de Colombia conducted a project to recover mangroves.

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