Institutional Analysis of Colombia's Autonomous Regional Corporations (CARs)

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RESOURCES
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AN RFF REPORT

Spanish Acronyms Used in this Report

AAU	*Autoridad Ambiental Urbana* – Urban Environmental Authority
ASOCARs	*Asociación de Corporaciones Autónomas Regionales de Desarrollo Sostenible y Autoridades Ambientales de Grandes Centros Urbanos* – Association of Autonomous Regional Corporations, Sustainable Development Corporations and Urban Environmental Authorities
AVMA	*Autoridad Ambiental Urbana del Area Metropolitana del Valle de Aburrá* – Aburrá Valley Urban Environmental Authority
CAR	*Corporación Autónoma Regional* – Autonomous Regional Corporation
CDS	*Corporación de Desarrollo Sostenible* – Sustainable Development Corporation
CVC	*Corporación del Valle del Cauca* – Autonomous Regional Corporation of the Cauca Valley
CONPES	*Consejo Nacional de Política Económica y Social* – National Council on Economic and Social Policy
DADIMA	*Autoridad Ambiental Urbana del Distrito de Barranquilla* – Barranquilla Urban Environmental Authority
DAGMA	*Autoridad Ambiental Urbana de Cali* – Cali Urban Environmental Authority
DAMA	*Autoridad Ambiental Urbana de Santafé de Bogotá* – Bogotá Urban Environmental Authority
DANE	*Departamento Administrativo Nacional de Estadística* – National Administrative Statistics Department
DNP	*Departamento Nacional de Planeación* – National Department of Planning
FONAM	*Fondo Nacional Ambiental* - National Environmental Fund
IDEAM	*Instituto de Hidrología, Meterología y Estudios Ambientales* – Institute of Hydrology, Meteorology and Environmental Studies

INDERENA	*Instituto Nacional de los Recursos Naturales Renovables* – National Institute of Natural Renewable Resources and Environment
MAVDT	*Ministerio del Ambiente, Vivienda y Desarrollo Territorial* – Ministry of Environment, Housing and Territorial Development
MMA	*Ministerio del Medio Ambiente* – Ministry of Environment
MVDE	*Ministerio de Vivienda y Desarrollo Económica* – Ministry of Housing and Economic Development
PAT	*Plan de Acción Trianual* – Triennial Action Plan
PGAR	*Plan de Gestión Ambiental Regional* – Regional Environmental Management Plan
POAI	*Plan Operativo Anual de Inversiones* – Operative Annual Investment Plan
SIA	*Sistema de Información Ambiental* – Environmental Information System
SIAC	*Sistema de Información Ambiental de Colombia* – System of Colombian Environmental Information
SINA	*Sistema Nacional Ambiental* – National Environmental System
UAESPNN	Unidad Administrativa Especial del Sistema de Parques Nacionales Naturales - National Natural Parks System Special Administrative Unit

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INSTITUTIONAL ANALYSIS OF COLOMBIA'S AUTONOMOUS REGIONAL CORPORATIONS (CARs)

EXECUTIVE SUMMARY

A. Background

Contracted in December 2003, this Institutional Analysis of Colombia's Autonomous Regional Corporations (*Corporaciones Autónomas Regionales,* CARs) is an input into the World Bank's Country Environmental Assessment of Colombia. As detailed in the World Bank Terms of Reference, the seven objectives of the study were to (i) analyze the design of CARs as per Law 99 of 1993; (ii) compare the variation in CARs' approaches to environmental governance and analyze good and bad practice cases; (iii) describe the institutional and social context of CARs and assess aspects of the social setting and institutional factors likely to affect the quality of environmental management; (iv) examine the effectiveness in the design and implementation of policies and procedures used for environmental management by CARs; (v) evaluate the effectiveness of CARs in terms of their major environmental functions; (vi) identify major institutional, administrative, and political challenges facing the regional environmental regulatory system in carrying out its environmental mandate; and (vii) report on the regional environmental regulatory system, illustrated by case studies, with recommendations on measures that would help the regional environmental regulatory system better carry out its environmental mandate.

Resources for the Future (RFF), a nonprofit research institute in Washington, D.C., conducted the study. The RFF team comprised Dr. Allen Blackman, Dr. Richard Morgenstern, and Ms. Elizabeth Topping. This team worked closely with two Colombian consultants hired by the World Bank—Ing. Angel Esterling Lara and Lic. Juan Carlos García de Brigard.

B. Methods

In writing this report, the RFF team carried out four tasks, each involving the analysis of a different type or category of data:

Task 1. Analysis of the design of CARs. To evaluate the design of CARs, the RFF team reviewed and analyzed Colombia's 1991 Constitution, Law 99 of 1993, and related decrees.

Task 2. Analysis of documentary data on CARs. The RFF team reviewed and analyzed studies, reports, books, and articles bearing on the performance of the primary SINA institutions. These documents were provided by the World Bank and were collected by the RFF team from sources in both Colombia and the United States.

Task 3. Statistical analysis of CAR-level data. The RFF team collected, collated, and analyzed detailed CAR-level statistical data on socioeconomic and historical characteristics, performance, allocations of investment funds across environmental subsectors, environmental quality, financial resources, environmental funds, and human and technical resources. Methods used included presentation, manipulation and comparison of summary statistics, as well as simple multiple regression analysis.

Task 4. Case studies of four CARs. Time and resource constraints precluded an institutional analysis of all 33 of Colombia's CARs. Therefore, as directed in the Terms of Reference, the RFF team analyzed a small sample of CARs whose selection was guided by three considerations. First, we hoped to include CARs with diverse socioeconomic settings, institutional structures, and overall performances. Second, we were limited to CARs that were sure to be able to provide basic data. Finally, we chose CARs geographically situated to facilitate field research. Ultimately, we chose to focus on CORANTIOQUIA, CAR, CARDIQUE, and CRA.

The RFF team recognized from the outset that documentary evidence would not be sufficient to respond to the Terms of Reference for this study, for two reasons. First, by their nature, the questions addressed by this report are sensitive. For political reasons, frank evaluations of poorly performing government institutions are rarely written down. Second, as documented in our report (and in many other reports), reliable, consistent, and up-to-date data—needed to evaluate the performance of government institutions and track changes in environmental quality—are exceptionally scarce in Colombia. This study therefore relies upon original interview data as well as documentary data.

In early March 2004, the RFF team traveled to Bogotá, Medellín, Cartegena, and Barranquilla, where we interviewed 29 stakeholders representing 27 institutions. (Please see Appendix 1 for a complete list of interviews.)

Given the time and resource constraints associated with this study, the RFF team was able to interview only a limited sample of stakeholders. In addition, interviewees were not randomly selected and not all interviewees were asked the same questions. As a result, their opinions are not necessarily representative.

That said, we believe these data are valuable for understanding the performance of CARs, for at least three reasons. First, the interviewees were expressly selected to provide as much credible information as possible. More specifically, interviewees were selected to ensure adequate representation of CAR staff, private-sector CAR clients, nongovernmental organizations (NGOs), and national and territorial government offices charged with interacting with CARs. Second, in directing the interviews, the RFF research team used its professional judgment developed through experience with similar research. Third, and perhaps most important, the RFF team used its professional judgment both in summarizing interviewee comments and in drawing conclusions from them. Our interviewees expressed a wide range of views about critical issues. However, we recognize that some of the opinions our interviewees expressed may reflect subtle biases and politicking, a problem inherent in this type of interview research. Our strategy for dealing with this issue was to exclude some of the interview data in drawing conclusions. Specifically, we discounted all opinions except those that either represented a consensus among the stakeholders interviewed, or that comported with complementary documentary evidence.

C. Complementarities and overlap with SINA report

In addition to this "Institutional Analysis of Colombia's Autonomous Regional Corporations," the RFF team conducted a second component of the Country Environmental Assessment of Columbia—an "Assessment of Colombia's National Environmental System (SINA)." Because the purview of that study included an analysis of Colombia's major environmental public-sector institutions, including CARs, a portion of the research for it was used to write this report. Of particular value was field research conducted for the SINA report in December 2003. During this trip, two members of the present RFF team (Dr. Blackman and Ms. Topping), along with a third RFF researcher not involved with the present study (Dr. Sandra Hoffman), interviewed 34 SINA stakeholders, all in Bogotá, with a wide variety of positions, experiences, and perspectives. These stakeholders represent 18 institutions. The majority of the December 2003 interviews had some relevance for the present report. (Please see Appendix 1 for a complete list of interviews.)

A significant percentage of the SINA report deals with CARs and their relationship with MAVDT. In addition, some of the conclusions and recommendations in that report overlap with those for the present report. To make each report a self-contained, stand-alone document, we have included those sections here, either in part or in whole.

D. Challenges

Our study generated in 11 principal findings on the main challenges facing CARs.

1. Reliable data on environmental quality and institutional performance are urgently needed to facilitate environmental management.

There is general recognition in Colombia that (i) a well-managed and well-functioning system for collecting and disseminating data on environmental quality and institutional performance are indispensable for environmental management, and (ii) Colombia's current system is inadequate. Many of our interviewees—from both inside and outside the government—cited lack of such a system as a critical contributor to SINA's failings and, in particular, an inability to coordinate environmental management at the CAR level.

Efforts to develop a consistent system of indicators and improve the management of Environmental Information System are underway at the national level and at the CAR level. But even were there agreement on indicators, Colombia would need to make substantial progress to implement them, given SINA's limited capacity for data collection. Colombia's data collection infrastructure—including environmental laboratories, measuring stations, documentation centers, and basic cartography—is clearly inadequate. For example, 40% of the country's CARs either have no environmental laboratories or have laboratories that do not function at a minimal level.

2. Significant financial and jurisdictional conflicts exist among CARs on the one hand and territorial entities meant to be cooperative partners within SINA on the other.

Significant financial and jurisdictional battles are taking place between CARs and the Urban Environmental Authorities (*Autoridades Ambientales Urbanas,* AAUs) and between CARs and municipalities, all institutions that need to—and by law are supposed to—cooperate to facilitate environmental management. Specifically, some municipalities appear to be resisting making full payments of property taxes to their CARs as required under Law 99, and some AAUs are seeking a greater say in the allocation of funds raised in their jurisdictions. Further, the precise roles and jurisdictions of the different agencies, particularly AAUs and CARs, are confused and sometimes in conflict. Some regulated firms report being inspected by multiple authorities, sometimes based on different criteria. Several court cases are pending, although interim cooperative agreements have been reached pending resolution of these cases.

3. Detailed, albeit limited, data suggest that CARs do not prioritize environmental risks adequately.

An examination of a limited sample of data on CARs' investment spending suggests that they do not appropriately prioritize environmental risks and allocate investment funds accordingly. In 2001, as a group, CARs allocated 28% of their investment funds to projects involving the protection of flora and fauna and only 5% to industrial pollution control projects other than wastewater treatment plants. Although this statistic is based on limited data and must be interpreted cautiously, given the severity of industrial pollution problems in Colombia, it suggests that, for whatever reason, CAR investments may focus disproportionately on natural resource conservation. In addition, an examination of individual CAR allocations of 2001 investment funds suggests that CARs' allocations of investment spending across different risks do not comport particularly well with the severity of these risks.

4. Overall performance varies significantly across CARs and appears to be correlated with the CARs' age, geographic size, and level of poverty.

Lack of data on environmental quality and institutional functioning makes it difficult to measure how well CARs are performing their principal function, environmental protection. Although limited, the performance data compiled for this report suggest that overall performance is correlated with certain historical and socioeconomic characteristics. Specifically, CARs that perform well tend to be those that were established prior to Law 99 of 1993 and have relatively low levels of poverty and geographically small jurisdictions. Surprisingly, neither the financial characteristics of CAR, attributes related to employment, or technical capital appear to be correlated with measured performance.

5. Although the distribution of financial resources across CARs is highly unequal, opportunities may exist to mitigate inequities by encouraging CARs to take advantage of unexploited prospects for revenue generation, and to rationalize national contributions.

The distribution of total financial resources across CARs is extremely uneven, with total as well as per capita budgets of the richest CAR a full two orders of magnitude greater than those of the poorest. The distribution of self-generated revenues, which account for the lion's share of all resources, varies even more. Two-thirds of total financial revenues for all 33 of Colombia's CARs accrue to just 7 CARs.

Statistical analysis of the variation of financial resources across CARs suggests some opportunities may exist to even out this skewed distribution. Although variation in the

property tax revenues generated by the CARs depends on levels of economic activity in their jurisdictions, variation in other sources of CAR revenue is not so easily explained. This finding that suggests there may be unexploited opportunities for revenue generation in some CARs.

Based on 2002 data, the allocation of national contributions (versus self-generated revenues, such as property taxes) to CARs does not follow readily discernible patterns. For example, national allocations do not appear to be correlated with levels of economic activity or urbanization. However, some evidence suggests that changes in national contributions between 2002 and 2003 are correlated with levels of income and urbanization in CARs.

6. Human and technical resources vary markedly across CARs. Human resource difficulties are exacerbated by conflicting national-level polices and by clientelism—the practice of obtaining political support through promises of employment—particularly in the use of contractors.

Environmental management capacity varies markedly, and shortages of human and technical resources are partly to blame. The number of employees per CAR (both permanent and contracted) varies enormously across the 33 CARs, even after normalizing for population differences. The same is true of levels of education of CAR staff. Although variation in permanent employment levels is, not surprisingly, closely related to the size of the operations budgets of the individual CARs, the number of contractors engaged by the CARs cannot be readily explained by easily measured factors, such as budgetary, economic, or demographic differences. This finding is consistent with anecdotal evidence suggesting that clientelism plays a role in contracting practices.

Strategies to address this excessive reliance on contractors are complicated by clear tensions between two policy objectives. On the one hand, there is a national goal to limit operational spending and staff size across all government agencies. On the other hand, there is growing recognition of the need to limit reliance on contractors by CARs. A related human resources issue is the professionalism of CAR directors. Recent reforms aimed at mitigating this problem by changing the selection procedures for CAR directors general appear promising, although it is too early to make definitive judgments.

Like the distribution of human resources, the distribution of technical resources across CARs is highly uneven. Although the availability of technical resources like computers is clearly related to the size of the operations budgets of the individual CARs, there appears to be a strong (inverse) correlation between computer use and poverty levels. This suggests that an increase in

budget resources, by itself, may not fully address the infrastructure and related problems faced by many of the CARs. For example, if our measure of poverty is serving as a proxy for computer literacy in the workforce, or for the strength of the infrastructure available to support computer networks, then these technological support issues may need to be addressed before one can effectively expand the use of computers in CARs.

7. Certain interest groups appear to exert undue influence on the activities of some CARs, such that instead of acting to further social welfare, they act to further the interests of select groups.

Many stakeholders interviewed for this report indicated that excessively close ties between CAR directors general and interest groups are too common and that similar problems exist between interest groups and members of the CAR boards of directors. Further, we were told repeatedly that NGOs, which in principle could serve to balance pressures from organized interest groups, are relatively weak. In fact, some of the NGOs represented on boards of directors were referred to as "spurious" because they were established for the express purpose of filling a designated seat on the board and did not represent a significant segment of civil society.

8. The participation of CARs in financing, owning, and operating sanitation infrastructure weakens their incentives to stringently regulate that infrastructure.

Although Law 99 redefines CARs as regional environmental regulatory authorities and assigns primary responsibility for sanitation infrastructure to municipalities, it also mandates that CARs retain certain responsibilities for developing infrastructure, a dictate that clearly has the potential to create conflicts of interest. In particular, in cases where CARs finance, plan, own, and/or operate sanitation infrastructure, their incentives to strictly enforce environmental regulations governing this infrastructure may be compromised. Several political, economic, and legal factors are driving CARs' continued investments in sanitation infrastructure. Perhaps most import, the Uribe administration has explicitly mandated such investments.

9. Coordination between MAVDT and CARs is inadequate, partly as a result of tensions inherent in the design of SINA.

Law 99 assigned the Ministry of Environment the role of leading SINA and, in particular, overseeing and coordinating the activities of CARs. A basic element of sound management, national-regional coordination is important for ensuring that CARs address environmental problems deemed of highest priority to Colombia, minimizing discrepancies in the enforcement

and implementation, and taking advantage of economies of scale in policy and program implementation and in investment. Unfortunately, considerable evidence—including major evaluations of SINA—suggests that the ministry's performance in this area has been inadequate.

Poor coordination between MAVDT and CARs stems in part from contradictions in the design of SINA as established in Law 93. CARs have a great deal of autonomy. For example, the lion's share of their funding comes from internal sources—property taxes levied by municipalities, taxes on energy generation and petroleum extraction, and effluent fees—and they have a great deal of control over how these funds are spent. Other countries with decentralized environmental management systems face the same problem of coordinating national and regional authorities. Indeed, such tensions seem to be inherent in decentralized systems.

National authorities in Colombia have a variety of mechanisms at their disposal to ensure that CARs act in accordance with national policies. First, CARs are required to submit 10-year, 3-year, and 1-year action plans that tie in with the National Development Plans drafted by the executive branch. Second, the National Department of Planning must approve CARs' investment projects. Third, CARs' boards of directors include a representative of MAVDT, as well as a representative of the president of the republic. Fourth, Colombia's control organizations can discipline CARs for failure to implement plans or for abuse of office. Fifth, national authorities have some control over the salaries of CAR staff. Finally, in the past, MAVDT and other national institutions have contributed investment funds—or have allocated funds contributed by multilateral institutions—and this power of the purse has given them some sway over CARs' investment projects.

Several factors limit the effectiveness of these mechanisms, however. MAVDT has very poor information about the investment, policy implementation, and regulatory enforcement activities of CARs. In addition, levels of staffing in the national office of the Delegate *Procuraduría* for Environmental Affairs are not adequate to monitor or evaluate the performance of CARs, and the *Contaloría* is severely hampered by lack of data. As for regulations that mandate intensive planning at the regional level, previous evaluations have concluded that even when CARs do fulfill their planning requirements, they often do so simply to fulfill the letter of the law rather than to actually orient resource management. Finally, the current fiscal situation and a decline in multilateral funding severely constrain MAVDT's ability to cofinance investment.

10. Enforcement of environmental regulations by CARs is inadequate.

CARs are principally responsible for enforcing environmental regulations in Colombia. Unfortunately, a wide variety of environmental regulations in Colombia are not consistently enforced. For example, of the effluent fees that CARs charge to polluters, only one-third are actually collected (Gómez Torres 2003, 40). Enforcement varies markedly across CARs, across sectors, and across sizes and types of firms. Contributing factors include a lack of political will and inadequate access to police assistance, as well as several of the problems discussed in this section and in Blackman et al. (2004)—regulatory capture, low levels of human and technical capacity, poor information systems, reliance on voluntary regulation, and inadequate regulations.

11. Voluntary regulation used by CARs is often ineffective.

CARs' reliance upon voluntary clean production agreements and voluntary environmental guides has raised a number of serious concerns. Many voluntary clean production agreements appear to have simply legitimized and perpetuated noncompliance with existing command-and-control regulations. The legal standing and purpose of environmental guides is not clear. In particular, confusion exists in the regulated community about whether compliance with voluntary environmental guides is a substitute for compliance with actual regulations. Also, the guides promote abatement strategies that are not always the most appropriate.

E. Recommendations

We offer 12 recommendations to address the challenges facing CARs.

1. Improve data collection, management, and dissemination.

Because information is the cornerstone of improved environmental management within CARs—as well as within SINA as a whole—MAVDT should move quickly to improve data collection and management at the CAR level and collate and integrate these data nationally. Toward this end, MAVDT can undertake the following efforts. Perhaps most important, it can move quickly to establish a system of indicators of both environmental quality and CAR performance. It is essential that the indicators be limited in number and sufficiently simple so that the system can be implemented despite the modest data collection and management capacity expected to prevail in CARs in the medium term. It is also very important that the system be consistent across CARs to ensure that data from different CARs can be compared and aggregated at national level.

Second, MAVDT can work with CARs to improve their capacity to use the system of indicators. Third, as discussed in Blackman et al. (2004), MAVDT can improve management and analysis of data at the national level by clarifying the regulatory underpinnings of the Environmental Information System and improving its general management. Fourth, MAVDT can make the indicators an integral component of the planning process that requires CARs to formulate and disseminate 1-year, 3-year, and 10-year environmental plans. The indicators can be used to help CARs develop these plans and also help both CARs and national-level policymakers evaluate implementation efforts. Finally, for reasons discussed below, all data that CARs collect on environmental quality and the performance of environmental institutions should be freely and publicly available, and significant resources should be devoted to disseminating these data via the Internet and other means.

2. Improve priority setting by requiring CARs to undertake comparative risk assessments.

To improve CAR priority setting, MAVDT can require that each CAR periodically perform an assessment of the relative importance of various risks to human health and the environment in its territory. Furthermore, MAVDT can require that CARs use this comparative risk assessment to guide its allocation of financial, human, and technical resources. MAVDT can take specific steps to make these requirements feasible. First, as discussed above, it can improve data collection and management at the CAR level. Second, it can develop a standard methodology for comparative risk assessments that is practical given the capacity for data collection and analysis that will prevail among CARs in the medium term. Third, it can provide technical assistance and training in comparative risk assessment by, among other things, developing user-friendly training manuals and holding workshops. Fourth, it can develop means of certifying third parties to assist CARs in carrying out risk assessments. Finally, it can develop regulations requiring CARs to link the results of comparative risk assessments to the resource allocations included in their three-year action plans.

3. Strengthen the participation of representatives of civil society on CAR boards of directors.

To balance the influence of private-sector interests on CAR boards, MAVDT and CARs can seek to strengthen the participation of the members who represent civil society, including representatives of NGOs, MAVDT, departments, and the president of the republic. CARs and MAVDT can strengthen NGO participation by funding projects and programs to build NGOs' capacity at the local level, creating networks and associations among NGOs and between Colombian and international NGOs, and involving NGOs in CAR activities. In addition, a

number of broad-brush measures can help strengthen NGOs, including continuing to promote environmental education and ensuring free availability of environmental data.

Steps can also be taken to professionalize the representatives of public-sector institutions on the boards of directors, including representative of MAVDT, the departments, and the office of the president. For example, following on MAVDT's recent decision to establish an office of CAR management staffed with all of MAVDT representatives to CAR boards, other public institutions represented on boards of directors could develop similar offices staffed by a relatively small group of professionals hired and trained to serve in these positions. These professionals could be organized into a central office within each relevant public institution to maximize information sharing and learning. Ideally, CAR management offices of each of the public institutions would meet periodically to share lessons learned and coordinate their activities.

4. Require top CAR managers and members of boards of directors to meet minimum professional criteria as well as financial disclosure requirements.

Steps can be taken to professionalize and enhance transparency of CAR management and oversight. First, in accordance with recent reforms of the election process for directors general (Decree 3345 of 2004), MAVDT can establish national minimum professional criteria for other top positions in CARs. Individual CARs would be allowed to establish stricter criteria but not weaker ones. The principal aim is to ensure that top CAR staff and most members of boards of directors possess the technical qualifications and / or professional experience needed to perform their jobs effectively and to discourage hiring and promotion based on purely political criteria. The professional criteria should take into account the fact that regional diversity implies that different qualifications may be appropriate in different CARs. Independent third parties, such as universities and professional associations, should be responsible for assessing the extent to which candidates meet the criteria. Professional experience and education could substitute for each other in meeting the criteria. Even if the criteria are not legally binding, a voluntary system of evaluation and public disclosure may have a positive impact and serve as a first step toward a more comprehensive system.

Second, MAVDT can establish financial disclosure requirements for CAR senior managers—including directors general and most public-sector board members—as well as regulations governing what types of conflicts of interest disqualify candidates from service. Financial disclosures need to be vetted by a credible, independent qualified party, but they need not be publicly available.

5. Reconstitute CAR boards of directors.

Given the apparent weakness of NGOs on CAR boards of directors, one option for strengthening the voice of civil society in the medium term is to increase representation of technically competent, qualified individuals who meet minimum professional standards and financial disclosure requirements. For example, draft legislation introduced by the Uribe administration in 1993 proposed replacing two of the four mayors on the board of directors with a representative of the National Parks System, and a representative of the national university system.

6. Hold an annual public meeting of CAR and MAVDT representatives.

An annual meeting of MAVDT and CAR directors general that is fully open to the public could serve a number of purposes including: improving CAR-MAVDT coordination; disseminating best practices among CARs in order to raise average levels of regulatory capacity; and increasing transparency and information sharing. In addition, an annual meeting of the type described would enable CARs to publicly report on their activities, and would thereby create incentives for improved institutional performance.

7. Improve national-regional coordination.

MAVDT should aggressively explore new strategies for improving coordination between MAVDT and CARs. A necessary condition for the success of virtually any coordination mechanisms is the establishment of a system for collecting data on the institutional performance of CARs (the topic of a separate recommendation). These data are needed for planning coordinated activities, monitoring compliance with such plans, and monitoring overall institutional performance. Actively disseminating such data—or even just publicly disclosing it—can create strong incentives for compliance with coordinated plans and for improved institutional performance.

Beyond this general point about information, a number of more specific coordination mechanisms are available. These fall into two categories: "carrots"—i.e., rewards for cooperative behavior—and "sticks"—sanctions for non-cooperative behavior. Carrots are likely to be more effective in the case of resource-poor CARs while sticks are more likely to be effective in the case of resource-rich CARs. Among the mechanisms that involve sticks, one is to strengthen the capacity and authority of SINA's control organizations which, in theory, are responsible for ensuring that CARs activities comport with the law.

A second stick mechanism is to enhance MAVDT authority over CAR management and spending decisions. For example, standards and processes might be developed that allow MAVDT to undertake a periodic formal evaluation of CAR directors general and to remove them in the case of blatant violations of MAVDT policy directives.

Alternatively, or in addition, MAVDT might be endowed with the authority to approve certain CAR budget and / or investment decisions on the basis of a set of clear standards. To minimize the potential for bureaucratic morass, MAVDT would be given a limited time to approve or reject budgets. In addition, a formal dispute resolution mechanism could be established to facilitate the overall process.

Among possible coordination mechanisms that involve carrots, one option would be to enhance MAVDT's ability to cofinance investment projects at the regional level. In countries with a decentralized environmental structure, cofinancing is often the most important tool national authorities have to ensure national-regional coordination. One disadvantage of this approach is that it would be less effective with CARs that have relatively large amounts of self-generated funds.

National environmental funds are likely the most efficient and transparent means of enhancing cofinancing. MAVDT could rely upon existing mechanisms—the National Royalty Fund, the Environmental Compensation Fund, the National Environmental Fund (*Fondo Nacional Ambiental*, FONAM), and the National Fund for Environmental Action. However, as discussed in Section 8.2.4, these funds have significant structural characteristics that render them less than ideal for the purpose at hand: each fund alone has resources that might not be sufficient to have the desired impact; several of the funds have goals other than coordinating national-regional environmental management and / or entail legal restrictions that would leave MAVDT with limited discretion in deciding how to disburse funds; some have been plagued by poor management; and some have limited resources outside national appropriations. Given these constraints, MAVDT might consider efforts to consolidate and restructure the existing funds or create a new fund. Evidently, MAVDT is currently attempting to establish a consolidated application process for these funds, although the funds themselves would remain separate.

Ideally, the fund used to improve national-regional coordination—whether a modification of an existing mechanism or a new one—would have the following features: CARs would submit proposals for cofinancing to MAVDT, which would evaluate and select proposals using clear and transparent criteria. In establishing these criteria, MAVDT's broad aim would be to maximize net benefits (benefits to human health and the environment net of total costs) and also

to further national-regional coordination and reduce disparities across CARs in both regulatory capacity and access to environmental services. Thus, the proposal selection criteria would include such factors as the degree to which the project comports with national and regional environmental plans, the capacity of the particular CAR to implement the project, the level of environmental infrastructure in the particular CAR relative to other CARs, the need for capacity building in the particular CAR relative to other CARs, and the magnitude of the potential net benefits to human health and the environment from the proposed projects.

Conventional mechanisms would be used to ensure that project funds are well spent. First, to ensure full commitment to the project, CARs would be required to supply a significant percentage of capital from their own coffers. Second, they would be required to collect clear, transparent baseline data, establish performance milestones based on specific monitorable criteria, and provide periodic progress reports on the extent to which these milestones have been met. Finally, clear failure to meet milestones would disqualify a CAR from future cofinancing. Note that these mechanisms would help bolster MAVDT's ability to monitor CAR activities.

Finally, the annual meeting discussed above constitutes a mechanism for enhancing CAR-MAVDT coordination that involves both carrots and sticks.

8. Balance and rationalize distribution of financial resources across CARs.

The executive branch can take steps to balance and rationalize the distribution of financial resources across CARs. First, it can develop clear objectives and processes for allocating national resources to CARs. These objectives and processes should be subject to periodic revision to account for changing conditions and policy directions. Second, MAVDT can help low-income CARs build capacity for generating revenue by, for example, identifying and exploiting underutilized tax instruments. Finally, as discussed above, national environmental funds could be consolidated and rationalized.

9. Develop guidelines to minimize conflicts of interests arising from CARs' involvement in developing sanitation infrastructure.

Potential conflicts of interest arising from CAR involvement in developing sanitation infrastructure should be minimized. The most effective means of achieving this end would be to simply prohibit CARs from having any involvement in developing sanitation infrastructure. Although not unreasonable as a long-term policy goal, in the medium term, given the paucity of other sources of funds for sanitation infrastructure and consequent national pressures to use

CARs' self-generated funds for this purpose, this drastic measure may not be politically feasible.

A more practical approach in the short term may be to prohibit CARs from operating or owning sanitation infrastructure. Hence, their role in developing sanitation infrastructure would be strictly limited to providing cofinancing. Although it would not completely eliminate conflicts of interest, this prohibition would likely dampen them. Similarly, conflicts of interest could be dampened by requiring CARs to create independent administrative divisions to finance sanitation infrastructure.

10. Take action at the national level to resolve jurisdictional and financial disputes between AAUs and CARs.

Continuing jurisdictional and financial disputes between CARs and AAUs—including numerous court cases—have needlessly drained scarce resources, precluded cooperation between the two institutions, and sowed uncertainty, confusion, and mistrust in the regulated community. National-level authorities, including MAVDT and, if necessary, the legislature, should clarify lines of authority and financial relationships between AAUs and CARs and develop workable and efficient dispute resolution mechanisms. Because the situation is complex, a blue-ribbon panel of independent experts might be convened to develop more specific recommendations and build consensus around them.

11. Develop national guidelines governing staffing.

Measures can be taken to ameliorate the interrelated problems in CAR staffing, including clientelism, high rates of turnover, and reliance on contractors to perform important functions. First, MAVDT can develop rules prohibiting CARs from contracting out defined core functions. Second, it can establish professional standards for both permanent employees and, perhaps more importantly, contractors. Finally, it can introduce more flexibility into national guidelines governing the percentage of funding that can be devoted to operational spending.

12. Eliminate CARs that chronically perform poorly.

One option for improving the functioning of the regional environmental management systems in Colombia is to eliminate CARs that chronically perform poorly by consolidating them with contiguous well-functioning CARs. Unfortunately, until information management systems are improved, evaluating the performance of individual CARs will remain a difficult, subjective, and extremely contentious exercise. Once indicators and management systems are in place,

however, rules could be established mandating that CARs meet minimum performance standards.

The process of developing these standards could be closely tied to efforts (that are presumably now underway) to require CARs to set specific quantifiable goals in their three-year action plans and systematically monitor their progress. Ideally, this performance evaluation system would measure CARs' direct impacts on environmental quality—for example, the hectares they reforest and water pollution they reduce each year. In addition, the new system could take stock of process-related proxies for CARs' environmental impacts, such as the extent to which they complete planning activities, collect environmental quality data, and carry out monitoring actions.

CARs that chronically fail to meet minimum performance standards and cannot show good cause for this failure would be subject to elimination by consolidation. Procedures to carry out these activities would need to be established, possibly including some form of legislative approval. Even if never carried out, this threat could provide strong incentives for improved performance.

Unfortunately, a performance evaluation system involving such severe sanctions would create strong incentives for poorly performing CARs to block improvements in information management systems. To prevent this, the two policy initiatives could be staggered—the evaluation system could be initiated after information systems have been upgraded. Thus, this system would appear to be more practical in the medium or long term than the short term.

INSTITUTIONAL ANALYSIS OF COLOMBIA'S AUTONOMOUS REGIONAL CORPORATIONS (CARs)

1. INTRODUCTION

1.1. Background

Contracted in December 2003, this institutional analysis of Colombia's Autonomous Regional Corporations (*Corporaciones Autónomas Regionales,* CARs) is an input into the World Bank's Country Environmental Assessment of Colombia. As detailed in the World Bank Terms of Reference, the objectives of the study were to (i) analyze the design of CARs as per Law 99 of 1993; (ii) compare the variation in CARs' approaches to environmental governance and analyze good and bad practice cases; (iii) describe the institutional and social context of CARs and assess aspects of the social setting and institutional factors likely to affect the quality of environmental management; (iv) examine the effectiveness of the design and implementation of policies and procedures used for environmental management by CARs; (v) evaluate the effectiveness of CARs in terms of their major environmental functions; (vi) identify major institutional, administrative, and political challenges facing the regional environmental regulatory system in carrying out its environmental mandate; and (vii) report on the regional environmental regulatory system, illustrated by case studies, with recommendations on measures that would help the regional environmental regulatory system better carry out its environmental mandate.

Resources for the Future (RFF), a nonprofit research institute in Washington, D.C., carried out the study. The RFF team comprised Dr. Allen Blackman, Dr. Sandra Hoffmann, Dr. Richard Morgenstern, and Ms. Elizabeth Topping. This team worked closely with two Colombian consultants hired by the World Bank—Ing. Angel Esterling Lara and Lic. Juan Carlos García de Brigard.

1.2. Methods

In writing this report, the RFF team carried out four tasks, each involving the analysis of a different type or category of data:

Task 1. Analysis of the design of CARs. To evaluate the design of CARs, the RFF team reviewed and analyzed Colombia's 1991 Constitution, Law 99 of 1993, and related decrees.

Task 2. Analysis of documentary data on CARs. The RFF team reviewed and analyzed studies, reports, books, and articles bearing on the performance of the primary SINA institutions. These documents were provided by the World Bank and were collected by the RFF team from sources in both Colombia and the United States.

Task 3. Statistical analysis of CAR-level data. The RFF team collected, collated, and analyzed detailed CAR-level statistical data on socioeconomic and historical characteristics, performance, allocations of investment funds across environmental subsectors, environmental quality, financial resources, environmental funds, and human and technical resources. Methods used included presentation, manipulation and comparison of summary statistics, as well as simple multiple regression analysis.

Task 4. Case studies of four CARs. Time and resource constraints precluded an institutional analysis of all 33 of Colombia's CARs. Therefore, as directed in the Terms of Reference, the RFF team analyzed a small sample of CARs whose selection was guided by three considerations. First, we hoped to include CARs with diverse socioeconomic settings, institutional structures, and overall performances. Second, we were limited to CARs that were sure to be able to provide basic data. Finally, we chose CARs geographically situated to facilitate field research. Ultimately, we chose to focus on CORANTIOQUIA, CAR, CARDIQUE, and CRA.

The RFF team recognized from the outset that documentary evidence would not be sufficient to respond to the Terms of Reference for this study, for two reasons. First, by their nature, the questions addressed by this report are sensitive. For political reasons, frank evaluations of poorly performing government institutions are rarely written down. Second, as documented in our report (and in many other reports), reliable, consistent, and up-to-date data—needed to evaluate the performance of government institutions and track changes in environmental quality—are exceptionally scarce in Colombia. This study therefore relies upon original interview data as well as documentary data.

In early March 2004, the RFF team traveled to Bogotá, Medellín, Cartegena, and Barranquilla, where we interviewed 29 stakeholders representing 27 institutions. (Please see Appendix 1 for a complete list of interviews.)

Given the time and resource constraints associated with this study, the RFF team was able to interview only a limited sample of stakeholders. In addition, interviewees were not randomly selected and not all interviewees were asked the same questions. As a result, their opinions are not necessarily representative.

That said, we believe these data are valuable for understanding the performance of CARs, for at least three reasons. First, the interviewees were expressly selected to provide as much credible information as possible. More specifically, interviewees were selected to ensure adequate representation of CAR staff, private-sector CAR clients, nongovernmental organizations (NGOs), and national and territorial government offices charged with interacting with CARs. Second, in directing the interviews, the RFF research team used its professional judgment developed through experience with similar research. Third, and perhaps most important, the RFF team used its professional judgment both in summarizing interviewee comments and in drawing conclusions from them. Our interviewees expressed a wide range of views about critical issues. However, we recognize that some of the opinions our interviewees expressed may reflect subtle biases and politicking, a problem inherent in this type of interview research. Our strategy for dealing with this issue was to exclude some of the interview data in drawing conclusions. Specifically, we discounted all opinions except those that either represented a consensus among the stakeholders interviewed, or that comported with complementary documentary evidence.

1.3. Complementarities and overlap with SINA report

In addition to this "Institutional Analysis of Colombia's Autonomous Regional Corporations," the RFF team conducted a second component of the Country Environmental Assessment of Columbia—an "Assessment of Colombia's National Environmental System (SINA)." Because the purview of that study included an analysis of Colombia's major environmental public-sector institutions, including CARs, a portion of the research for it was used to write this report. Of particular value was field research conducted for the SINA report in December 2003. During this trip, two members of the present RFF team (Dr. Blackman and Ms. Topping), along with a third RFF researcher not involved with the present study (Dr. Sandra Hoffman), interviewed 34 SINA stakeholders, all in Bogotá, with a wide variety of positions, experiences, and perspectives. These stakeholders represent 18 institutions. The majority of the December 2003 interviews had some relevance for the present report. (Please see Appendix 1 for a complete list of interviews.)

A significant percentage of the SINA report deals with CARs and their relationship with MAVDT. In addition, some of the conclusions and recommendations in that report overlap with those for the present report. To make each report a self-contained, stand-alone document, we have included those sections here, either in part or in whole.

1.4. Organization of the report

The remainder of this report is organized as follows. **Chapter 2** presents a brief overview of the history of environmental and natural resource management in Colombia leading up to the 1991 Constitution. **Chapter 3** briefly describes the environmental provisions of the 1991 Constitution, discusses those provisions of Law 99 of 1993 that focus on CARs, summarizes major environmental legislation and regulation since the passage of Law 99, and offers a brief analysis of whether and how Law 99 facilitates good governance. **Chapter 4** very briefly reviews basic descriptive data on CARs, including geographic, historical, and socioeconomic characteristics. **Chapter 5** discusses the availability of, and systems for, managing data on environmental quality and institutional performance at the CAR level. **Chapter** 6 discusses the performance of CARs. First, we consider how well CARs perform their major functions and how effectively they use major regulatory instruments. Second, we use CAR-level data to analyze the overall performance of CARs. **Chapter 7** discusses CARs' priority setting and examines whether they allocate resources to the most pressing environmental problems. **Chapter 8** discusses the distribution of financial resources across CARs. It uses detailed CAR-level data to describe this distribution and shed light on the factors driving it. In a similar way, **Chapter 9** uses detailed data on the distribution of human and technical resources across CARs to describe and explain this distribution. It also discusses the problem of clientelism—that is, undue influence of politics on human resource management. **Chapter 10** discusses another problem that inhibits the performance of some CARs—regulatory capture, or the disproportionate influence of certain interest groups on CAR decision making. **Chapter 11** discusses conflicts of interest that arise from CARs' involvement in developing sanitation infrastructure. **Chapter 12** reviews evidence on problems related to CARs' relationships with other SINA entities, namely the Ministry of Environment (since 2003, *Ministerio del Ambiente, Vivienda y Desarrollo Territorial*, Ministry of Environment, Housing and Territorial Development, MAVDT), the Urban Environmental Authorities (*Autoridades Ambientales Urbanas,* AAUs), and municipalities. Finally, **Chapter 13** presents conclusions. The first section reviews the major findings of the report, and the second part offers recommendations.

2. INSTITUTIONAL HISTORY, 1952–1993

In many Latin American countries, environmental management institutions and capacity developed at the national level first, and much later at the regional level. This has not been the case in Colombia, however. Since the early 1950s, Colombian environmental management capacity has been split between the national and regional levels. This section provides a brief overview of the development of Colombian environmental institutions and capacity through 1993, when Law 99 created the National Environmental System (*Sistema Nacional Ambiental*, SINA). The first subsection focuses on the regional level and the second on national level.

2.1. Regional environmental management

Colombia's regional environmental management institutions are known as Autonomous Regional Corporations (*Corporaciones Autónomas Regionales*, CARs). Colombia's first CAR, the Autonomous Regional Corporation of the Valle del Cauca (*Corporación del Valle del Cauca*, CVC), was created in 1954 to promote integrated regional economic development (Ministry of Environment et al. 2002). CVC's geographic boundaries were defined by the Valle del Cauca watershed. The design of CVC was strongly influenced by contemporaneous thinking about development planning in North America and Latin America. CVC was modeled after the Tennessee Valley Authority in the United States but also reflected the growing popularity of integrated regional planning in Latin America—a trend encouraged by the influential Economic Commission for Latin America (Gómez Torres 2003).

Between 1960 and 1988, a total of 18 CARs were created. Watersheds eventually ceased to define the geographic boundaries of these institutions, in large part because each of Colombia's departments (*departamentos*) lobbied for its own CAR (Rodríguez Becerra 1994). During this period, national funding accounted for approximately half of CAR budgets. The other half was generated internally by, among other things, fees for the provision of sanitation and other services, environmental fees, and municipal property taxes.

Although the majority of the CARs focused their resources on infrastructure, land development, and ranching, their functions were, on the whole, quite varied and included electricity generation and transmission, telecommunications, transportation, flood control, sanitation, potable water, and cattle ranching (Sánchez Triana 1999). This diversity of functions may explain CARs' somewhat confused relationship to the national bureaucracy prior to 1993. They

were first attached to the Ministry of Economic Development (1960–1968), then to the Ministry of Agriculture (1968–1977), and finally to the National Department of Planning (*Departamento Nacional de Planeación*, DNP, 1977–1993). In 1987 President Virgilio Barco issued a decree that clarified the functions of CARs and transferred functions such as road infrastructure and telecommunications to other specialized entities. Nevertheless, CARs retained responsibility for both management of natural resources and economic development (Ministry of Environment et al. 2002).

As discussed in detail in Section 3, Law 99 of 1993 redefined the roles, functions, and jurisdictions of the CARs. Although CARs retained some of their economic development functions, they were essentially recast as environmental management authorities. Law 99 also established additional CARs, along with autonomous Sustainable Development Corporations (*Corporaciones de Desarrollo Sostenible*, CDSs), a similar regional authority in territories reserved for indigenous peoples, and Urban Environment Authorities (*Autoridades Ambientales Urbanas*, AAUs) in the cities with more than 1 million inhabitants.[1] This proliferation of regional environmental authorities ensured that the entire national territory was under the jurisdiction of a regional environmental authority.

2.2. National environmental management

2.2.1. Division of Natural Resources, Ministry of Agriculture, 1952–1968

Modern national environmental management in Colombia began in 1952 with the creation of the Division of Natural Resources within the Ministry of Agriculture. The division's mission was to ensure the rational development of natural resources such as forests and fisheries. Administration was centralized and funding was derived exclusively from the national budget, an institutional structure that was virtually universal in Colombia at the time (Gómez Torres 2003). Widely considered the first triumph of the country's "greens," the division managed to further conservation even as the Ministry of Agriculture promoted development of natural

[1] Today, Colombia has 33 CARs. One CAR was absorbed into another in the late 1990s. Colombia's four AAUs are the *Departamento Administrativo de Medio Ambiente de Bogotá* (DAMA) in Bogotá, the *Departamento Administrativo de Medio Ambiente de Cali* (DAGMA) in Cali, the *Departamento Administrativo de Medio Ambiente de la Oficina Area Metropolitana de Medellín* (AREA) in Medellín, and the *Departamento Administrativo de Medio Ambiente de Barranquilla* (DADIMA) in Barranquilla.

resources. Under the division's leadership, Colombia's first forest conservation regulations were issued, and seven sizable protected areas were created.

2.2.2. National Institute of Natural Renewable Resources, 1968–1993

In 1968, the government of President Carlos Lleras Restrepo created a new national environmental management institution called the National Institute of Natural Renewable Resources and Environment (*Instituto Nacional de los Recursos Naturales Renovables*, INDERENA) by fusing the Division of Natural Renewable Resources in the Ministry of Agriculture with a CAR, the *Corporación Autonoma Regional del Magdalena*. INDERENA, like the Division of Natural Resources that preceded it, retained an affiliation with the Ministry of Agriculture. Under INDERENA's leadership, Colombia made important advances in environmental management.

2.2.3. Environmental legislation and regulation

Significant new environmental regulations under INDERENA included the 1969 Forestry Law, a 1973 statute covering flora, and a 1977 statute creating the National Parks System. By far the most important new legislation, however, was the 1974 National Natural Renewable Resources and Environmental Protection Code, a comprehensive statute that remains one of the pillars of Colombian natural resource and environmental law. The code's 340 articles cover water, air, solid and hazardous waste, soil, flora, and fauna. It was one of the first environmental protection laws in the world to incorporate pollution fees and environmental impact assessments. The code's first regulatory decrees, issued between 1974 and 1978, dealt with a variety of topics, including the management of forestry reserve areas, the provision of environmental education, and the protection of wild fauna and hydrobiological resources (Ministry of Environment et al. 2002).

2.2.4. Pressures for institutional reform

INDERENA faced two important challenges. First, it had a small budget relative to its responsibilities. By end of the 1980s, Colombia's 18 CARs covered only a quarter of the national territory; INDERENA was completely responsible for environmental management in the remaining territory. Dr. Julio Carrizosa, an ex-INDERENA director, once pointed out that his organization had less than 5 pesos to protect each hectare of national territory, whereas CVC had more than 17,000 pesos per hectare (Ministry of Environment et al. 2002).

Second, like the Division of Natural Resources, INDERENA was constrained by its affiliation with the Ministry of Agriculture. INDERENA worked to protect the same natural resources that ministry offices sought to develop. Manuel Rodríguez Becerra, the first minister of Environment, points out that INDERENA was greatly weakened by "the secondary place that [it occupied in the Ministry of Agriculture and the conflict inherent in the fact that [the Ministry] was one of the principal users of natural renewable resources (1994, 16)."

Third, INDERENA—and environmental management generally—was weakened by the continued dispersion of environmental functions across many different national and regional organizations, including the Ministry of Health, the Ministry of Mining and Energy, the Maritime and Port Directorate, DNP, and the Institute of Hydrology, Meteorology and Land Suitability. The creation of INDERENA seems to have done little to rectify this situation. For instance, environmental licensing was transferred from INDERENA to the Ministry of Mining, while fishery management was transferred to a new National Institute of Fishing. Simultaneously, INDERENA gradually lost jurisdiction in the areas where 16 new CARs were created. According to Rodríguez Becerra, this dispersion amounted to a "slow death through dismemberment," a "process that was never planned" (Rodríguez Becerra 1994, 14–16).

In the mid-1980s, Colombian environmentalists and concerned stakeholders both within the fledgling environmental management bureaucracy and outside it formed an alliance, encouraged by the unprecedented international attention then being devoted to environmental issues in developing countries. In addition, it was spurred by increasing evidence of a rapid deterioration of environmental quality in Colombia (Rodríguez Becerra 1994). This new alliance lobbied for a major restructuring of environmental management in Colombia. INDERENA itself encouraged and participated in this effort. An important theme of the debate was whether and how to decentralize environmental authority, at the time a trend throughout Latin America (Dillinger and Webb 1999). A 1985 consulting study of environmental management in Colombia concluded that such decentralization was in order (Ministry of Environment et al. 2002). The study, which had been contracted by INDERENA, found that administration and management of natural renewable resources could be performed better at a regional level and proposed the creation of an administrative department to which CARs would be attached (Rodríguez Becerra 1994).

These currents culminated in INDERENA's proposal to create an independent Administrative Department of Natural Renewable Resources and the Environment *(Departamento Administrativo de Recursos Naturales)* that would raise the status of environmental management. The proposal

was controversial, however, and failed because it threatened the autonomy of the CARs (Ministry of Environment et al. 2002). Yet the alliance of environmentalists continued to call for the creation of a national entity charged with coordinating environmental management.

In November 1990, the César Gaviria Trujillo administration presented Congress with a bill to create a new national environmental system, including a national ministry that would coordinate the decentralized management. Discussions of the proposal coincided with the 1991 constitutional reform, which significantly changed the structure of governance in all sectors (see Section 3). The design of the proposed environmental system was adjusted in response to the passage of the new Constitution. The first important government documents on environmental policy reform—issued by the National Council on Economic and Social Policy (*Consejo Nacional de Política Económica y Social*, CONPES)—were approved in 1991 and paved the way for the creation of SINA in 1993.

3. CARS' LEGAL FOUNDATION

The two legislative pillars of Colombia's current environmental management system are the Constitution of 1991 and Law 99 of 1993. This chapter summarizes those provisions of each piece of legislation that are pertinent to Colombia's CARs and then considers whether and how these provisions facilitate the attributes of good governance, including transparency, accountability, national-regional coordination, stability, and conflict resolution. Blackman et al. (2004) contains a broader discussion of Law 99 and of the environmental provisions of the 1991 Constitution.

Note that when the Ministry of Environment (*Ministerio del Medio Ambiente,* MMA) was merged with the Ministry of Housing and Economic Development (*Ministerio de Vivienda y Desarrollo Económica,* MVDE) in 2003, all of MMA's functions and responsibilities were transferred to the Ministry of Environment, Housing and Territorial Development (*Ministerio del Ambiente, Vivienda y Desarrollo Territorial,* MAVDT). For the purposes of this report, MMA and MAVDT can be considered the same entity.

3.1. 1991 Constitution

3.1.1. Governance structure

A major motive of the 1991 constitutional reform was to establish a more decentralized and participatory government (Art. 1). Toward that end, the Constitution gives departments, municipalities, and CARs autonomy to plan and administer local policy (in coordination with national planning), pass local decrees and ordinances (Arts. 300 and 313), and impose taxes that are not transferable to the national level (Art. 362).

The Constitution did not abolish centralized, unitary government, however. Departments, municipalities, and CARs are all part of the executive branch of the national government (Art. 115). Furthermore, governors and mayors are elected by the public but are agents of the president and can be removed from office by the president (Arts. 260, 303, 314, and 315).

The CAR governance structure and relationship to the national government is similar to that of departments and municipalities. The Constitution gives Congress the power to create and regulate the functioning of CARs (Art. 150). It specifically requires that CARs be autonomous

(Art. 150). The Constitution created one CAR, the CAR del Río Grande de la Magdalena, with the specific purpose of developing and managing water resources.

3.1.2. Planning

The 1991 Constitution envisions a government with extensive planning responsibilities, including those related to environmental protection. It creates a national system of planning and requires the president to draft a National Development Plan (*Plan Nacional de Desarrollo*) and present it to Congress within six months of taking office (Arts. 339–344). This plan, which typically includes environmental provisions, must set forth long-term goals, medium-term priorities for action, and short-term strategies for implementation. The territorial governments are required to develop plans in consultation with the national government under the advice of territorial planning councils (Art. 339). Law 99 adopted the same general planning structure for CARs.

3.1.3. Fiscal resources

The Constitution creates a dedicated revenue base for the environmental protection activities of the government. Municipalities must transfer a percentage of municipal property taxes to CARs for environmental management (Art. 317). The Constitution also creates the National Royalty Fund from the proceeds of a severance tax on the exploitation of nonrenewable resources. The tax is targeted at ecological preservation in the departments and municipalities where the extractive activities occur (Arts. 360–361).

3.1.4. Public participation

The 1991 Constitution envisions a central role for individual citizens and nongovernmental organizations in formulating and implementing environmental policy. In addition to having a collective right to a clean environment (Art. 79), citizens have an express duty to protect natural resources and the environment (Art. 95.8).

The Constitution creates three causes of action through which citizens can intervene in the Colombian courts to protect the environment. First, any citizen or group of citizens may bring a popular action *(acción popular)* to protect their collective right to a clean environment, even if they cannot demonstrate direct, personal damage (Art. 88). Second, any person may bring a compliance action *(acción de cumplimiento)* to ensure that laws—including environmental laws—are upheld (Art. 77). Finally, the Constitution allows the law to establish cases in which an

action requesting injunctive relief *(acción de tutela)* can be brought to prevent violation of fundamental rights (Art. 86). The Constitution also requires that the law establish those cases in which an *acción de tutela* can be brought to protect "the collective interest" (Art. 86). The Constitutional Court of Colombia has interpreted the Constitution to allow an *acción de tutela* to protect the right to a clean environment where environmental deterioration threatens human health. This has proven to be an important tool in environmental protection, since it provides virtually immediate injunctive relief—courts must issue a decision within 10 days.

Aside from those mechanisms of participation, which depend on access to courts, the 1991 Constitution guarantees participation of the community in decisions that may affect it and states that an essential purpose of government is to facilitate such participation (Art. 2). It deals specifically with implications of these provisions for the environmental sector. It stipulates that the state has a duty to provide citizens with sufficient understanding about environmental protection to enable them to fulfill their duty to protect the environment (Art. 67). Also, it specifically requires adoption of statutes that guarantee community participation in decisions that affect the environment (Art. 79).

The Constitution creates several general mechanisms for public participation, including the right to petition public authorities (Art. 23) and public hearings, open meetings, referendums, and standard participation in elections (Art. 103). For the most part, the Constitution does not specify precisely how these mechanisms will be implemented. In the case of the *Contraloría*, however, the Constitution does require adoption of laws that create systems to allow citizens to monitor public fiscal management at all levels of government.

3.2. Law 99 of 1993

Law 99 creates Colombia's National Environmental System (*Sistema Nacional Ambiental*, SINA), a "set of orientations, norms, activities, resources, programs and institutions that allow the implementation of general environmental principles" (Art. 4). Consistent with the Constitution of 1991, this management system was to be decentralized, democratic, and participatory. As discussed in detail in Blackman et al. (2004), for heuristic purposes, SINA may be thought of as a management system made up of institutional actors, coordination and planning mechanisms, mechanisms for public participation, legal norms, mechanisms for implementing and enforcing policy, and financial resources.

Although Law 99 assigns the Ministry of Environment (*Ministerio del Medio Ambiente*, MMA) the role of leading and coordinating environmental management in Colombia, arguably, SINA's

most important institutional actors are its regional environmental authorities—CARs, AAUs, and Sustainable Development Corporations (*Corporaciones de Desarrollo Sostenible*, CDSs)—which are assigned the role of implementing environmental policy. For convenience, for the remainder of this section the acronym CAR will be used to refer to all three types of regional environmental authorities. In the following subsections, we summarize the provisions of Law 99 pertinent to CARs, primarily Titles VI and VII.

3.2.1. Broad function

Law 99 defines CARs as corporate entities with public charters endowed with fiscal and administrative autonomy and comprised of territories with ecosystem, hydrological, geopolitical or other commonalities. Their broad function is to manage natural resources within their territories, and to promote sustainable development according to policies established by MMA (Art. 23).

3.2.2. Governance

Law 99 creates a three-tiered governing structure for the CARs: a corporate assembly (*asemblea corporativa*), a board of directors, and a director general (Art. 24).

The corporate assembly is an oversight body made up of legal representatives of all the territorial governments in the geographic jurisdiction of the CAR. The assembly elects the CAR's comptroller as well as key members of its board of directors. It conducts an annual financial review, approves management reports, and has the power to adopt CAR-level environmental regulation subject to the approval by MMA (Art. 25).

The board of directors is the CAR's administrative authority. The board comprises the governor of each department represented in the CAR (or their delegates); a representative of the president of the republic; a representative of MMA; up to four mayors elected by the corporate assembly; two representatives of the private sector; one representative of indigenous or black communities; and two representatives of local environmental NGOs. The mayors are elected to one-year terms by the corporate assembly, ideally in such a way as to represent all the departments and regions of the CAR. The NGO representatives are elected by NGOs. One of the departmental governors (or her delegate) serves as the board's chair (Art. 26).

The board of directors is responsible for proposing new rules to the corporate assembly; hiring; arranging external credit; determining the internal administrative structure of the CAR;

approving a general plan of activities for the CAR; helping establish or support various associations and functions; specifying contracting standards; authorizing the delegation of CAR function; and naming the CAR director general to manage day-to-day operations (Art. 27).[2]

Elected to a three-year term, the general director is the CAR's executive authority. Their specific functions include directing, coordinating and controlling CAR activities; seeking approval from the board of directors for internal regulations, budgets, plans, programs, and staffing; ensuring that the board's decisions and agreements are carried out; serving as the CAR's legal authority; hiring and firing; administering funds; and reporting to MMA (Art. 29)

3.2.3. Functions

Article 31 of Law 99 assigns to CARs the following 32 functions:

1. executing national policies, plans, and programs on environmental matters;
2. serving as the supreme environmental authority in their areas of jurisdiction;
3. promoting public participation in environmental protection activities;
4. coordinating the preparation of environmental plans, programs, and projects by all of the SINA entities in their areas of jurisdiction;
5. ensuring that environmental considerations are factored into decisionmaking by all the entities within their areas of jurisdiction;
6. establishing contracts and voluntary agreements with entities in their jurisdictions with the goal of promoting environmental protection;
7. conducting and promoting research on environmental issues;
8. promoting environmental education programs;
9. granting concessions, permits, authorizations and licenses for the use, exploitation, and mobilization of resources or activities that can affect the environment;

[2] Prior to Law 99, CAR directors general were appointed by the director of DNP.

10. establishing regulations governing the discharge, transportation, or disposal of materials that can affect the environment (which must be at least as stringent at those established by MMA).
11. overseeing activities involving nonrenewable resources;
12. overseeing activities involving renewable resources;
13. collecting fees and tariffs for the use of renewable resources;
14. overseeing mobilization, processing, and commercialization of renewable resources;
15. administering any national natural park system areas delegated to the CAR's control by MMA;
16. creating or eliminating districts of integrated management and soil conservation, regional forest reserves, and natural parks;
17. imposing sanctions when environmental protection norms are violated;
18. establishing norms for managing watershed basins;
19. promoting irrigation, drainage, flood control, and land recovery;
20. executing projects needed to protect, decontaminate, or recover the environment and natural resources;
21. executing projects for the sustainable use of natural resources and the environment in indigenous and black communities;
22. developing and operating an environmental information system in their areas of jurisdiction;
23. undertaking disaster prevention and control;
24. transferring technology from scientific research;
25. imposing and collecting various taxes;
26. advising territorial entities on developing environmental projects funded by the National Royalty Fund;

27. when necessary, acquiring private property needed to execute projects;
28. promoting and executing water provision programs for indigenous and black communities;
29. supporting territorial entities in their planning functions;
30. carrying out all functions previously delegated to other authorities in natural resource and environmental matters and not explicitly assigned to other entities under the current law;
31. in concordance with municipalities and districts, engaging in land-use planning and zoning; and
32. delegating the exercise of certain of their functions.

3.2.4. Creating and sanctioning of CARs

As noted in Section 2, Law 99 created regional environmental authorities—21 new CARs and 8 new CDSs (Art. 33). Table 4.1 indicates which CARs were created by Law 99.

3.2.5. Revenue

Title VII of Law 99 provides CARs with independent sources of revenue, including economic instruments, taxes, fees, fines, and environmental funds.

Economic instruments. Law 99 establishes, or refines, three economic instruments for the dual purpose of generating revenue and creating incentives for emissions reductions. First, it requires CARs to impose effluent fees (tasas retributativas) on all sources of air, water, or soil pollution (Art. 42). In addition, it requires CARs to impose compensation fees (tasas compensatorias) on natural resources users to help defray the expenditures needed to maintain these resources (Art. 42). Finally, it requires CARs to impose a charge, set by the national government, on all uses of water. The revenue from this charge is to be used to protect and renovate water resources (Art. 43). These three fees are an explicit application of Article 338 of the Constitution, which allows the government to impose fees to recuperate the costs sustained by—or the benefits provided by—government action. Law 99 mandates that all of the fees are to be based on a calculation of the social benefits and costs of either emissions reductions—in the case of effluent fees—resource use—in the case of compensatory and water fees (Arts. 42 and 43).

Fiscal instruments. Law 99 also provides for a number of purely fiscal (versus economic) mechanisms designed to provide revenue for environmental management. It mandates that between 15% and 26% of the municipal property tax be used to fund the environmental management activities of the CARs. At the initiative of the mayor of the affected municipality, the municipal council must determine each year the percentage of the property tax to be transferred to the CAR. The law specifies that a CAR containing an urban area with more than one million inhabitants must spend half of its revenues from property taxes on environmental investments inside the urban zone, a provision that, as discussed below, has since been repealed (Art. 44).

Law 99 also stipulates that electricity generators must pay to CARs a gross tax on their power sales. Hydroelectricity generators must pay a 6% tax, half of which goes to the CAR that has jurisdiction over the hydrographic basin associated with the power plant (the other half is paid to the municipalities located in this basin). Thermal power generators must pay a 4% tax, 63% of which (2.5% of power revenues) is paid to the CAR where the plant is located (the remainder goes to the municipality where the plant is located). Law 99 mandates that a maximum of 10% of the revenue from electricity generation can be used for operational expenses of the CAR (Art. 45).

Environmental funds. Law 99 mandates that CARs receive funds from the National Royalty Fund established by the 1991 Constitution (Const. Arts. 360 and 361; Law 99 Art. 46). Law 99 also creates two environmental funds that can be used to support the work of NGOs and the private sector—FONAM and *Fondo Ambiental de Amazonia*. These funds were meant to support a wide range of environmental activities by the private sector and territorial governments (Arts. 87–96).

Other sources of revenue. Other sources of CAR revenue mentioned in Law 99 include fines, a percentage of damages awarded by courts in *acciones populares*; a percentage of fines imposed by territorial authorities for violations of environmental law, appropriations from the national budget; and fees from licenses, permits, authorizations, and concessions (Art. 46)

All of the revenues generated by taxes created under Law 99 are subject to oversight by the *Contraloría General* and the *Contralorías* of the CARs, departments, and municipalities (Art. 48).

3.2.6. Relationships with territorial governments

Although CARs are the principal regional environmental authorities within SINA, territorial governments—principally departments and municipalities—also play a significant role. In general, Law 99 requires both departments and municipalities to support CARs and one another in implementing environmental programs and projects. Both departments and municipalities must coordinate their planning activities with CARs and with the National Development Plan and must implement national environmental policy as it affects their jurisdictions (Art. 63).

Law 99 defines the relationship between the principal government entities in SINA as a hierarchical structure in which CARs and territorial governments are subordinate to MMA in environmental matters; the departments and municipalities, in turn, are subordinate to the CARs (Art. 63). Rulemaking must adhere to the subsidiary principle—that is, requirements adopted by lower levels of government cannot be weaker than nor weaken those of higher levels of government (Art. 63).

With regard to the specific role departments, Law 99 mandates that these territorial entities provide financial, technical, and administrative support to the CARs and municipalities in their jurisdictions to carry out environmental programs. Within their jurisdictions, departments are responsible for monitoring and enforcing environmental regulations. They also have responsibility for managing irrigation, drainage, land recovery, and flood control in coordination with CARs and municipalities in their jurisdiction (Art. 64).

With regard to the specific role of municipalities, Law 99 mandates that these territorial entities develop environmental programs and projects in such areas as sanitation, wastewater treatment, and solid waste disposal. Municipalities also have the power to pass ordinances necessary for environmental protection. Finally, municipalities play an important role in monitoring and enforcing national and regional environmental regulations. Law 99 requires the National Police to create a specialized unit of Environmental and Natural Resource Police charged with the assisting environmental and territorial authorities in enforcing environmental and natural resource law (Art. 101). In addition, under the Constitution, mayors are responsible for supervising the National Police assigned to their municipality. CARs depend on the cooperation of both the National Police and majors in taking enforcement actions. Municipalities are legally required to provide this support (Art. 65).

3.2.7. Instruments of governance

CARs—and SINA institutions in general—rely on several instruments of governance to design and implement environmental policy, including laws and implementing decrees, enforcement actions, planning processes, fiscal instruments, and mechanisms for citizen participation (MMA et al. 2002).

Laws and implementing decrees. Environmental law in Colombia is based principally on three documents: the 1991 Constitution; the National Renewable Resources and Environmental Protection Code (Decree Ley 2811 de 1977 and its regulations); and Law 99 of 1993. The Constitution and Law 99 lay out the structure of the management system and create a set of planning and management instruments. The National Renewable Resources and Environmental Protection Code and its implementing decrees lay out much of the substantive content of Colombia's environmental law.

Enforcement actions. Law 99 of 1993 grants police power to CARs (as well as to MMA and the territorial governments) for the purpose of imposing sanctions to enforce environmental law (Art. 83). Law 99 provides these institutions with a wide range of mechanisms for enforcing environmental laws, including warnings; fines; suspension of environmental licenses, concessions, permits, or authorizations; power to close or demolish a business; and seizure of products or equipment (Art. 85).

Licensing. Law 99 mandates that any activity that could generate serious environmental damages or significantly modify the landscape requires an environmental license (Title VIII). Three types of institutions—MMA, CARs, and some territorial governments—have the authority to grant environmental licenses (Art. 51). CARs have environmental licensing authority for projects whose impacts are limited to their geographic territory, while MMA has authority for licenses for large-scale activities or activities that have a national impact (Arts. 52 and 53).[3] CARs may delegate this authority to other territorial governments in their jurisdiction (Art. 54). Municipalities and metropolitan areas with populations over one million have the power to grant licenses within their jurisdictions (Art. 55).

[3] Activities that have a national impact are defined to include licenses for petroleum exploration, extraction, refining, or transportation; large mining projects; large dam projects; large energy projects; construction of large ocean ports, international airports, or other large transportation projects; construction of large irrigation districts; production of hazardous or toxic materials subject to international conventions; projects that affect national parks, involve introduction of potentially invasive foreign species, or involve generation of nuclear energy (Law 99 Art. 52).

The basic procedure for obtaining a license is the same at all levels of government. When it appears that an environmental license may be needed, the party planning the activity must notify the appropriate environmental authority. The authority then determines whether an environmental impact study must be completed before the party can apply for an environmental license (Art. 57). Requests for a license must be presented to the appropriate environmental authority together with an environmental impact study if one is required (Art. 58). Law 99 provides a detailed timeframe under which environmental authorities must decide whether to grant the license. Licenses may be revoked by the granting body for noncompliance (Art. 62).

Planning. Decrees 1768 and 1865 under Law 99 require CARs to conduct annual planning exercises and to develop short-, medium-, and long-term plans. These plans are to be consistent with national environmental and natural resource planning efforts (Art. 31). CARs are required to oversee environmental planning activities of the other territorial governments with a goal of harmonizing environmental management in their jurisdictions. Law 99 requires that these territorial entities coordinate environmental and natural resource aspects of their broader development planning efforts with the CARs (Art. 68).

Public participation mechanisms. Law 99 provides numerous opportunities for public participation at the CAR level, both in the formulation of environmental policy and in its implementation and enforcement. The primary mechanism for public participation in the policy formulation is representation of various interest groups, including NGOs, territorial governments, and indigenous and black communities, on CAR oversight institutions—the corporate assembly and the board of directors (Art. 26).

The primary mechanisms for public participation in policy implementation and enforcement (as opposed to policy formulation) are intervention in licensing actions, public hearings over licenses, and access to the court system. Title X of Law 99 deals with public participation in administrative actions by CARs (and other environmental authorities) related to expediting, modifying, or canceling an environmental permit or license, as well as imposing or revoking sanctions for failure to comply with environmental laws. This title allows anyone to intervene in such administrative actions (Art. 69). It mandates that CARs must keep records of such administrative actions and provide them to anyone who requests them in writing (Arts. 70 and 71). It stipulates that a wide variety of entities and authorities, including the *Procuraduría*, MMA, and mayors, may call for a public hearing about environmental permits and licenses, and it holds that the decision of the CAR should be motivated by the interventions and data

presented in the hearing (Art. 72). Furthermore, Title X states that all persons have a right to information related to activities that endanger human health and the environment and to information on the use of financial resources in environmental management (Art. 74). Finally, Title X mandates that administrative actions on matters related to indigenous and black communities will be taken subject to consultation of the representatives of these communities (Art. 75).

Law 99 reinforces legal remedies established in the 1991 Constitution. Any person may demand compliance with environmental statutes or regulations in a popular action (Art. 77). MMA must be informed of all popular actions brought to enforce an environmental right and may intervene in these actions (as may the governmental entity responsible for the affected natural resource) (Art. 75).

3.3. Major developments since Law 99: Changes in the planning process (Decree 48 of 2001)

Coordinating CAR planning efforts has proven a central challenge in implementing Law 99. Law 99 requires the CARs to develop short-, medium-, and long-term plans. By 1999, however, only a third of the CARs had developed the capacity to conduct these exercises. In 1999, DNP and MMA undertook a formal consultation to evaluate CAR planning. The consultation concluded that CARs tended to conduct planning exercises simply to fulfill their legal obligations, rather than to actually orient resource management. The DNP-MMA consultation also noted little consistency in the methods CARs used to develop their long-term and medium-term plans, and little relationship between these two efforts. Finally, it identified a tendency of CARs to formulate goals that were not easily quantifiable. As a result, MMA evaluation of the success of management efforts was difficult (Decree 48 of 2001).

In light of the 1999 DNP / MMA consultation, MMA began a process of strengthening regional environmental planning. The new approach provides explicit guidelines on the content of long-, medium- and short-term plans. It requires CARs to draft a 10-year action plan (*Plan de Gestión Ambiental Regional*, PGAR) that is coordinated with the National Development Plan (*Plan Nacional de Desarrollo*) drafted by the executive branch. In addition, each CAR director general is required to draft a 3-year action plan (*Plan de Acción Trianual*, PAT) covering his or her 3-year tenure, as well as annual investment operating plans (*Planes Operativos Anuales de Inversiones*, POAIs) for each year of the term.

The PATs must contain (i) a general statement of the long-term vision for environmental management in the CAR, objectives of the CAR administration, and strategies for coordinating CAR actions with national policies, the PGAR, and territorial plans; (ii) an evaluation of environmental conditions in the CAR that follows diagnostic guidelines developed in the PGAR; (iii) a plan of actions and programs that will carry out the 10-year plan; (iv) a program-by-program financial plan with an annual projection for revenues and expenditures identifying specific sources of revenue; and (iv) a process of monitoring and evaluation with indicators that permits the CAR to monitor progress toward and completion of established objectives and goals (Decree 48 of 2001). The POAI must specify concrete projects and specific actions that will be undertaken to carry out the triennial plan. These actions include both investment and monitoring and enforcement. The POAI links the planning process to the CAR's annual budgeting process.

The reforms in the planning process extend to the departments, municipalities, and districts as well. These entities are required to formulate development plans that take into consideration the CAR's PGAR.

3.4. Analysis

This section considers whether and how Law 99 facilitates selected attributes of good governance (identified in the Terms of Reference for this study): transparency, accountability, national-regional coordination, balancing of regulatory and project investment responsibilities, administrative stability, adequacy of (technical, administrative and financial) resources, and adaptive management.

3.4.1. Transparency and accountability

Law 99 specifies at least five mechanisms that serve to enhance transparency and accountability: CARs' three-tiered governance structure, CARs' planning requirements, national and local control organizations, the courts, and provisions for public intervention in administrative actions.

Governance structure. As discussed in Section 3.2.2, the governance structure mandated by Law 99 establishes two institutions to oversee CAR functioning—the corporate assembly and the board of directors. Each is composed of parties that represent civil society and that, in principal, can help ensure that CARs carry out their assigned functions and are not captured by private-sector interest groups. In addition, the corporate assembly and board of directors are, in

principal, endowed with considerable oversight powers. Comprising representatives of all of the territorial governments in the CAR's jurisdiction, the corporate assembly conducts an annual financial review, approves reports of CAR management, elects key members of the board of directors, and approves CAR-level environmental regulations. The board of directors, which includes representatives of president of the republic, the Ministry of Environment, NGOs, and indigenous and black communities, is responsible for administering funds, approving the CAR's general plan of activities, specifying contracting standards, and hiring and firing.

Planning requirements. As discussed in Section 3.3, Law 99 and subsequent decrees mandate that CARs formulate long-, medium-, and short-term action plans and submit them to the Ministry of Environment. Presumably, these plans provide the ministry with a means of controlling CAR activities and, in particular, ensuring that they comport with the National Development Plan.

Control organizations. Law 99 assigns important oversight functions to Colombia's control organizations—the *Procuraduría* and the *Contraloría.* It creates an office within the *Procuraduría* dedicated specifically to environmental concerns: the Delegate *Procuraduría* for Environmental Affairs is responsible for protecting the environment by conducting investigations and by intervening in judicial, administrative, and police actions either directly or through the Public Defender's Office. Law 99 also permits municipal and district councils to create Delegate *Procuradurías* for Environmental Affairs at the local level to which the national office may delegate functions (Art. 97). As mandated in the Constitution, the *Contraloría* is responsible for fiscal oversight of all government agencies, including MMA and CARs, and for presenting an annual report to Congress on the state of the country's environment.[4]

Courts. As noted above, Law 99 reinforces legal remedies established in the 1991 Constitution.

Intervention in administrative actions. As discussed in Section 3.2.6, Title X of Law 99 creates mechanisms for public participation in administrative actions by CARs (and other environmental authorities) related to expediting, modifying, or canceling an environmental permit or license, as well as imposing or revoking sanctions for failure to comply with environmental laws. It allows for public hearings on such actions, directs CARs to take input

4 Under Law 42 of January 26, 1993, the Contraloría is also required to prepare a quantitative cost-benefit analysis of most environmental projects.

provided in such hearings into account in making decisions, and mandates that CARs make records of such available to the public.

Weaknesses of existing provisions. Many of the transparency and accountability mechanisms that Law 99 provides have significant weaknesses. The effectiveness of the governance structure of CARs as a mechanism for ensuring transparency and accountability depends on the political strength and technical competence of the members of the oversight institutions. Such strength and competence are not assured. For example, Law 99 mandates representation of nongovernmental organizations on CAR boards of directors. Yet nothing in Law 99 guarantees that this participation is meaningful and is not captured by either political interests or an administrative authority.

The effectiveness of planning requirements as a mechanism for ensuring transparency and accountability depends on the ability of the Ministry of Environment to monitor the activities and performance of CARs. As discussed below (Section 5), however, Colombia's national environmental information system is clearly inadequate. Reliable environmental quality data are relative sparse. Thus, MMA is not able to monitor the impact of CAR activities.

The effectiveness of intervention in administrative actions as a mechanism for ensuring transparency and accountability is severely hampered because Law 99 mandates only that CARs "take into account" input provided in these hearings. It does not require them to show how they have done this or even to respond to this input in any formal way.

Missing provisions. In addition to weaknesses in those transparency and accountability provisions that Law 99 does establish, the law fails to provide mechanisms that have proven important in other countries. Most importantly, neither Law 99 nor related legislation (Law 489) provides the legal underpinnings for a meaningful process of prior notice and comment in policy formulation. The 1991 Constitution recognizes the need for citizens in a democracy to be informed about deliberations over new laws by requiring that proposed legislation before Congress be published in the *Dario Legal.* However, there is no legal requirement that the public be informed that an administrative authority is contemplating development of rules of general applicability that (like laws passed by Congress) are legally binding. In addition, there is no requirement that administrative authorities give the public an opportunity to comment on proposed laws and rules, or that this authority consider these comments in making its decisions.

In general, public participation in a democratic system requires open access to the rule-making process. It is not possible to know *a priori* who in the public will be affected by a new law. Standard guidelines for national public participation in environmental management (such as those developed by the Access Initiative) favor the creation of mechanisms that do not specify which members of the public should participate, but rather provides all members of the public with a means of being involved in the making of decisions that affect them (Access Initiative 2004). Experience in other countries has shown that public input into environmental rule-making is needed for good environmental governance not only to ensure fair representation of civil society, but also because environmental regulators require technical information that is in the hands of members of the public—including the regulated industry and scientists.

3.4.2. National-regional coordination

The design of Law 99 virtually ensures inadequate national-regional coordination. As mandated by Law 99, CARs have responsibility for implementing national policy at the local level. Yet certain features of Law 99 tend to inhibit this function. Most importantly, CARs are endowed with considerable fiscal and political autonomy—they have locally elected leaders and significant revenue streams that are independent of the national government.[5] As a result, they are often able to flout national policy directives with near impunity. In addition, CARs are not truly democratic local governments responsible primarily to local citizenry. Such an arrangement might provide stronger electoral oversight of their activities.

The Constitution and Law 99 provide a variety of mechanisms for national control over CARs activities. First, CARs are required to submit 10-year, 3-year, and 1-year action plans that tie in with the National Development Plans drafted by the executive branch. CARs may be sued in court, and CAR directors general may be removed from office for failure to comply with planning requirements or failure to carry out their PATs. Second, the National Department of Planning must approve CARs' investment projects. Third, CARs' boards of directors include representatives of MMA and the president of the republic. Fourth, Colombia's control organizations can discipline CARs for failure to implement plans or for abuse of office. Fifth, national authorities have some control over the salaries of CAR staff. Finally, in the past, the

[5] In this sense CARs embody elements of a unitary system of governance and a national system of governance without really falling into either category, a structure that inevitably creates conflict and confusion. CARs are neither regional administrative offices of a national environmental ministry nor local governments.

Ministry of Environment and other national institutions have contributed investment funds—or have allocated funds contributed by multilateral institutions—and this power of the purse has given them some sway over CARs' investment projects.

However, as discussed in Blackman et al. (2004), in practice, a number of factors limit the effectiveness of these coordination mechanisms is limited. The Ministry of Environment has very poor information about the investment, policy implementation, and regulatory enforcement activities of CARs. In addition, levels of staffing in the national office of the Delegate *Procuraduría* for Environmental Affairs are not adequate to monitor or evaluate the performance of CARs, and the *Contaloría* is severely hampered by lack of data. As for regulations that mandate intensive planning at the regional level, even when CARs do fulfill their planning requirements, they often do so simply to fulfill the letter of the law, rather than to actually orient resource management. Finally, as discussed in Section 4, the current fiscal situation and a decline in multilateral funding severely constrains MAVDT's ability to cofinance investment.

3.4.3. Balance of regulatory and project investment responsibilities

As discussed in Section 2, CARs originated as entities whose main function was to promote integrated regional development by, among other things, financing, building, and operating infrastructure, such as irrigation and water distribution facilities. Over time, however, CARs increasingly assumed environmental management functions. Law 99 of 1993 made environmental management the principal function of CARs: of the 32 functions that Article 30 assigns to CARs, the vast majority deals with environmental management. Furthermore, Law 99 assigned territorial entities—municipalities and to a lesser extent territories—primary responsibility for developing sanitation infrastructure (Arts. 64 and 65). However, Article 30 also assigns CARs some responsibility for developing certain types of infrastructure. For example, Clauses 19–21 of Article 30 assigns CARs responsibility to:

> Promote and execute irrigation, drainage, flood control, water management, and land recovery projects needed for the defense, protection and management of watershed basins in the territory of its jurisdiction;
>
> Execute, administer, operate and maintain in coordination with the territorial entities, projects, sustainable development programs and infrastructure works necessary for the defense, protection, decontamination and recovery of the environment and natural renewable resources;

> In coordination with indigenous communities and authorities of the lands traditionally inhabited by black communities, to which Law 70 of 1993 refers, advance programs and projects for sustainable development and management, exploitation, use and conservation of natural renewable resources and the environment.

In addition, Clause 6 of Article 64 assigns departments responsibility for infrastructure development jointly with CARs. Departments are responsible

> To promote, co-finance or to execute, in coordination with the entities, directors and executing agents of the National System of Land Adaptation and with the CARs, irrigation, drainage, flood control, water management, and land recovery projects needed for the defense, protection and management of watershed basins.

Clause 9 of Article 65 assigns municipalities sole responsibility for sanitation infrastructure. Municipalities are responsible

> To execute projects related to the decontamination of water affected by the effluents of the municipality, as well as programs for the disposal, elimination and recycling of solid and liquid wastes and air pollution control.

However, Clause 10 of Article 66 assigns municipalities and CARs joint responsibility for other types of infrastructure. Municipalities are responsible

> To promote, co-finance or to execute, in coordination with the entities, directors and executing agents of the National System of Land Adaptation and with the CARs, irrigation, drainage, flood control, water management, and land recovery projects needed for the defense, protection and management of watershed basins and micro-basins.

Hence, Law 99 effectively assigns to CARs dual responsibility for environmental management and infrastructure development. This dual responsibility creates conflicts of interest: CARs are responsible both for developing infrastructure projects and for ensuring that they comply with environmental laws and regulations. For example, under Law 99, a CAR can build, manage, and operate a wastewater treatment facility and can also be responsible for ensuring that the facility complies with discharge standards and pays appropriate emissions fees. In such a case,

incentives for stringent enforcement are clearly compromised.

Law 99 does not explicitly recognize or address this conflict of interest—a serious shortcoming. However, in theory, the general provisions of the law aimed at ensuring accountability and transparency could be used mitigate it. These include oversight by the CAR's corporate assembly and board of directors and by national and local control organizations; planning requirements that tie CAR activities to the National Development Plan; public access to courts; and public participation in CAR administrative actions. As discussed above, however, many of these mechanisms have significant weaknesses.

3.4.4. Adequacy of financial, technical, and administrative resources

Of the different types of financial, technical, and administrative resources CARs need to carry out their functions, Law 99 focuses explicitly only on financial resources. As discussed in Section 3.2.5, Title VII of Law 99 provides CARs with a variety of independent sources of revenue, including economic instruments, taxes, fees, and fines. These financial resources are not evenly distributed across CARs, however. Quantitatively, CARs' most important revenue sources are property taxes and energy taxes. The drivers of these tax revenues—urbanization and endowments of energy resources—are far more substantial in some CARs than in others. The clear implication is that self-generated revenue of some CARs may be inadequate.

The framers of Law 99 anticipated this problem and included several provisions to address it. Law 99 allows for CARs to receive direct appropriations from the national budget (Art. 46). In addition, as discussed in Section 3.2.5, the law mandates that CARs receive appropriations from the National Royalty Fund (Art. 46). Finally, Law 99 establishes two national environmental funds—FONAM and Fondo Ambiental de Amazonia (Title XIII Arts. 87–96). Section 8 below discusses the performance of these mechanisms for ensuring the adequacy of financial resources.

For the most part, Law 99 leaves it to CARs themselves to ensure that they have adequate administrative and technical resources. For example, CAR boards of directors are responsible for determining overall staffing, and directors general are responsible for actual hiring and firing (Arts. 27 and 29). CARs are also responsible for establishing laboratories and setting up data management systems.

However, Law 99 assigns some responsibilities pertinent to administrative and technical resources to MMA and the research institutes. MMA broadly has responsibility for overseeing

and planning CAR activities (Art. 5). The institutes of investigation are responsible for developing and transmitting the scientific information CARs need to carry out environmental management (Arts. 16–22).[6] The research institutes vary in their charges and sources of funding. All but the Institute of Hydrology, Meteorology, and Environmental Studies (*Instituto de Hidrología, Meterología y Estudios Ambientales*, IDEAM) have a specific geographic or ecological focus. IDEAM differs from the other research institutes in that it focuses primarily on data collection and analysis rather than on research, and it is funded mainly by the Colombian government (as opposed to private domestic sources or international sources, such as foundations and bilateral and multilateral aid agencies). IDEAM's role is to support both MMA and CAR activities with data, analysis, and information systems and to provide an interface between SINA and the data collection activities of the national government.

3.4.5. Administrative stability and adaptive management

Although Law 99 does not explicitly address either administrative stability or adaptive management in CARs, several of its provisions are pertinent to these matters. Regarding administrative stability—that is, continuity and consistency in management and administration—CARs' corporate assemblies and boards of directors bridge the three-year terms of the directors general (Arts. 25–29). In addition, CARs must develop long-, medium-, and short-term plans that comport with the National Development Plan (Arts. 25–29). Furthermore, Law 99 and related decrees explicitly establish broad guidelines for CAR functions and procedures (Title VI). Finally, most of the actual regulations that CARs have responsibility for enforcing are set at the national level by the Ministry of Environment (Title II).

Notwithstanding those provisions, Law 99 clearly does not guarantee administrative stability. CAR directors general have considerable discretion to create new policies and programs, modify or eliminate existing policies, and hire or fire CAR employees. These powers are needed to facilitate adaptive management—that is, management that learns from past experience and that adapts to changing conditions and new information. Hence, there is some

[6] The five research institutes are the Institute of Hydrology, Meteorology and Environmental Studies (*Instituto de Hidrología, Meterología y Estudios Ambientales*, IDEAM); the José Benito Vives de Andréis Institute of Marine and Coastal Studies (*Instituto de Investigaciones Marinas y Costeras José Benito Vives de Andréis*, INVEMAR); the Alexander von Humboldt Institute for the Study of Biological Resources (*Instituto de Investigación de Recursos Biológicos "Alexander Von Humboldt"*), the Amazonian Institute of Scientific Studies (*El Instituto Amazonico de Investigaciones Científicas*, SINCHI); and the Institute for Environmental Studies of the Pacific (*Instituto de Investigaciones Ambientales del Pacífico*, IIAP).

inherent and unavoidable tension between the requisites for administrative stability and adaptive management.

4. BASIC DESCRIPTIVE DATA

A central theme of this report is that Colombia's 33 CARs display marked heterogeneity across a wide variety of institutional characteristics, including performance, priorities, resource allocation, finances, and human and technical resources. CARs' basic geographical, historical, and socioeconomic characteristics also vary widely. Several of the sections that follow identify correlations between the former type of characteristics and the latter.

Table 4.1 presents data on CARs' basic geographical, historical, and socioeconomic characteristics, and Figure 4.1 presents a map of the CARs. In size, CARs vary from 51 square kilometers (Coralina) to 226,000 square kilometers (Corpamazonia), and in number of municipalities from 2 (Coralina) to 87 (Corpoboyoca). Eight CARs border on an AAU. Sixteen CARs were established prior to Law 99 of 1993. Population varies from between 81,000 (Coralina) to more than 4 million (CVC), and urbanization from 22% (Corpoguavio) to 94% (CRA). GDP varies from 100 billion pesos (Corpoguavio) to 21,509 billion pesos (CVC). Literacy varies from just 68% (Codecheco) to 95% (Coralina). Perhaps most striking of all, poverty, measured as the percentage of municipalities where basic needs are not met for more than 50% of the population, varies from 0% (CVC and CRQ) to 100% (CDA). As Table 4.1 indicates many of these socioeconomic characteristics (e.g., poverty and literacy) are highly correlated.

5. DATA ON ENVIRONMENTAL QUALITY AND INSTITUTIONAL PERFORMANCE

A recurring theme of our research on CARs has been the paucity of data on environmental quality and institutional performance at the CAR level. The importance of this deficiency is impossible to overstate. It hamstrings environmental decisionmaking at the regional, national, and even international levels.

A more immediate implication is that it has constrained the present analysis of CARs. Unfortunately, data limitations are in issue in most of the sections that follow, particularly those that focus on statistical analysis. This section briefly reviews Colombia's recent efforts to improve its data management system as well the factors that have inhibited these efforts.

5.1. Background

Law 99 assigned MMA the task of establishing an Environmental Information System (*Sistema de Información Ambiental,* SIA). SIA has at least two functions. One is to provide governmental entities in SINA with the information they need for effective environmental management. The other is to inform Colombians about the state of their environment and thus to facilitate public participation in environmental management. Decrees issued in 1994 charged IDEAM with directing, coordinating, and operating SIA. However, the 2003 decree that created MAVDT assigned coordination of SIA to the ministry's General Bureau of Regional Information, Planning, and Coordination. According to the *Contraloría* (2003b, 75), the administrative structure of the system lacks clarity.

5.2. Efforts to establish a system of environmental indicators

There is wide agreement in Colombia that indicators are indispensable for the formulation of new policies and for overall environmental management. Unfortunately, this agreement is matched by a recognition that regulatory authorities have yet to develop an adequate system of such indicators (Interinstitutional Committee on Indicators 2002; *Contraloría* 2003b).

Efforts to develop environmental indicators have arisen separately at the national and regional levels, and in public and private arenas. Unfortunately, these successive efforts have been more or less independent and uncoordinated, a strong indication that management of these efforts has been inadequate. The first concerted national effort to construct a system of indicators was

led by DNP. In 1996, it proposed the Environmental Management and Planning Indicators System, which included 256 indicators.[7] Partly because of the large number and complexity of the proposed indicators, development of this system was eventually abandoned (*Contraloría* 2003b).

In 2001, MMA, with technical assistance from the Economic Commission for Latin America and the Caribbean (ECLAC) undertook a new effort to create environmental sustainability indicators, in coordination with national and regional entities and various research institutes. As a result, in July 2002, these groups published a document describing 32 indicators.

At about the same time, IDEAM and the ministry were working with research institutes to develop an environmental baseline. This effort resulted in the publication of the country's first environmental baseline, which included 149 indicators. Unfortunately, however, according to the *Contraloría* (2003b), this effort had weaknesses. The contributions of the participating institutes were not well integrated, and the baseline indicators lacked a unified conceptual framework. The information from the diverse entities had different scales, coverage, and data collection methodologies, which made the integration of data difficult (Peña Villamil 2003). Some participants complained that IDEAM—the agency charged with coordinating the effort—did not actively manage the process. Furthermore, resources have not been assigned to maintain the information flow and purchase the technology needed to continue collecting information for this program.

Efforts are currently underway to develop indicators at the level of CARs. According to Decree 1300 of 2002, CARs must establish—in concert with MAVDT—basic indicators for monitoring and evaluating natural resources and the environment. Some CARs have made proposals to develop baselines in their areas, through the formulation of state and pressure indicators. Thus far, however, most CARs have not developed such systems.

As to evaluation of management, the majority of CARs either use the indicators developed by the ministry or have developed their own. Most of the management performance indicators that CARs currently use reflect administrative processes, such as expenditures on reforestation, rather than environmental impacts, such as actual deforestation rates. Unfortunately, the data and models designed by IDEAM are not applicable for CARs (*Contraloría* 2003b).

[7] Detailed methodological standards were developed for 177 of these indicators.

MAVDT plans to eventually develop three national indicator systems: (i) environmental sustainability indicators associated with the state of the environment and natural resources; (ii) environmental management indicators, related to the impact of intervention by environmental management authorities; and (iii) sustainable development indicators, which allow comparison in the international arena.

5.3. Faltering data collection infrastructure

Overall, although Colombia has made efforts to develop environmental indicators, the country is far from possessing an integrated system. This is, in part, a result of inadequate infrastructure—including environmental laboratories, measuring stations, documentation centers, and basic cartography—for data collection.

Forty percent of the country's CARs have no environmental laboratories or have infrastructure that doesn't function. Many CARs that have laboratories do not operate them effectively or fund them adequately. In 2002, less than 7,000 million pesos (1.4% of the total CAR investment) was assigned to laboratory facilities. The absence and poor quality of basic cartography present another serious challenge. Many CARs lack basic maps of their jurisdictions or have not updated their cartographic information in more than a decade (*Contraloría* 2003b).

Measurement stations are a problem as well. Only 20 CARs have some type of measuring station. Ten of these stations have not registered their networks in the National Catalogue of Monitoring Stations, and only four routinely send information to IDEAM. Most stations lack the budget necessary for proper maintenance, even though 97% of the stations have been in service for more than 20 years and have significant maintenance backlogs. Of the activities that the measurement stations are required to perform, only a fraction are actually carried out—25% of hydrology measurements and 45% of climatologic measurement (*Contraloría* 2003b).

A recent review of SIA by the *Contraloría* found that very few data were being collected at the CAR level. What data CARs had were principally on forestry and had been collected under an agreement with the International Tropical Timber Organization in the mid-1990s.

5.4. Assessment of data collection in Colombia's environmental information system

Overall, the *Contraloría* (2003b) reports that Colombia "does not have a satisfactory environmental information system." According to the *Contraloría*, seven factors limit the

development of SIA. Many of these factors are also highlighted in a Peña Villamil (2003) report on environmental indicators.

1. IDEAM performs analyses at the national scale, but CARs perform analyses at the regional or local scale. As a result, the data and models designed by IDEAM are not applicable for CARs.

2. Limited integration among SINA entities prevents a flow of information. There is no systematic process for data transfer among institutes. Thus, regionally generated information is not generally used to refine IDEAM information.

3. On the whole, CARs have not demonstrated a strong interest in developing environmental information, which is reflected in their limited participation in group efforts at environmental information planning meetings.

4. IDEAM's process of developing an environmental information system has lacked continuity. For example, although the above-mentioned meetings resulted in recommendations for adjustment of the environmental information system, IDEAM has not yet implemented the proposed changes.

5. IDEAM and CARs often use incompatible computer platforms. IDEAM should develop network applications through free software so that CARs and other public and private users can use these instruments at low cost.

6. SIA lacks methodological standards or protocols for data collection. Likewise, few advances have been made in generating standards that would allow validation of environmental information.

7. Informational planning instruments are not used. MAVDT, IDEAM, and the majority of CARs lack plans to integrate information.

Finally, the *Contraloría* argues that, in addition to those seven specific problems, lack of regulation—from constitutional precepts to specific information standards—makes it difficult to advance SIA.

6. PERFORMANCE

6.1. Performance of major functions and regulatory instruments

6.1.1. Enforcement

Considerable evidence demonstrates that many environmental regulations in Colombia are not consistently enforced. Enforcement varies markedly across CARs, across sectors, and across sizes and types of firms. Contributing factors include a lack of political will and inadequate access to police assistance, as well as several of the problems discussed in Sections 6.1 and 6.2—regulatory capture, low levels of human and technical capacity, poor information systems, reliance on voluntary regulation, and inadequate regulations.

For example, Sánchez Triana and Medina (1994) state, "In spite of specific norms and permits, including in regions in which government entities have pollution control programs, strict compliance with regulation on the part of industries does not exist…it is important to underline that even in jurisdictional areas of corporations such as CAR, CVC or CORNARE, 50% of the industries are not inspected" (258–59). More current evidence comes from Gómez Torres (2003), who reports that of the effluent fees that CARs charge to polluters, only one-third are actually collected (40). More broadly, the *Contraloría* (2003a) states, "Problems in coordination and communication needed to guarantee firms' compliance with environmental laws, persist in some sectors…[E]nvironmental management problems [degrade] environmental authorities' ability to enforce established norms." The *Contraloría* report cites a number of more specific problems that inhibit enforcement. It states that although some regulatory authorities have made advances in sectoral planning, they have made "limited advances in implementation [due to]…deficient mechanisms for follow-up and maintenance…" (155). Additional factors limiting enforcement include "the limited quantity and reliability of information" (64); a lack of "indicators to measure concrete results" (154); a lack of "adequate systems for the final disposal of wastes, and limited oversight of compliance with norms" (65); and a lack of "adequate laboratories to verify that the values declared or estimated for billing [of environmental fees] correspond to the real contamination values" (66).

6.1.2. Licensing and permitting

By law, MAVDT is responsible for granting environmental licenses and permits to large facilities and those in specified sectors, such as energy generation. CARs are responsible for most other facilities. As a result, CARs grant approximately 70% of all environmental licenses and permits.

Licensing and permitting at the regional level are problematic in several ways. First, according to numerous interviewees, both licensing and permitting involve copious red tape and long delays that create bottlenecks in the pipeline for urgently needed investment and economic development. Second, licensing and permitting requirements are not consistent across CARs. For example, in some CARs, companies building roads are required to reforest cleared areas, but in others there is no such requirement. Finally, according to several interviewees, licensing and permitting in some CARs are corrupt. For example, CAR directors general sometimes grant licenses to improve their chances of reelection. According to one interviewee, a root cause of all of these problems is that Colombian environmental regulations are often incomplete and unclear.

Under Law 99 the primary mechanisms for public participation in policy implementation (versus formulation) are interventions in licensing actions and public hearings over licenses. Here the formal procedures do appear adequate. However, implementation of these procedures appears to be inadequate. Use of hearings varies widely: 40% of CARs did not hold any public hearings between 1998 and 2002; 11% had seven or more (*Contraloría* 2002b). The absence of regulation specifying the scope and applicability of public hearings has made their use almost incoherent (*Contraloría* 2002a). Each environmental authority has a different notion of how the hearings are to be used, and this has contributed to corruption (*Contraloría* 2002a).

Many of the stakeholders interviewed for this report concurred with the *Contraloría*'s assessment. Concern was also expressed that often little effort is made by authorities to show how the information gathered at hearings was considered in reaching a decision on the permit or license, as is required by Law 99. NGO representatives said that the hearing process works better where NGOs are strong.

6.1.3. Effluent fees for wastewater

As discussed in Section 3, Law 99 provides the legal underpinnings for several types of economic incentive instruments, including effluent fees *(tasas retributivas),* water use fees, and natural resource fees *(tasas compensatorias).* Of these instruments, effluent fees for wastewater have generated the most controversy.

According to a study of the impact of effluent fees undertaken by the Ministry of Environment and summarized by Gómez Torres (2003), when implemented adequately, such fees have been quite effective. In those jurisdictions where implementation has been complete, biological oxygen demand (BOD) loads fell 27% between 1998 and 2002, and total suspended solids (TSS) loads fell 45%, However, just nine jurisdictions have implemented effluent fees adequately. In other jurisdictions, impacts have been significantly smaller (Gómez Torres 2003, 39).

Overall, the performance of effluent fees for wastewater has not matched the expectations of those who drafted Law 99. One interviewee said that, in part, this was because the framers of Law 99 held unrealistically high expectations for the effectiveness of this instrument. Their view—strongly influenced by the environmental economics literature on instrument choice—was that economic incentive instruments were more efficient than poorly performing command-and-control regulations and therefore were likely to be more effective than these "first generation" instruments. However, the policymakers failed to appreciate that like command-and-control instruments, economic incentive instruments are ineffective absent strong environmental regulatory institutions and stringent enforcement.

Colombia's effluent fees for wastewater face a number of challenges. First, in most cases CARs simply do not enforce fee programs. Only a few high-functioning CARs actually collect a significant percentage of effluent fees. Self-reported 2002 data collected by the Association of Autonomous Regional Corporations, Sustainable Development Corporations and Urban Environmental Authorities (*Asociación de Corporaciones Autónomas Regionales de Desarrollo Sostenible y Autoridades Ambientales de Grandes Centros Urbanos,*ASOCARs) indicates that for all 32 CARs, of the 45,625 "potential" sources that could be charged effluent fees, only 5,356 (11.7%) are actually charged. Gómez Torres (2003, 40) reports that of the effluent fees that CARs charge to polluters, only one-third are actually collected. Evidently, most CARs lack the capacity or political will (or both) to collect the fees.

Second, even where effluent fees are collected, they do not always create significant incentives for abatement. In terms of volume of discharges, municipal sewage authorities are likely to be

among the most important pollution sources covered in the effluent fee program. Interviewees said that authorities typically do not have the financial wherewithal to build wastewater treatment facilities. As a result, they try to pass effluent fees on to their customers by charging higher fees for the provision of water and sewage services.[8]

According to several interviewees, a third important problem with effluent fees is that they represent a misallocation of resources. These interviewees argued that investments in the provision of potable water are more urgently needed than investments in wastewater treatment. Therefore, the revenues raised by the fees, and the institutional resources spent enforcing them, should be reallocated. The validity of this point could be validated only by a rigorous comparison of the risks posed by different types of environmental and sanitation problems, a topic addressed in the following section.

Finally, effluent fees focus on too limited a set of pollutants. The fees are calculated based on quantities of TSS and BOD in waste streams. They do not cover, and therefore do not create incentives to control, other pollutants, such as heavy metals and fecal coliform bacteria.

6.1.4. Voluntary regulation

Background. The strategy of developing and promulgating regulatory standards and guidelines that are not strictly mandatory has been a focus of both the Ministry of Environment and some CARs practically since the passage of Law 99 in 1993. The last three ministers in particular have emphasized the use of voluntary regulations. Two types of voluntary regulations are popular in Colombia.

The first is clean production agreements (*convenios de produccion limpia*), negotiated with polluters. The agreements target either specific productive sectors (e.g., transportation or agriculture) or specific regions. Typically, they involve a *quid pro quo:* polluters pledge to improve environmental performance over a specified period, and in exchange, the regulator declares a certain grace period during which existing command-and-control standards are not enforced. The ostensible purpose of such agreements is to mitigate the problem of chronic

[8] Several interviewees from a private-sector trade association noted that the problem of "exorbitant" effluent fees has been mitigated to some extent by Decree 3100 of 2003, which modified the way the fees are calculated. Originally, the fees could be increased by as much as half a percentage point every six months if local surface water did not meet certain ambient standards, regardless of the quality of the effluents that individual facilities were discharging. The 2003 decree modifies this procedure, in effect adjusting water fees downward.

noncompliance in certain sectors and certain regions by "building consensus" among polluters on the need for compliance and giving polluters guidance on how to achieve compliance. Many clean production agreements were signed in the mid-1990s. Self-reported data collected by ASOCARs indicates that by 2002, CARs had signed a total of 101 clean production agreements with various sectors.

Environmental guides *(guias ambientales),* a second type of voluntary regulation, are also popular in Colombia. These are manuals that detail options for improving environmental performance in specific sectors. They typically focus on pollution prevention rather than end-of-pipe abatement strategies. Environmental guides have their origin in the national Cleaner Production Policy, a policy paper issued by the National Environmental Council *(Consejo Nacional Ambiental).* Fifty-seven environmental guides have been published covering approximately 60% of all productive sectors. The guides have been written for sectors where licensing is mandatory, and also for sectors where licensing is not required, such as livestock production.

Clean production agreements and environmental guides have both strengths and weaknesses.

Strengths. As noted above, the purported strength of clean production agreements is to build consensus for improved environmental performance in sectors or regions where compliance is a chronic problem. According to one interviewee formerly affiliated with DAMA, the AAU for Bogotá, clean production agreements can have an impact, at least at the regional level. This interviewee maintained that several clean production agreements negotiated and administered by DAMA have been successful.[9] The interviewee who described these success stories took pains to emphasize, however, that in his view, voluntary agreements work only in sectors and regions where environmental regulatory institutions are strong, and only as a complement to conventional command-and-control regulation.

Colombia's environmental guides have several strengths, according to one of the architects of these manuals. First, industrial sectors have input into the guides, and therefore they build consensus for improved environmental performance. Second, they fill a significant gap in Colombian regulation—a lack of technical guidance on how emissions standards are to be met. Such gaps imply that emissions standards are unrealistic for most firms, which lack the

[9] One such program focused on small and medium enterprises in Bogotá. A second successful voluntary program called *Programa Excelencia* is not a conventional clean production agreement. It involves rating the environmental performance of polluting facilities, and then publicizing these ratings.

technical information (or other types of resources) needed to purchase and operate abatement devices or to adopt clean technologies.

Third, environmental guides clarify exactly what polluters need to do to obtain a license and therefore facilitate consistent and transparent licensing. As discussed below, licensing requirements and processes differ markedly across CARs, and *ad hoc* and corrupt licensing is a major concern for many firms and farms. According to this interviewee, in sectors where licensing is required, the environmental guidelines constitute *de facto* binding *(vinculantes)* regulations, and efforts are underway to give the guidelines the legal status of regulation—that is, to make them *de jure* binding.

Fourth, by improving polluters' technical capacity and establishing uniform standards, environmental guides reduce the transaction costs of permitting for firms, CARs, and MMA. Fifth, in sectors where permits are *not* required, the guides may help firms improve their environmental performance by lowering the informational costs of pollution prevention and pollution abatement investments. Finally, environmental guides may help firms meet growing demands for cleaner production in the international marketplace. According to this interviewee, several sectors require some type of certification that firms are producing in an environmentally friendly manner. The environmental guides facilitate this certification.

Weaknesses. Notwithstanding those potential benefits, both interview and documentary data suggest that clean production agreements typically have not succeeded in improving environmental performance. During the grace period specified in the agreement—that is, the period during which polluters have committed to investing in pollution control and prevention and during which regulators have promised not to enforce regulations—polluters do not actually make any significant new investments. In any case, regulators typically have no means of assessing environmental performance because the clean production agreements do not include indicators or establish a baseline. Thus, the agreements simply end up legitimizing inaction on the part of both polluters and regulators. Evidently, this has been the pattern for most national-level sectoral clean production agreements. One interviewee noted that voluntary agreements are very attractive politically, perhaps for this reason. According to this same interviewee, as noted above, clean production agreements work only as a complement to strong command-and-control regulation, and only in sectors and regions where regulatory institutions are strong.

Esterling Lara (2003) evaluated a sample of 13 voluntary clean production agreements, including both single-sector and multisector agreements as well as agreements at the national

level and at the regional level. His findings are decidedly mixed. He found that many of the agreements suffered from weaknesses that rendered them ineffective. For example, commitments made by the signatories to the agreements—and moreover, the consequences of failing to keep these commitments—were typically vague and ill defined. In addition, the agreements did not identify sources of financing for costly pollution abatement and prevention investments. Finally, the legal status of the agreements was unclear. These conditions created incentives for stakeholders to sign these agreements even if they had no real intentional of meeting their commitments.

Esterling Lara developed a system to rank the extent to which signatories complied with various components of the voluntary clean production agreements in his sample. In general, these rankings were quite low. For example, in evaluating a national coal sector voluntary clean production agreement, Esterling Lara assigned rankings of zero (on a scale of zero to one hundred) to all of the components of the agreement that concerned "incentives and financial resources" and "follow-up and evaluation." Similarly, in evaluating electricity sector agreements, Esterling Lara assigned rankings of zero to eight of the nine components of the agreement on "clean production promotions strategies," three of the four sections on "legal and technical environmental norms," and three of the five sections on "incentives and financial resources."

Our interviewees also identified weaknesses in Colombia's 57 environmental guides. First, they are being used for a purpose other than that originally envisioned, and as a result they do not serve that function very well. The guides were originally conceived as a way of implementing the national Cleaner Production Policy. Specifically, they were to enable facilities to move beyond compliance with existing command-and-control regulations by adopting clean (pollution prevention) technologies. However, as discussed above, in sectors where licenses are required, they have evolved into guides for achieving compliance with existing regulations. Unfortunately, the guides do not serve this end very well. There is often no clear link between existing command-and-control regulations and the information in the environmental guides. Hence, there is no guarantee that a firm that follows the advice provided in the guide will actually meet existing regulatory standards.

Second, the environmental guides typically provide a limited range of technological alternatives for pollution prevention and pollution control. These alternatives are not always the most appropriate for all scales and types of firms in the sector. For example, they may be appropriate

for large firms but not for the small and midsize firms that may constitute the bulk of firms in the sector.

6.2. Overall performance

This section considers the overall performance of individual CARs and the factors that explain differences in performance. Is better performance correlated with certain socioeconomic and geophysical features, such as greater economic activity, larger geographical jurisdictions, or less poverty? Or are better-performing CARs those with certain institutional features, such as abundant self-generated resources, better computer systems, or more highly educated staff?

The bulk of this section describes the data and methods used to address these questions. Although somewhat technical and detailed, this material is important. Unfortunately, the best performance-related data available to us are limited, and our methods (inevitably) involve assumptions that affect the results. We explain these limitations and the effect they have on the analysis before presenting our findings, which are summarized in the last four paragraphs of the section.

6.2.1. Performance data

As discussed in Section 3, by law, CARs' principal responsibility is environmental protection. Therefore, the ideal measure of how well individual CARs are carrying out this responsibility is their impact on environmental quality over time, using data on, for example, hectares reforested and water pollution reduced by year. Unfortunately, however, as discussed in Section 5, environmental quality data in Colombia are inadequate: although some credible environmental quality data exist for selected media and geographical subregions, very few complete and reliable data exist at the CAR level.

Given that problem, past studies of the performance of CARs have supplemented CAR-level data on environmental quality with "process-related" proxy data—that is, information about whether and to what extent CARs carry out functions associated with environmental protection. For example, Vargas (2003) uses data on the number of monitoring actions (raids and seizures) conducted by CARs. Although clearly second-best, such data do provide some useful information about performance. More specifically, they provide an indication of whether necessary (but not sufficient) conditions exist for the CAR to have a positive impact on environmental quality. Hence, proxy data help identify CARs that are unlikely to have a positive impact on the environment, as opposed to those that actually do have such impacts.

The only repository of extensive CAR-level performance data is maintained by ASOCARs. Most of the data are self-reported by CARs in response to an annual ASOCARs survey. To our knowledge, these data are not checked by ASOCARs or a third party to ensure CARs do not exaggerate their performance (and verifying the data beyond basic checks for internal consistency is beyond the scope of this study). Given the apparent lack of quality control, it is important to keep possible limitations of the ASOCARs data in mind in interpreting our results. Our findings regarding the differences in overall performance across CARs and regarding the factors that explain these differences are valid only to the extent that our ASOCARs data, and the indices we construct from them, really capture overall performance.

Although the ASOCARs dataset comprises hundreds of variables, much of it is not useful for our purposes, either because it is only tangentially related to performance or because it is incomplete. Of the complete and consistent variables in the ASOCARs data, we have selected 14 that in our view are the best measures of performance. These variables are defined in Table 6.1. We obtained some of these data directly from ASOCARs and some of it second-hand from the MAVDT Planning Office. Four of our 14 performance variables are direct measures of performance: REFOREST, SOLIDWASTE, CLEAN_PDN_GOALS, REDUCE_H20_PLN. The remaining 10 performance variables are measures of processes related to environmental management: RAIDS, SEIZURES, VALUE_FINES, EFF_PERMIT, ENVIRO_PDM, WATER_MGMT_PLAN, ENVIRO_POT, DIS_PREV_PLAN, ENV_ED_PLAN, and SOIL_ZONING.

6.2.2. Ranking CAR performance

Previous attempts to rank the performance of CARs have used a large number of variables and complex procedures (Vargas 2003). Notwithstanding its advantages, such an approach has certain disadvantages. Specifically, the procedure is difficult to understand and may mask inconsistencies and gaps in the underlying data. The guiding principal of our ranking exercise was transparency. Toward this end, we restricted the analysis to a relatively small set of consistent and complete data, and we employed a simple methodology.

We constructed two indices: GRADE1 and GRADE2. GRADE1 is based on all 14 variables listed in Table 6.1 including both direct measures of performance and process-related proxies; GRADE2 is based only on the 4 direct measures of performance.

The two indices were constructed as follows. First, to be able to compare and aggregate variables measured in different units (for example, RAIDS, the number of raids per hectare per

year, with REDUCE_H20_PLN, the reduction in biological oxygen demand per year), we scaled each of our 14 variables using the following formula:

$$\text{Score}_i = (X_i - \text{minimum value of X}) * 100 \ / \ (\text{maximum value of X} - \text{minimum value of X})$$

where i indexes each of the 33 CARs and X is the performance variable in question. This formula produces a score on a scale of 1 to 100, where 1 corresponds to the minimum value of the performance variable and 100 corresponds to the maximum value. Table 6.1 reports the scores for each performance variable for the 33 CARs. Second, having scaled our variables, we simply summed them. GRADE1 is the sum of all 14 scores, and GRADE2 is the sum of four scores derived from the direct measures variables. Finally, we used GRADE1 and GRADE2 to rank the CARs (Table 6.2).

6.2.3. Econometric analysis

As noted above, the principal goal of our ranking exercise is to understand the external and internal factors driving differences in performance across CARs. To accomplish this goal, we employed multivariate regression analysis. The dependent variables in this analysis were GRADE1 and GRADE2. Table 6.3 presents the independent (explanatory) variables. These independent variables include socioeconomic factors external to the CAR, specifically, a subset of the socioeconomic variables presented in Table 4.1. The reason for the choice of these particular variables is explained below. In addition, the independent variables include a set of internal institutional factors, such as the education of CAR staff.

Econometric issues. The econometric analysis is constrained by four factors. First, as discussed above, our independent variable measuring CAR performance is constructed from limited data, the validity of which has not been checked.

Second, the data that could be used to explain CAR performance are also limited. Most socioeconomic data—for example, GDP and literacy rates—are collected at the department level. We converted some of these department-level data into CAR-level data using weights based on population. For example, we converted department-level data on GDP into CAR-level data.

Third, the number of observations in our sample is limited to 33—the number of CARs in Colombia. Given this small sample, it is not practical to specify a model with more than five explanatory variables.

Finally, many of our explanatory variables are correlated with each other. In some instances, this arises because certain socioeconomic variables are inherently and inevitably correlated. For example, as one would expect, poverty and literacy are highly negatively correlated—that is, CARs with relatively high levels of poverty have relatively low levels of literacy. In other cases, underlying correlations are magnified by the fact that we used population-based weights to convert department-level data to CAR-level data. For example, because we derived our CAR-level GDP data from department-level data, the variables POP and GDP are highly correlated. Correlation among explanatory variables in ordinary least squares regressions ("multicollinearity") biases both estimates or regressions coefficients and standard errors used to determine the statistical significance of the coefficients.

Given those four limitations, we were forced to specify multiple parsimonious models, each of which includes a small number of carefully chosen explanatory variables. For example, correlations among our independent variables made it impractical to include both POP and GDP in our model, or to include both POVERTY and LITERACY. We chose to include GDP but not POP and to include POVERTY but not LITERACY. Additional regressions not reported here reversed this decision—that is, they included POP but not GDP and included LITERCY but not POVERTY. Qualitatively, the results of these regressions are the same as those reported here.

Finally, note that the scales of some of our independent variables differ by an order of magnitude. For example, AREA ranges from a minimum of 51 square kilometers to 226,040 square kilometers, whereas PERCURBAN ranges from 22% to 94%. Such differences in scale can bias ordinary least squares regression results. To control for this problem, we normalize potentially problematic variables using natural logarithms—the conventional approach to dealing with this problem.

Regression results. Tables 6.4 through 6.7 present our regression results. We have used four econometric models. Model 1 examines the impact on performance of socioeconomic factors external to the CAR. Models 2, 3, and 4 examine the impact on performance of internal institutional factors, such as the education of CAR's staff. Each model includes two submodels. Submodel A uses GRADE1 as an independent variable, and submodel B uses GRADE2.

As noted above, Model 1 examines the impact on overall performance of socioeconomic factors external to the CAR—the natural log of gross domestic product (GDP), the natural log of geographic area in square kilometers (AREA), the percentage of population living in urban areas (PERCURBAN), whether the CAR was established prior to Law 99 of 1993 (PRELAW99), and the percentage of municipalities in the CAR where more than 50% of the population does

not have its basic needs met (POVERTY). Table 6.4 presents the regression results for Models 1A and 1B. In Model 1A, POVERTY is negative and significant at the 10% confidence level. In Model 1B, AREA is negative and significant at the 5% level, and PRELAW99 is positive and significant at the 10% level. The results from these two models suggest that when performance is assessed using an array of proxies and direct measures, CARs with lower levels of poverty perform better. However, when performance is assessed using only direct measures, CARs with smaller geographic jurisdictions and those established prior to Law 99 of 1993 perform better.

Model 2 examines the impact on overall performance of human and technical capital: total CAR employment normalized by the population of the CAR (EMPTOTPERCAP), the percentage of CAR staff who are temporary contractors (PERC_CONTRACTED), and number of computers per CAR staff (COMPPERCAP). Table 6.5 presents the regression results for Models 2A and 2B. In Model 2A, COMPPERCAP is positive and significant at the 5% level. None of the remaining variables are significant in either Model 2A or 2B. Thus, these results appear to indicate that when performance is assessed using an array of proxies and direct measures, computerization is correlated with overall performance.

Although suggestive, this result may be driven by the fact that Model 2 omits external socioeconomic variables that we know (from Model 1) are correlated with performance: POVERTY, PRELAW99, and AREA. When all three of these socioeconomic variables are included in the regression, COMPPERCAP is not significant. Hence, these results do not appear particularly robust, and one must exercise caution in drawing any conclusions from them.

Model 3 examines the impact on overall performance of financial variables: total spending per CAR inhabitant (TOTAL03PERCAP), percentage of total spending contributed by the national government (PERC_NAT03), and percentage of total spending devoted to operations (PERC_OP03). None of the coefficients in either model are statistically significant (Table 6.6). Moreover, the F-statistic for Model 3A suggests that the relatively stringent hypothesis that all of the coefficients in the model are jointly or simultaneously equal to zero cannot be rejected. In other words, these financial variables—total per capita spending, and percentage of total spending devoted to operations—do *not* do a good job of explaining the performance of CARs as measured by GRADE1.

Finally, Model 4 examines the impact on CAR performance of contributions from the Environmental Compensation Fund (ECF), a fund set up to even out the distribution of financial resources among CARs (the fund is discussed in detail in Section 8.2.4). ECF is not significant in either Model 4A or Model 4B (Table 6.7). Moreover, the F-statistic for Models 4A

and 4B suggests that the hypothesis that all of the coefficients in the model are jointly or simultaneously equal to zero cannot be rejected.

Discussion. To sum up, although interesting, the results of our econometric analysis of overall performance are not particularly robust. We found that only a few of our external socioeconomic explanatory variables and none of our internal institutional explanatory variables—that is, those measuring characteristics of the CARs related to finances and to human and technical capital—were correlated with our measures of overall performance. In addition, of the socioeconomic variables that did appear to explain performance, none were correlated with both of our measures of performance—GRADE1 and GRADE2.

Those somewhat limited results could be due to the data problems discussed above, in particular, the nature of the data used to measure performance. Alternatively, however, they could arise because factors that are difficult to measure and not picked up by our explanatory variables are driving differences in the overall performance of CARs. In other words, our results could reflect the fact that idiosyncratic factors—for example, management expertise and popular support for environmental protection—drive overall performance.

In any case, the positive results that we have generated indicate that three socioeconomic characteristics are correlated with overall performance: PRELAW99, POVERTY, and AREA. Unfortunately, we do not have the data needed to fully explore the causality underlying these results—the best we are able to do is identify correlations and speculate about causality. That said, the positive results do make intuitive sense and do jibe with anecdotal information about CAR performance. In particular, with regard to the PRELAW99 result, several interviewees speculated that CARs established prior to Law 99 were more effective because they have stronger institutions and more political and popular support.

At least two factors may explain the POVERTY result. First, considerable research suggests a link between poverty and environmental degradation (see, e.g., Duraiappah 1998). Therefore, CARs with higher rates of poverty may face more significant challenges in mitigating environmental problems. Second, poorer CARs may generate lower tax revenues and have fewer environmental professionals in both the public sector and the private sector. As a result, such CARs may have to make do with relatively low levels of financial and human resources.

Finally, the explanation for our finding that CARs with geographically smaller jurisdictions perform relatively well is fairly obvious: such CARs presumably have more financial, managerial, and technical resources to devote to each hectare.

7. PRIORITY SETTING

As discussed in Blackman et al. (2004), SINA as a whole lacks a systematic mechanism for priority setting across environmental programs and subsectors such as forestry, air pollution, water resources, and water sanitation. Planning within and across SINA institutions is generally done sector by sector, and efforts to break out of "sectoral boxes" to consider prioritization across programs or sectors have not been successful. This is a common problem in environmental regulatory systems around the world. It is partly due to the fact that, in most environmental regulatory systems, day-to-day work is organized by environmental media or problem areas, such as forestry, water, or air.

Blackman et al. (2004) presents evidence suggesting that MAVDT resource allocations do not appear to conform to a rational prioritization of environmental risks. Specifically, considerable evidence suggests that MAVDT, like MMA before it, has a "green bias." That is, in light of the fact that that over 70% of Colombia's population lives in urban areas, it focuses disproportionately on natural resource and rural environmental issues, such as forestry and biodiversity, at the expense of urban environmental issues, such as air quality, water quality, and solid and hazardous waste management. For example, in MMA investment (versus operational) spending in 2002, green issues accounted for three-quarters of the ministry's investment budget (Blackman et al. 2004).

Do CARs, like MAVDT, have a green bias? This chapter examines trends in investment spending to distill information about CARs' priority setting. We address two questions. First, do CARs allocate resources to the most pressing environmental problems? Second, how closely does CARs' investment spending comport with priorities established in their three-year action plans?

7.1. Do CARs allocate resources to the most pressing environmental problems?

To address this question, we examined 2001 CAR-level investment data provided by MAVDT, along with environmental quality data culled from a variety of sources.

7.1.1. CAR investment data

In its original form, the investment data comprise the names, budget allocations, and classification (explained below) for every CAR investment project for the year 2001. Collectively, CARs invested 331,418,152,500 pesos in 524 projects in 2001 (Table 7.1). The number of investment projects per CAR ranged from 4 (CVS) to 84 (CAM), and the size of the investment projects ranged from 200,000,000 pesos to 93,184,000 pesos. The average investment was 632,477,000 pesos.

To determine how CARs allocated their investment funds across environmental subsectors, we categorized the investment projects as follows.

Flora and fauna conservation

1. Forests and ecosystem conservation
2. Protected areas
3. Green markets

Industrial pollution control

4. Air pollution control
5. Solid and hazardous waste management
6. Clean technologies
7. Industrial pollution control projects covering multiple or unspecified media
8. Wastewater infrastructure
9. Water quality control other than wastewater infrastructure
10. Drinking water supply

Water quantity

11. Water quantity (general)
12. Irrigation

Other

13. Water (general or unspecified)
14. Soil conservation
15. Coastal and marine resources management
16. Natural disaster prevention (including flood control)
17. Mosquito control
18. Research and information gathering
19. Environmental education
20. Operations and general activities (including planning, legal actions, monitoring and control, and institutional strengthening where environmental media are not specified)
21. Community and territorial entity activities (including joint activities with departments, municipalities, NGOs, and indigenous and black communities where the nature of the activity is not specified)

The categorization of the 524 CAR investment projects was somewhat subjective. The original investment data included limited information about each project, namely the project's name and a coarse classification of the project (e.g., forests, water, biodiversity), presumably made by MAVDT. The classification was often either wholly inaccurate (judging from the title of the project) or so general as to be uninformative (e.g., "water"). For approximately two-thirds of the 524 projects, the appropriate categorization was immediately obvious from the project name. For the most part, we dealt with the uncertainty for the remaining one-third of the projects by relegating them to catchall categories that captured whatever limited information could be gleaned from the title of the project. Although time and resource constraints prevented us from contacting CARs to determine the exact nature of each project, future research might benefit from such an effort.

7.1.2. Do CARs collectively allocate resources to the most pressing environmental problems?

Table 7.2 presents the distribution of investment funds and projects among the 5 metacategories and 21 categories for each CAR. This subsection focuses on the aggregate information for all 33 CARs in Table 7.1. These data reflect two important trends.

First, CARs allocated a relatively large percentage of funds—11%, the third-largest percentage outside flora and fauna conservation and industrial pollution control—to projects in operations and general activities (category 20). This category includes projects that, judging from their titles, would be more accurately categorized as operations expenditures than investment expenditures. Examples include projects titled "Legal Advice on the Defense of Institutional Interests," "Strengthening of Monitoring and Control Activities," and "Participation in Environmental and Natural Resources Associations and Events." We do not have the data or resources to verify the exact nature of these projects or determine why they are classified as investment projects. One hypothesis is that some CARs intentionally mask operational expenditures as investment expenditures in response to legal and institutional pressures to limit operational expenditures.

Second, and more relevant to the broad purpose of this section, the aggregate CAR investment data suggest that, like MAVDT, CAR investment allocations reflect a green bias. The greatest percentage of investment funds—35%—appears to have been devoted to "industrial pollution control (categories 4 through 9). However, the lion's share of this investment was in just one category—wastewater infrastructure (category 8), which accounted for 30% of total investment. Moreover, investments in wastewater infrastructure comprised a small number of very expensive wastewater treatment plants. In 2001, all 33 CARs funded only 11 projects in this category, but the average cost of each project was 9,078,200,454 pesos. (Note, too, that municipalities and departments already make sizable investments in sanitation infrastructure). In any case, leaving aside wastewater infrastructure, investments in all the remaining categories under industrial pollution control—those involving air pollution, solid and hazardous waste, clean technologies, and other industrial pollution and water quality projects—accounted for only 5% of the total funds invested by CARs, and only 12% of the total number of investment projects.

Hence, although the summary statistics in Table 7.1 seem to suggest that CARs devote a large percentage of their investment funds to industrial pollution control, in actuality, the lion's share of these funds was spent on building a small number of very expensive wastewater treatment plants, and relatively few funds were spent on any other industrial pollution projects. By

contrast, CARs devoted fully 28% of their investment funds to projects in flora and fauna conservation, including forest and ecosystems conservation, protected areas, and green markets.

Although the data suggest that CARs spend a disproportionately small sum on industrial pollution control, three caveats are in order. First, our analysis omits investments by AAUs, which have jurisdiction over Colombia's four largest cities—Bogotá, Medellín, Cali, and Barranquilla. If these investments were included, any charges of a green bias would be less credible.

Second, leaving aside this problem, data on CARs' investment spending may not accurately reflect their prioritization of different environmental risks. The reason is that for most environmental risks, the financial responsibilities for environmental protection are split between the public and private sectors. Moreover, the division of financial responsibility between the two sectors varies considerably across media. For example, the public sector typically is primarily responsible for water sanitation, and as a result, public-sector investment typically accounts for the vast majority of total investment spending in this area. However, the private sector is primarily responsible for air pollution, and public-sector spending is limited to controlling emissions from publicly owned facilities and investing in monitoring and enforcement. Other media fall between these two endpoints. The public sector typically bears considerable responsibility for solid waste management, flora and fauna protection, and natural disaster protection. The private sector often bears considerable responsibility for industrial (inorganic) water pollution control.

Just as our analysis omits private-sector investments in pollution control, it also omits public-sector investments made by entities other than CARs—for example, investments by municipalities and departments in wastewater infrastructure or potable water supply.

To control for those limitations on our analysis, one would need detailed data on private- and public-sector spending on pollution, as well as on CARs' spending on monitoring and enforcement. Together, these data could indicate what resources CARs are devoting to areas like air pollution control, where the private sector is primarily responsible for abatement investments. Unfortunately, such data are not available in Colombia. (Indeed, they are difficult to acquire in industrialized countries.) That said, our inability to account for private-sector investments in pollution control is probably less of a problem than it would be in industrialized countries. Given weaknesses in Colombia's environmental regulatory system—particularly in monitoring and enforcement—private-sector investments in pollution control are almost certainly small relative to those in industrialized countries.

A third caveat to our analysis is that making a more definitive determination about aggregate investment priorities would require information about the benefit to human health and the environment that marginal investment dollars have in each spending category, or at least a more qualitative comparative analyses of environmental risk—that is, a comparative risk assessment. Such an assessment is beyond the scope of this study. (However, it is a focus of other studies that form part of the Country Environmental Assessment of Colombia). That said, it is important to note that comparative risk assessments worldwide almost inevitably prioritize industrial pollution highly in light of its serous impacts on human health (see, e.g., Morgenstern et al. 2000). In addition, we note that even the brief overview of aggregate data on the magnitude and incidence of industrial pollution problems in Blackman et al. (2004, Section 5.1) strongly suggests that underinvestment in industrial pollution is a problem.

7.1.3. Overview of industrial pollution

More than 70% of Colombia's population is concentrated in urban centers, and 30% of the urban population is concentrated outside the four cities under the jurisdiction of AAUs (Bogotá, Medellín, Cali, and Barranquilla). Thus, industrial pollution problems are a serious risk for a significant percentage of the population living in the jurisdiction of CARs.

Air quality. Air quality analysis typically focuses on urban areas, where Colombia's population, automobiles, and industry are concentrated. Seventeen of Colombia's cities and industrial corridors have some type of air quality monitoring network (including Bogotá, Area Metropolitana del Valle de Aburrá, Bucaramanga, Cali, Tolima, and Santa Marta City). Unfortunately, these networks lack standardized data collection methodologies and have yet to be integrated (SIAC 2002b). Table 7.3 summarizes monitoring data for Bucaramanga, a large urban center that is not under the jurisdiction of an AAU. Particulate air pollution is clearly a serious problem.

Table 7.4 presents data on the sources of total emissions of conventional pollutants in 1996. Thermal electricity generation was the leading source of sulfur oxides and nitrogen dioxide. Industry was the leading source of particulate pollution and a major source of sulfur oxides. Transportation was the leading source of hydrocarbons and carbon monoxide.

Water quality. High population and industrial density in the Andean region have led to significant water quality problems. For example, the Cauca and Magdalena rivers have high levels of pollution, and the Bogotá River is reputed to be one of the most polluted rivers in the world. Large urban centers like Cali, Bogotá, Medellín, Barranquilla, Cartagena, and

Bucaramanga are the most significant contributors to high biological oxygen demand levels. Although Colombian regulatory agencies monitor BOD and total suspended solids, they do not monitor chemical oxygen demand (COD) or sanitary pollutants, which are particularly harmful to human health (*Contraloría* 2003b).

Both industrial and domestic wastewater contributes to water quality problems. For example, in 1999 the domestic sector was responsible for 74% of BOD in all wastewater, and the industrial sector was responsible for 26% (SIAC 2002a). The vast majority of industrial wastewater is not treated. Aside from industry and households, agriculture is also a leading contributor to water pollution. Colombia's extensive use of agrochemicals exacerbates this problem. In 1991, agrochemical consumption reached 9.8 kilograms per hectare, a far higher rate than in the United States, where consumption averages 6.8 kilograms per hectare. Finally, mining contributes to water pollution. In particular, gold mining has resulted in the release of large quantities of mercury (SIAC 2002a).

Sanitation. Most of Colombia's cities are in the Andean zone, at an altitude above 1 kilometer. This concentration of people in mountainous areas has significant environmental implications, especially for the supply of potable water (*Contraloría* 2002b).

Some form of water and sewage service is available to most Colombian residents. In 1997, potable water services reached 94.1% of urban areas, and sewage services covered 80.8% of urban areas. Thus, approximately 2 million people lacked water service and 5.5 million people lacked sewage service. The lowest level of water and sewage service was found in department capitals with fewer than 100,000 inhabitants. In such areas, water supply coverage averaged 70.6%, and sewage coverage averaged 44.8% (*Contraloría* 2002b).

However, wastewater treatment is, in general, inadequate, and therefore water quality is typically not fit for human consumption. As a result, 60% of the Colombian population is at medium to high risk of contracting illnesses from poor water quality. Of Colombia's 1,709 water service entities, 35% had no wastewater treatment plant. Furthermore, the majority of the wastewater treatment plants in urban zones have serious operational deficiencies. Although wastewater treatment plant construction has grown significantly in recent years, the situation is still alarming—only 8% of the urban population had wastewater treatment coverage in 1998 (*Contraloría* 2002b).

Solid waste. According to SIAC, less than half of Colombia's solid waste is recycled or disposed of legally (Table 7.3F). Thirty-four percent of Colombia's municipalities do not have legal solid

waste disposal facilities (Table 6.1A). The *Contraloría* (2002b) argues that solid waste collection has lacked appropriate technical systems operations. For example, monthly solid waste production in Bogotá, Cali, Medellín, and Barranquilla is estimated at 88,076 tons, of which only 69% is collected; the remaining 31% is disposed of informally in the urban area or is released into water bodies.

7.1.4. Do individual CARs allocate resources to the most pressing environmental problems?

Thus far, we have used the 2001 CAR investment data to shed light on the question of whether aggregate CARs investment spending is subject to a green bias. This subsection focuses on a different question: are *individual* CARs allocating their investment funds to the most pressing environmental problems?

To address this question, for each CAR we compare (i) the severity of the environmental risks in its jurisdiction with (ii) the extent to which the CAR focuses investment funds on these risks. If CARs are allocating investment spending rationally—that is, based on an assessment of the severity of different risks—then there should be a correlation between (i) and (ii). For example, CARs where deforestation rates are relatively high should be spending a relatively high percentage of their investment funds on flora and fauna conservation, and vice versa.

Once again, our analysis is limited by the availability of appropriate data. Our data are less than ideal in at least three ways. First, we do not have data on environmental risks that exactly match our categories of investment spending. Rather, we have data on environmental risks associated with certain of our categories of investment spending. For example, we do not have data on the severity of the risk posed by the degradation of flora and fauna in each CAR. However, we do have data on the rates of deforestation in each CAR, a statistic that presumably is correlated with the risk posed by the degradation of flora and fauna. For some of our categories of spending, the match between our environmental risk data and our spending data is better than in others. Perhaps the most questionable and imperfect proxies for the severity of environmental risks are for water pollution and air pollution. Our proxy for air pollution is the percentage of deaths from respiratory illness. As is widely known, a wide range of factors unrelated to outdoor air pollution affect the incidence of respiratory illness, including indoor air pollution and smoking. Similarly, a wide range of factors unrelated to water pollution affect gastrointestinal illness, including basic sanitation. Hence our measures of the severity of these risks are clearly imperfect.

A second data limitation is that, leaving aside their relation to our spending data, some of our environmental risk data are imprecise. In particular, some information was collected at the department level and converted to the CAR level using population- or land area–based weights. Finally, as noted above, our categorization of spending is imprecise.

Given those data limitations, our analysis of whether CAR spending is allocated rationally is not precise, but we hope it can identify *gross* imbalances in the allocation of investment spending across categories.

We use a simple method to compare the severity of the environmental risks in each CAR with the extent to which CARs focus their investment funds on these risks. We rank the severity of each type of environmental risk in each CAR as high, medium, or low depending on whether the CAR ranks in the top, middle, or bottom trecile of the distribution of the appropriate measure of environmental risk across all 33 CARs. For example, we rank the risk to flora and fauna as high when the deforestation rate in a CAR is in the top trecile of the distribution of deforestation rates across all 33 CARs.

We use a similar method for ranking the extent to which CARs focus their investment funds on a certain risk. We rank the percentage of investment funds allocated to addressing a certain risk in each CAR as high, medium, or low depending on whether the percentage of investment funds spent on that risk ranks in the top, middle, or bottom trecile of the distribution of these percentages across all 33 CARs. For example, we rank a CAR's percentage of investment funds devoted to flora and fauna as high when it is in the top trecile of the distribution of such percentages across all 33 CARs. The purpose of choosing coarse (high, medium, low) categories of risk is to match the precision of our ranking with the precision of our data on environmental risks.

Having ranked the severity of different types of environmental risks and the extent to which CARs focus their investment funds on these risks, we compare these two rankings to determine whether CARs have "overinvested" or "underinvested" in certain types of risks. We say that a CAR has underinvested when the risk is ranked as either high or medium but the CAR investment spending is ranked as low. Similarly, we say that a CAR has overinvested when the risk is ranked as low but the CAR investment spending is ranked as medium or high. For example, we say that Corpamag has underinvested in flora and fauna if deforestation rates in Corpamag are in the top or middle trecile of rates for all CARs, but Corpamag's spending on flora and fauna preservation is in the bottom trecile.

We conduct the analysis for six types of environmental risk—soil degradation, flora and fauna loss, natural disasters, water pollution, air pollution, and solid and hazardous waste. Our measures of environmental risks and spending in each of these areas are detailed in Table 7.5. For each environmental risk, the first column from the left presents a ranking of the risk in each CAR. The second column presents a ranking of the percentage of investment funds devoted to this risk. The third column indicates how these two rankings compare. The last four rows of the third column indicate the percentage of all 33 CARs that underinvest and overinvest in that risk.

The data presented in Table 7.5 suggest that CARs' allocations of investment spending across different risks do not comport particularly well with the severity of these risks. For all but one type of risk—flora and fauna loss—far more CARs underinvest in the risk than overinvest. For soil degradation, 54% of CARs underinvest in this risk, and no CARs overinvest. For natural disasters, 61% of CARs underinvest, and only 3% overinvest. For water supply and sanitation, 33% to 66% of CARs underinvest (depending on what measure of spending is used), and 3% to 15% overinvest. For air pollution, 33% to 55% of CARs underinvest, and 3% to 15% overinvest. Finally, for solid waste management, 36% to 45% of CARs underinvest, and 18% to 27% overinvest.

7.2. How closely does CAR investment spending comport with priorities established in their three-year action plans?

As discussed in Section 3.3, Law 99 places considerable emphasis on planning. CARs are required to draft 10-year regional development plans (PGARs), 3-year action plans (PATs) and annual investment operating plans (POIAs). All of these plans are required to comport with the National Development Plans drafted by every newly elected president of the republic. CARs may be sued in court, and CAR directors general may be removed from office, for failure to submit these plans or failure to carry them out. Presumably, then, to the extent the various plans establish priorities for investment, the planning process provides a possible mechanism for priority setting.

Obviously, however, a necessary condition for planning to serve this end is that CARs must actually comply with their plans. This section examines this issue by comparing investment plans and actual investment spending for the four case-study CARs: CAR (Bogotá), Corantioquia, CRA, and Cardique. Specifically, we compare 2001 data on investment spending by category (described in Section 7.1.1) with 2001 investment plans included in 2001–2003 PATs. The PATs include estimates of planned spending on a project-by-project basis. We aggregated

these projects into the 21 spending categories listed in Section 7.1.1. Hence, for each of these 21 spending categories, we are able to compare planned investment spending with actual investment spending. Ideally, one would want to compare spending on a project-by-project basis. Resource constraints precluded this approach, however. Thus, the analysis is subject to the same caveats regarding possible misclassification of individual project discussed in Section 7.1.1. The results of the analysis are presented in Table 7.6.

As illustrated by Table 7.6A, CAR's planned investment spending does not comport well with actual investment. Even though actual investment spending (93,184,000,000 pesos) exceeded planned spending (70,543,088,000 pesos) by more than 20 billion pesos, CAR does not appear to have invested in a good number of the projects listed in its PAT for 2001, and conversely, it appears to have invested in a good number of projects that were *not* listed in its 2001 PAT. For example, in the industrial pollution categories, CAR did not invest in a 31-billion-peso water quality project that was listed in its PAT, but it did invest in a 70-billion-peso wastewater infrastructure project, and several other urban pollution control projects, that were *not* listed in its PAT. In the water quantity categories, CAR invested only approximately one-sixth of the total amount listed in its PAT. Finally, in the "other" categories, although CAR invested just 4 million pesos less than the planned amount, the distribution of projects among the categories did not match planned spending.

Compared with CAR, Corantioquia's planned investment spending matches its actual spending fairly well (Table 7.6B). Some significant discrepancies exist between actual and planned spending, however. Actual total investment spending (33 billion pesos) fell 18% below planned total spending (40 billion pesos). In the flora and fauna categories, Corantioquia spent approximately 3 billion pesos less than planned on forest and ecosystem management and approximately 1 billion pesos more than planned on green markets. In the industrial pollution control categories, Corantioquia evidently canceled a planned air pollution control project and, therefore, spent approximately 2 billion pesos less than planned in this area. In the water quantity categories, Corantioquia spent 4% of the amount planned on a water quantity project. Finally, in the "other" categories, Corantioquia spent more or less the planned amounts.

CRA's planned investment spending matches its actual spending quite well (Table 7.6C). Actual total investment spending (7.7 billion pesos) exceeded planned total spending (6.7 billion pesos) by 1 billion pesos. The discrepancy apparently arose because CRA spent 2.2 billion pesos on forest and ecosystem management instead of the 1.2 billion planned. Otherwise, actual spending more or less comports with actual spending.

Finally, Cardique's actual investment spending also matches its actual spending quite well (Table 7.6D). Actual total investment spending and planned total investment spending match almost exactly, at 5.7 billion pesos. The only significant discrepancies between planned and actual spending arose because Cardique cancelled a planned 112-million-peso project in the green markets category and developed an unplanned 450-million-peso industrial pollution project.

In sum, actual investment spending comports well with planned investment spending for two of our four case study CARs—CRA and Cardique. The match between planned and actual spending is poorer for Corantioquia, and poorer still for CAR. Conclusive evidence on the extent to which CARs abide by the plans laid out in their PATs would require an analysis of planned and actual investment spending by several more CARs over several more years. In addition, it would require an effort to track spending on a project-by-project basis, versus category-by-category. That said, our limited evidence suggests that for some CARs, there may be a significant gap between their PATs and their actual investment spending.

8. DISTRIBUTION OF FINANCIAL RESOURCES

8.1. Introduction

This chapter focuses on the sources and uses of financial resources available to the CARs. Of particular interest are the differences in financial resources and the factors that contribute to those differences, including the allocation of the dedicated national level environmental funds. For example, do some CARs have more resources simply because their area of jurisdiction has higher incomes? Do other factors also matter? What can be said about the allocation among the CARs of national contributions and the dedicated national-level environmental funds? Have changes in the allocation of financial resources among the CARs been significant, particularly in the most recent years?

Since neither the time nor resources were available to conduct in-depth analyses of each of the 33 CARs, a less detailed approach was adopted, involving assembling the basic data on financial resources available to each CAR. This chapter presents these data along with a limited econometric analysis to try to explain observed differences among the CARs. Despite the obvious limitations of conducting an econometric analysis with meager explanatory data and only 33 observations, the results are quite interesting. Certain of the quantitative results tend to reinforce anecdotal evidence gathered in the course of the interviews. Other statistical findings call into question other claims made in the interviews.

8.2. Financial resources

As the frontline environmental management institutions in Colombia, CARs generate and use the majority of financial resources in SINA. Nationwide, between 1995 and 2002, 71% of total SINA funding for operations and 86% of total SINA funding for investment was allocated to CARs. Fully 78% of the funding for operations and 86% of the funding for investment was self-generated (Gomez-Torres 2003). The financial resources available to the CARs are clearly critical to their ability to manage environmental and natural resources in their areas.

To examine the sources and uses of funds at the level of the individual CARs, we have assembled detailed CAR-level financial data for the years 2002 and 2003. The first part of this section examines the nature and causes of financial disparities among CARs, based on the 2003 data. The second part looks in detail at CARs' various sources of self-generated funds. The third

examines the nature and causes of changes in financial resources between 2002 and 2003, including changes in different sources of funds. The last part examines the allocation of national funds among the CARs.

8.2.1. Distribution of financial resources among CARs, 2003

Summary data. Table 8.1 displays the financial resources available to the CARs in 2003. Separate entries indicate the funds available from national contributions and self-generated revenues, including debt. Separate entries also indicate the resources used for CAR operations and for investments.

A number of observations can be drawn from the broad array of information presented in Table 1. First, self-generated resources account for the lion's share of all resources. Ninety-two percent of total resources were self-generated and the remaining 8% were derived from national contributions. Although the data in the table do not identify the trend, it is important to note that national contributions declined significantly in recent years. The 8% figure in 2002 represents a reduction of slightly more than 50% when compared with the period 1995–2002 (as reported by Gomez-Torres 2003).

Second, the distribution of funds across CARs is highly unequal. Total revenues of the CARs vary by approximately two orders of magnitude, from a low of 2.7 billion pesos (CSB) to a high of 135.7 billion pesos (CVC). Two-thirds of the total resources for all 33 of Colombia's CARs accrue to just seven CARs (in rank order): CVC, CAR, CDMB, CORANTIOQUIA, CORPOGUAJIRA, CORNARE, and CRC.

As expected, the variation in self-generated (as opposed to total) revenues is even larger: self-generated revenues in CVC are a full three orders of magnitude greater than those in Corpomojana. Even adjusting for population, wide differences persist. As shown in Table 8.2, CAR spending ranges from a low of 3,040 pesos per person (Corpocesar) to a high of 84,660 pesos per person (Corpoguavio).

As shown in Table 8.1, it appears that, on average, about one-quarter of CAR revenues is devoted to operations and the remaining three-fourths to investments. However, these proportions also vary widely (column 5 of Table 8.1). Despite the requirements of Law 617, which established a maximum of 30% of the total funds that can be used for salaries and administration, operational expenses far exceed 30% in many CARs, especially those with relatively modest levels of self-generated funds and correspondingly small budgets. For

example, operations account for as much as 73.3% of the total 2003 budget in a low-income CAR like Codechoco, and as little as 11.1% in a relatively high-income CAR like Corantioquia. For the funds provided by national contributions, the situation is different than for the total funds: an average of four-fifths of national contributions supports operations, and only one-fifth is devoted to capital investments. Only eight CARs report debt-related revenue, which amounted to about 2% of total spending across all 33 CARs in 2003.

In the course of our in-country interviews, the most common explanations offered for the large disparities in revenues were the large differences in income and wealth among the CARs. Additional explanations offered by interviewees were the differences in population and geography, the relative importance of urban versus rural influences in the CARs, and discrepancies in the institutional strengths of CARs' environmental management structures.

Econometric analysis. Clearly, a rigorous quantitative examination of the financial issues would involve a detailed dataset of the type that is not readily available at this time. To increase our understanding of the factors contributing to the different financial capabilities of the CARs, we have assembled a dataset that we believe can help shed some light on the importance of the different issues identified by the interviewees. At the same time, we are not so naive as to believe that a simple quantitative assessment based on a cross-section of data for 33 CARs can yield definitive results of these complex issues. Nonetheless, an enhanced understanding of the cause of the financial disparities can be an important step to limiting or refocusing resources where that is required and increasing resources for those CARs with high-priority, unmet needs. As discussed in subsequent sections, we adopt a similar approach to the assessment of CARs' human and technical resources.

The econometric analysis presented here is constrained by the same three factors that limited the analysis of overall performance presented in Section 6.2. To reiterate, briefly: (i) the data that could be used to explain CAR performance are limited; (ii) the number of observations in our sample is limited to 33—the number of CARs in Colombia—and as a result, it is not practical to specify a model with more than five explanatory variables; and (iii) many of our explanatory variables are correlated with each other, and as a result, we are forced to specify multiple parsimonious models, each of which includes a small number of carefully chosen explanatory

variables. The five independent variables used throughout this chapter—GDP, POVERTY, AREA, PERCUBAN, and PRELAW99—are defined in Table 6.3.[10]

Based on financial data for the year 2003, Table 8.3 presents the multiple regression results for the major revenue or spending categories defined in Table 8.1.[11] As in Chapter 6, to control for outliers (extreme values that bias regression results), we normalize potentially problematic variables—namely GDP, AREA, and all of the dependent variables—using natural logarithms. Regression coefficients and "t" statistics along with the R-squared terms and F statistics are shown at the bottom of the table. Coefficient estimates are ordinary least squares (OLS).[12]

The results are quite interesting. Looking across the equations for other revenue and spending categories in Table 8.3 (columns 2 through 8), GDP consistently emerges as a key variable. It is statistically significant in five of the seven regressions reported. As discussed below, GDP is close to significant in one other equation, although the sign is negative. POVERTY emerges as a key variable as well. It is statistically significant in four of the seven regressions reported. Also of interest is the proxy institutional variable, PRELAW99, which is statistically significant in two of the seven equations.

We turn now to a discussion of each of the seven regression equations in Table 8.3. As shown in equation 1 (in column 2 of Table 8.3), there is a positive and statistically significant relationship between the log of GDP and the log of total spending in the CARs, and there is a negative and statistically significant relationship between POVERTY and the log of total spending. AREA, PERCURBAN, and PRELAW99 are not even close to being statistically significant. Overall, with an R-squared of 0.55 and an F value indicating a high degree of confidence that the full equation

[10] Note that our GDP variable, or more precisely, the natural log of GDP, is highly correlated with the natural log of population (simple correlation =.90). This likely derives, at least in part, from the "synthetic" way that the CAR-level GDP variable was calculated—that is, as a population-weighted version of department-level data. Unfortunately, we have no other means of calculating CAR-level GDP. In the statistical work that follows, we are interpreting the variable as a true measure of GDP, but it is likely a proxy of some sort for both GDP and population.

[11] Quite similar results were obtained for 2002. For simplicity of presentation, only the 2003 results are displayed.

[12] We have examined intercorrelations among the independent variables and found them generally quite low, on the order of 0.2 or less. The most troublesome case is between log GDP and log Land Area, where the simple correlation coefficient is 0.59. For the regressions reported in this (and other sections), we have performed a diagnostic procedure developed by Belsley et al. (1980) to test for multicollinearity in the regression equation. In all cases, the resulting score was well below 30, a threshold value of concern.

is statistically valid, it appears that differences in economic activity and the poverty explain a significant portion of observed differences in total environmental spending among the CARs.

Since self-generated revenues represent such a large percentage of total revenues, it is not surprising that equation 2 is so similar to equation 1. The notable difference is that PRELAW99 is also statistically significant in equation 2 (at the 90% confidence level) suggesting that CARs with longer track records (i.e., those in existence prior to 1993, the year Law 99 was enacted) have stronger revenue bases than the newer CARs. This point is seen even more clearly by comparing the results of equations 4 and 6, which subcategorize self-generated funds by the intended uses, i.e., operations versus investment. Here we observe that self-generated funds for operations are considerably higher in those CARs established before 1993, but in the case of self-generated funds for investment, the differences are not statistically significant.

In contrast to the equations for total spending (which, as noted, are dominated by self-generated revenues) or those that directly examine self-generated revenues, the equations addressing national contributions are quite different. Equations 3, 5, and 7 contain no variables that are statistically different from zero. In none of these cases does the estimated F statistic provide any assurance that the full equation has statistical validity. Of note is that in two of these cases, the coefficients for GDP are negative, albeit not statistically significant from zero. This indicates a tendency to for national funds to be distributed disproportionately to poorer areas, but it is not a particularly robust finding.

Overall, the exercise serves to validate interview evidence suggesting that self-generated revenues vary in a logical and quite predictable manner among the CARs: revenues are higher in those CARs with higher GDP levels and less poverty, and vice versa. Further, there is evidence that CARs with longer institutional histories garner more self-generated funds than the newer ones.

In contrast, our statistical analysis is unable to identify any significant patterns in national contributions based on the independent variables tested. As noted, there is some soft statistical indication of an inverse relationship between GDP and national contributions, although this does not meet standard statistical criteria. We return to this issue at the end of this section.

8.2.2. Sources of self-generated revenues by CARs

Summary data. Self-generated CAR revenues consist of various taxes, fees, and other types of revenue. Table 8.4 displays the self-generated revenues for 12 revenue subcategories by CAR for

2002 (the latest year available). As described in Chapter 3, most of these revenue categories are mandated by Law 99. For example, Law 99 stipulates that 15% to 26% of municipal property taxes are to be used to fund CARs' environmental management activities. Law 99 also requires that electricity generators pay a gross revenues tax to CARs based on their power sales. Other sources of revenue mentioned in Law 99 include monies from the National Royalty Fund, fines, a percentage of damages awarded by courts in *acciones populares,* a percentage of fines imposed by territorial authorities for violations of environmental laws, appropriations from the national budgets, fees, licenses, permits, authorizations, and concessions.

In a review of the data in Table 8.4, we note that the large number of zeros is troubling, a possible indication of data errors. Taking the data at face value, we see that the largest single source of self-generated revenues is capital. However, 60% of those revenues accrue to a single CAR, namely CVC. The next largest recipients are CRC and Corantioquia, with 9.4 and 8.7%, respectively. Five CARs report no or negligible revenues from capital.

Following revenues generated from capital, property taxes represent the largest source category. These are somewhat more evenly distributed than capital revenues, although even here a single entity, CAR (Bogotá) accounts for 42.1% of total property tax revenues. Other important sources of self-generated revenues are contributions, electricity taxes, and revenues from the sale of good and services. Water fees are a relatively small source of revenues, although as in the case of property taxes, a very large proportion of total revenues, 76.9%, is accounted for by CAR (Bogotá). Other small revenue sources include redistribution fees, contractor revenues, penalties, forest fees, licensing fees, and other.

Econometric analysis. Econometric analysis was conducted in an attempt to identify the potential "drivers" of the different sources of self-generated revenues. Table 8.5 presents the regression results for the same five independent variables used in the analysis in the previous subsection. To minimize the undue influence of outlying data points, the subcategorized self-generated revenue data are also converted to logarithmic form. A quick look at this table indicates that in only three of the cases do we have a high degree of confidence that the full equation has statistical validity—that is, the statistical probability associated with the F statistic is greater than 10%. The three self-generated revenue categories that meet this criterion are property taxes, water fees, and other.

Not surprisingly, the only two significant variables in the property tax equation are GDP and POVERTY. That is, the higher the CAR income and the lower the level of poverty, the greater amount of property taxes collected.

In the case of water fees, AREA, PERCURBAN, and PRELAW99 emerge as the statistically significant variables. This suggests that geographically large CARs, those with more urbanized populations, and those with more established institutional structures are generally more capable of collecting water fees. Finally, the category "other revenues" seems to be driven strictly by GDP.

Overall, in contrast to the finding from the previous section, where we took a relatively coarse look at self-generated revenues and found that GDP and PRELAW99 were the most important drivers, a more nuanced story emerges from this analysis. Here we find that differences among the CARs in self-generated revenues are readily explicable only for certain revenue subcategories. Further, at least for some types of revenues (e.g., water fees), different factors are most critical. One implication of these findings is that with the trend toward urbanization and the development of stronger institutional structures, one might expect water fees to increase in the future.

8.2.3. Changes in financial resources, 2002–2003

Summary data. An additional perspective on CAR finances can be taken by examining year-to-year changes in revenues. This enables us to gauge, for example, whether the growth in self-generated and/or national contributions is associated with relatively rich or relatively poor CARs. For this exercise, we consider the changes over the most recent two-year period, 2002–2003. Table 8.6 displays the 2002 data in the same categories as shown in Table 8.1. However, to facilitate year-to-year comparisons, Table 8.7 presents the ratio of spending for each budget subcategory. Perusal of Table 8.7 suggests that, overall, total CAR spending for 2003 rose by 14.5% over 2002 levels. However, the major revenue components displayed different patterns. For example, national contributions declined by 1.3% while self-generated revenues rose by 16%.

Total spending on operations declined in 2003 by 8.3% while investment spending increased by 26.8%. National contributions for operations increased by a negligible amount while national contributions for investments declined by 8.4%. The opposite pattern applies to self-generated revenues, which declined by 10.9% for operations while increasing 27.8% for investments. Self-generated funds from debt declined by 13.7%.

Econometric analysis. What are the possible causes of these quite dramatic year-to-year budget changes? Of particular interest is whether the CARs with larger budgets are growing more rapidly than the ones with smaller budgets. To address this question, we regressed the ratio of

the budgets (2003/2002) for each budget category on the log of total spending in 2002 plus the five explanatory variables previously used to explain spending levels (GDP, AREA, PERCURBAN, PRELAW99, and POVERTY). Despite our concern that log of spending and log of GDP would be too highly correlated, this did not appear to bias our results. Although the simple correlation coefficient between the two is 0.577, the overall equation easily passed the Belsley, Kuh, Welsch test of multicollinearity. The results are shown in Table 8.8.

Perusal of Table 8.8 indicates that in all but two cases, each of the regression equations has statistical validity—that is, the statistical probability associated with the F statistic is greater than 5%. GDP, AREA, POVERTY, and 2002 spending all appear as significant variables in one or more equations. Of particular interest are the differences between the determinants of self-generated revenues and national contributions. In the case of national contributions to operational (and total) spending, it appears that such contributions to CARs with higher GDP and lower poverty rates increased between 2002 and 2003 compared with other CARs. At the same time, national contributions for investments increased for CARs with particularly large land areas and decreased for those with higher poverty rates and higher overall spending levels in 2002.

These results for the changes in national spending patterns differ significantly from those from our analysis of the determinants of the national spending levels in 2003, shown in Table 8.3. At least by implication, this suggests some policy changes in the most recent budget cycle compared with the historical patterns of national contributions. Based on the level of spending in 2003, none of the variables considered in the analysis had much effect. Yet in the most recent year, we see national contributions for operations move toward higher-income CARs and away from those with considerable poverty. CARs with large land areas and lower 2002 spending levels gained disproportionately in their shares of national contributions for investments.

In the case of self-generated funds, we see interesting patterns as well. Here, it appears that CARs with larger land area gained in their self-generated investment funds relative to those with small land areas. At the same time, CARs with larger concentrations of poor people, and CARs with higher 2002 spending levels found that their self-generated investment revenues declined relative to others. No discernible patterns were observed in self-generated funds for operations.

Taken together, the findings on year-to-year changes over the period 2002–2003 reflect some reallocation of national contributions for both investment and operations. In general, one can interpret these results as demonstrating a more activist reallocation of funds. Although there is

a small "Robin Hood" effect involving the reallocation of investment funds from CARs with high spending levels the previous year to those with lower spending levels, this does not extend to national contributions for operations. Here it can be argued that richer CARs fared better in 2003 than in 2002.

Thus, one interpretation of these results is that, despite our failure to demonstrate a clear connection between income levels and national contributions in the overall allocation of national contributions in 2003, some elements of such activism may be entering the most recent year-to-year reallocations of national contributions.

8.2.4. Environmental funds

Colombia has four semi-independent funds that finance investments and institutions in the environmental sector: the National Royalty Fund, the National Environmental Fund, the Environmental Compensation Fund, the National Fund for Environmental Action. Below we describe these funds in some detail. We then apply our basic regression model to the data available for the only fund for which we were able to obtain cross-CAR data, the Environmental Compensation Fund.

National Royalty Fund. The 1991 Constitution created a National Royalty Fund (*Fondo Nacional de Regalías,* FNR) from the proceeds of a tax on the exploitation of nonrenewable resources (Constitution Arts. 360 and 361). Under Law 141 of 1994, 32% of the revenue from this tax goes to FNR.[13] The fund is administered by the National Royalty Commission, which comprises five governors, seven mayors, the minister of Mines and Energy, the minister of Transportation, and the minister of MAVDT. The governors and mayors on the commission are elected by their peers. Each minister may send a vice-minister in his or her stead. The director of DNP presides over the commission.

A number of issues detract from FNR's ability to function as an environmental fund. First, its focus is not on the environment—it finances mainly economic development, not environmental protection. Legislation dictates in considerable detail how FNR is to distribute its funds both among specific groups of CARs and among specific kinds of projects (Law 141 of 1994, Law 344 of 1996, and Law 756 of 2002). Originally, a minimum of 20% of FNR's investments had to be

[13] The remaining 68% goes directly to territorial and municipal governments in areas directly affected by the resource exploitation.

focused on environmental quality (Law 141 of 1994). In 2002, new legislation changed this percentage to 30% (Law 756 of 2002). In the four years between 1999 and 2002, FNR funded 378 projects related to environmental protection. These projects were valued at 121,142 million pesos, or an average of 30,286 million pesos (US $12 million) per year. This sum represents less than 10% of CARs' annual investments from self-generated revenue (Table 8.3). Second, most of FNR's environmental projects have been focused on one area—forestry. Of FNR's investments in the environmental sector between 1999 and 2002, 53% was devoted to reforestation, 20% to wastewater treatment, and 13% to solid wastes. Finally, Gómez Torres (2003) notes that, in part because of the specificity of laws governing the allocation of its funds, FNR has been characterized by "excessive fractioning between project destinations in the localities, regions and departments and, overall, by poor quality proposals, which reduce the cost-effectiveness of investments" (45–49).

National Environmental Fund. Created by Law 99 and subsequent decrees, the National Environmental Fund (*Fondo Nacional Ambiental,* FONAM) is a national environmental fund charged with promoting environmental decentralization and private-sector participation in environmental management (Law 99 of 1994 Arts. 87–90, Decree 1602 of 1996). FONAM is a semi-independent institution affiliated with MAVDT. It is administered by a representative by DNP, the minister or vice-minister of MAVDT, the director of ECOFONDO, an academic representative, and technical directors of MVDT. By statute, FONAM must give priority to projects in poorer regions.

Law 99 allows FONAM to use funds from three sources: national appropriations, international loans, and debt-for-nature swaps. Historically, however, most of FONAM's funding has come from the InterAmerican Development Bank (IDB). National funds have been sufficient only to cover FONAM's costs of administering IDB loans. Projects funded under FONAM helped MMA promote coordinate national environmental policy.

Unfortunately, FONAM no longer appears to be very effective. Since 2002, FONAM has been without external funding. National funding sources designated under Law 99, principally national park user fees and fees and fines from environmental licenses, have not provided a sustainable funding base for the fund.

Environmental Compensation Fund. The Environmental Compensation Fund (*Fondo de Compensación Ambiental,* FCA) was created in 1996 to redistribute financial resources generated

by CARs in such as way as to decrease the concentration of financial resources in a few CARs (Law 344 of 1996, Decree 954 of June 1999).[14] All CARs (except the Sustainable Development Corporations, CDSs) must contribute 20% of their electricity sector transfers and 10% of certain other self-generated resources to the fund. Funds are redistributed in response to semiannual proposals from the 15 CARs with the lowest income in the current fiscal period. The fund is administered by MAVDT and a committee of five members representing MAVDT, DNP, the CARs, and the CDSs.

The fund began operation in 1999 and by 2002 had disbursed 25,379 million pesos. The fund grew steadily between 1999 and 2002, from roughly 1,588 million pesos in 1999 to 8,662 million pesos (US $3 million) in 2002. On average, approximately 30% of the fund is used for operational expenses, and the remainder for investments. The fund has been critical in maintaining the viability of some of the poorer CARs, particularly those in depressed areas of the northern coast, Amazonía and Orinoquía.

National Fund for Environmental Action. The National Fund for Environmental Action (*El Fondo Para la Acción Ambiental,* FAA) was established in 1993 under a bilateral agreement between Colombia and the United Sates as part of the Initiatives of the Americas. FAA was funded by a debt-for-nature swap in the early 1990s with the goal of promoting preservation or protection of natural and biological resources in Colombia. The fund was intended primarily to support small, concrete projects by NGOs.

From 1993 through 1997, FAA was administered by ECOFONDO. In 1996, it approved 11 projects valued at 402 million pesos, and in 1997 it approved 35 projects valued at 2,680 million. In 1997, operation of FAA was suspended because of problems in its implementation. In March 2002, the United States and Colombia reached an agreement that allowed FAA to resume operations under the direction of a new board—the Council of the Americas—composed of representatives of the private sector, universities, the U.S. government, MAVDT, DNP, and five representatives from NGOs that work on environmental issues, community development, and child development.

By agreement with the U.S. government, FAA is required to spend the capital it had accumulated through 2002 on projects over a four-year period. This spending is a precondition

[14] The fund was premised on the idea that some of the poorest CARs provide other CARs with environmental services without receiving financial compensation.

for a new debt-for-nature swap under the Initiative for Tropical Forests. In 2001, FAA approved 30 projects valued at 7,731 million pesos, and in 2002 it approved 81 projects valued at 56,325 million pesos.

Analysis of the Environmental Compensation Fund. As noted, of the four environmental funds, the only one for which we were able to obtain CAR-specific data was the Environmental Compensation Fund, which contributed about 20% of all national contributions in 2003.

Table 8.9 presents data on spending for operations and investments for this fund. Overall, investment spending for the Environmental Compensation Fund has increased markedly from 283 million pesos in 1999 to 7.8 billion pesos in 2003—a jump of almost 2,800% over four years. Over the same period, spending on operations has displayed a more erratic pattern. Following a quadrupling in 2000, funding declined in 2001 by about two-thirds and then again by about 15% in 2002. Spending for operations in 2003 increased by about 15%, roughly back to 2001 levels. Not surprisingly, FAA distributions were made to only a limited number of CARs, largely the lower-budget ones.

To look for possible patterns in fund spending, we regressed changes in spending levels for both operations and investment for various years on the same set of independent variables used for the previous analyses of spending ratios. The results are shown in Tables 8.10 and 8.11. As shown in Table 8.10, the relatively low F statistics from such small samples do not enable us to place any statistical confidence in the overall results.

9. ADEQUACY OF HUMAN AND TECHNICAL RESOURCES

9.1. Introduction

This chapter addresses issues relevant to the adequacy of human and technical resources of the CARs. Section 9.2 presents basic data on the number of direct employees and contractors for each CAR. This is followed by a limited statistical analysis of the possible explanation for the large observed differences CARs' hiring patterns. Differences in the educational achievement of CAR employees and contractors are also examined. Section 9.3 presents information on CARs' computers and other technical resources. In contrast to the first three sections, Section 9.4 is largely qualitative. It addresses issues associated clientelism in the CARs, including recent reform efforts, and discusses the efforts to limit operating budgets and staff sizes across all government agencies, including the CARs.

9.2. Human resources

9.2.1. Qualitative evidence

It is well known that environmental management capacity varies markedly across the CARs. Shortages of human resources are partly to blame. Booz-Allen & Hamilton (1997a) found a general "scarcity of highly-qualified human resources" in CARs with poor governance (9). Vargas (2003) argues that there is a direct relationship between overall efficiency of CARs and the professionalization of their staffs (55).

Such concerns were echoed by our interviewees, for whom staffing patterns in the CARs, including the use of contractors, were a major issue. Interviewees in several CARs suggested there was too-heavy reliance on filling staff needs via contractors as opposed to permanent staff. They also cited problems associated with high turnover among staff (and contractors), and what was generally described as political favoritism in hiring both staff and contractors. The technical qualifications of both staff and contractors were another issue of concern. One private-sector interviewee said that in some CARs, utilities cannot find competent staff with whom to negotiate licenses and contracts. In a similar vein, a second interviewee noted that air quality monitoring in some CARs has been inadequate because CARs do not have trained personnel capable of using the sophisticated monitoring equipment provided to them. A third interviewee argued that the main weakness of SINA today is a lack of human resources both in CARs and at the national level.

9.2.2. Summary data

Table 9.1 presents information on the number of CAR employees and contractors for all CARs, by educational level, for 2002 (the most recent data available). The average staff size over all the CARs was 112.6, but not surprisingly, there are large differences in staff size across the CARs. Some CARs operated with small staffs: 26 in CRA; 27 in Corpoguavio; and 31 each in Cardique, Coralina, and Corpoboyaca. Others have much larger staffs: 817 in CAR (Bogotá); 331 in Corantioquia; and 262 in CRC.

The number of contractors also varied considerably in 2002. While the average CAR engaged 66.9 contractors, some reported as few as 7 (Corpomojana and Corponor). At the high end, CDMB reported a total of 301 contractors in 2002. On average, contractors account for 37.3% of total staff, ranging from a low of 2.7% (CAR, Bogotá) to a high of 83.3% (CRA).

Table 9.2 presents the information on the ratio of inhabitants in each CAR to the number of employees and contractors. Note that the extremes across CARs in this ratio are slightly higher than the extremes in total employees. In the case of contractors, the variation on a per capita basis is many times greater than the variation in total employees.

Returning to the educational data in Table 9.1, we see that some CARs employ a high proportion of college-educated people, and others relying disproportionately on those with only a high school education (Table 9.1). An average of 60.7% of CAR staff members and 63.5% of contractors completed four years of college (or more) in 2002. Six CARs report that 100% of their staffs held at least a college degree, and 6 reported that fewer than 50% of their staffs had that status. In the case of contractors, 13 CARs reported that 100% held at least a college degree, and 9 reported that less than 50% had that status.

9.2.3. Econometric analysis

A first-order question is how the number of staff and contractors vary with CARs' operating and investment budgets. Since a high proportion of the total budgets pays for staffing, it would be surprising if there was not a clear connection between staff size and both operating and investment budgets. For contractors, the situation is less clear. Some interviewees reported that contractors carried out a lot of daily tasks more typically assigned to staff, such as making periodic inspections of permitted facilities to monitor compliance. Others reported that contractors were focused primarily on investment projects.

To assess these issues, we conducted a limited statistical analysis similar to the cross-section type of assessment presented in Sections 6 and 8. We examined the potential effect of income-related and demographic variables on the number of staff and contractors, namely GDP, POVERTY, AREA, PERCURBAN, and PRELAW99—the same five independent variables as in the previous section.

In addition, we include two new independent variables: size of the operations budget and size of the investment budget. Hence, our analysis here differs from the analysis in Chapter 8 where we regressed operating and investment budgets onto GDP in an effort to explain differences in these budgets across the CARs. In this section, we are seeking to understand differences in staff and contractor levels. Thus, we argue that causality runs from budgets to staff (and contractor) size, and we also hold constant GDP and other income and demographic-type variables. From a technical standpoint, we had concerns that operational and investment budgets were highly correlated with each other. Although the simple correlation coefficient between the two variables is 0.80, the overall equation easily passed the Belsley, Kuh, Welch (Belsley et al. 1980) test of multicollinearity.[15]

Based on staffing and contractor levels for the year 2002, Table 9.3 presents the multiple regression results for the relevant categories defined in Table 9.1.[16] As in Chapter 8, the dependent variables along with GDP and AREA are presented as natural logarithms to control for outliers. Again, estimates are ordinary least squares (OLS).

As shown in equation 1 (column 2), in the case of permanent employees, operational spending enters the equation with a positive and highly significant coefficient. This indicates, as expected, that the number of employees is highly dependent on the size of the CARs' operations budgets. However, the coefficient on investment spending is not statistically different from zero, suggesting that such spending is not a key factor in determining employment across the CARs. Also of interest in this equation is the variable PRELAW99. Although only significant at the 89% confidence level, the positive coefficient indicates a strong likelihood that older, more established CARs have relatively higher staffing levels. Overall, the relatively high R-squared indicates that a high percentage of the variation in staff size is explained by these variables,

[15] The BKW test score is 14.5, well below the threshold level of 30.

[16] Quite similar results were obtained for 2002. For simplicity of presentation, only the 2003 results are displayed.

largely by the operating budget. The high F statistic indicates a high probability that the overall equation has statistical validity.

Equation 2 (column 3) reports the results for contractors. In this case neither the operations nor the investment budgets is statistically significant at the 95% confidence level, although the negative sign on the coefficient on operational spending may indicate a tendency for CARs with smaller operating budgets to hire more contractors, and the positive coefficient on investment spending may indicate a tendency for CARs with large investment budgets to hire more contractors. The relatively low R-squared and F statistics of this equation suggest that factors other than the size of the operating and investment budgets are likely important determinants of the use of contractors by the CARs.

This simple econometric analysis supports some of the concerns raised in the interviews about the excessive use of contractors by CARs. For example, more than one interviewee suggested that the use of contractors constituted a form of corruption and that some contractors even had "no-show" jobs. Although other rationales may explain our statistical findings, the fact that the number of contractors engaged by the CARs is not easily explained by the size of the operations and investment budgets is consistent with the observation that political factors are important. Since reforms were instituted in a number of CARs in 2003, it would be interesting to examine more recent data to see whether the statistical relationships changed significantly between 2002 and 2003.

Table 9.4 presents the results for the same variables used in Table 9.3, although in this case the dependent variable is defined as the percentage of employees and contractors, respectively, with a high school education or less. Despite the low F statistics in both equations, it is noteworthy that the coefficients on the log of GDP are negative for both employees and contractors, indicating that educational levels are generally higher in richer areas than in poorer ones. No other variables, except for investment spending in the employee equation, appear to be significant. The explanation for the investment spending is not entirely clear, although the positive coefficient on this variable may reflect a tendency of CARs with large investment budgets to hire more manual labor.

9.3. Technical resources

A number of authors, including González et al. (2002, 85), cite technical weaknesses in the CARs as one of the leading problems inhibiting environmental investment projects. However, it is fair to say that the term "technical resources," as applied to the operations of the CARs, is not very

precise. In this section we examine various measures of technical resources, but as the reader will clearly note, none represent a very complete measure of technical sophistication.

9.3.1. Summary data

Shortages of technical capacity are not surprising, given the highly unequal distribution of financial resources across CARs as described in Section 8. The consensus opinion of our interviewees was that technical and administrative capacity varies markedly across CARs. Some CARs are excellent; others are minimally functional. Table 9.5 displays the number of computers and computers per employee available in the CARs in 2002. The average of the (reporting) CARs is about 104 computers per CAR, but the variation is considerable. On the high end, CAR (Bogotá) reports 358 computers. On the low end, Carsucre reports 16 computers, roughly 5% the number in CAR (Bogotá). Computers per employee also vary considerably. The average is 0.9 computers per employee, but on the high end, Corpocaldas reports 3.33 computers per employee, Corpoguavio reports 2.96, and CRA reports 2.62. On the low end, CVS reports 0.32 computers per employee, and Carsucre reports 0.39—a full order of magnitude lower than Corpocaldas. Even though some CARs may provide computers for contractors or other relevant groups, it is nonetheless difficult to explain why the number of computers in some CARs exceeds the number of employees by such a wide margin. Although time did not permit, it would be useful to dig deeper into this apparent anomaly. One possible explanation is simply that the data are faulty. Another is that the computer inventory is old and not suitable for current-generation software.

Table 9.7 (from Vargas 2003) displays various measures of systemization of processes and functions in selected CARs. Table 9.8 (also from Vargas 2003) displays the inventory of hydrological and meteorological stations in selected CARs. Table 9.9 (also from Vargas 2003) reports the number of air quality monitoring stations in selected CARs. Although we make no attempt to perform statistical analysis on these limited data, it is clear that CARs vary substantially in these alternative measures of technical capacity.

9.3.2. Econometric analysis

To examine the possible factors underlying those differences, we regressed the same independent variables used in the previous econometric analysis of employment on the total number of computers and computers per employee available within each CAR. The results are shown in Table 9.6. Based on the reported F statistic, the first equation (second column) is

highly significant, although the second one (third column) does not meet standard statistical criteria. Of all the independent variables considered, the log of the operational spending and percent poverty are statistically significant in the first equation, while only the percent poverty is significant in the second equation. That operational spending influences the total number of computers is not a surprise, since computers represent an operational expense. That the same effect does not apply in the case of computers per employee suggests that large operations budgets imply large staffs as well. Since GDP and other factors are held constant, the significant coefficient on the poverty variable is consistent with the notion that poverty and related factors—computer infrastructure, literacy and computer knowledge—are important determinants of computer use in the CARs. Thus, it is likely that the overall availability and use of computers are closely related to the overall social conditions in the CAR's jurisdiction.

9.4. Clientelism

Three important issues related to clientelism arose during the interviews. (i) Hiring and promotion of staff are based on political criteria rather than technical merit, and this, in turn, has increased staff turnover and management disarray. (ii) CARs rely excessively on contractors who are allegedly selected and compensated on the basis of politics rather than more meritocratic bases. Arguably, nationwide efforts to limit staff size and administrative budgets are exacerbating this problem, as the CARs shift resources to contractors who are often paid out of investment budgets. (iii) CAR directors are excessively political and not sufficiently professional. Here we examine each of these three clientelism issues.

9.4.1. Staff

Interviewees in several CARs indicated that staff hiring and promotion were too political and not sufficiently keyed to professional standards. Although most of the staff we met during the in-country interviews appeared to be extremely knowledgeable and have strong professional credentials, members of both the business and NGO communities in two of the four CARs we visited complained about the excessively political nature of the CAR staff. Of course, some individual staff members were highly regarded, but many were not. Further, we were told that the situation in these CARs has deteriorated in recent years and that staff turnover has increased, creating considerable confusion in the regulated and NGO communities. Unfortunately, it was not possible to determine with more certainty whether staff turnover is explicitly related to local corruption or clientelism, low staff morale, or other factors.

Although it is difficult to evaluate those claims, the fact that they came from several different individuals, representing diverse points of view, including NGOs, suggests they likely have merit. On the positive side, recent initiatives in certain CARs indicate that these problems are widely recognized and that at least some efforts are being made to reform these practices.

9.4.2. Contractors

Interviewees in virtually all the CARs visited suggested there was excessive reliance on contractors and that political rather than technical factors were most important in making contract awards. Further, they contended that contractors were being used to perform essential staff functions, such as routine inspection of permitted facilities. Even more so than in the case of staff, it is difficult for the RFF team to directly evaluate the claims made about contractors. We did not meet any contractors personally, nor did we review CAR files to examine their technical qualifications. However, even if we had conducted a limited number of such interviews (or reviews), it is unlikely that we would have been able to draw firm conclusions from such data.

Nonetheless, as in the case of the complaints about political criteria applied to staffing decisions, the fact that they came from different individuals, representing diverse points of view, including NGOs, suggests they likely have merit. Further, the quantitative analysis presented earlier in this chapter can certainly be construed to be consistent with complaints about excessive reliance on contractors. Whereas the regression on the number of staff per CAR suggests a clear correlation between staff size and the level of operational spending (and to a lesser extent, between staff size and PRELAW99, the measure of institutional longevity), no relevant correlations could be established in the case of contractors. That is, none of the independent variables examined in our regression equations appeared to have a discernible connection to the number of contractors retained in the CARs. Although this certainly does not prove that the use of contractors is dominated by political concerns, it is consistent with such an explanation.

Interestingly, in the course of the interviews, conflicting points were raised about reform efforts currently underway. On the one hand, interviewees in several CARs spoke about efforts to reduce reliance on contractors and, correspondingly, to hire more staff directly. In the cases where the individuals could meet the relevant qualifications, this might involve converting people from contractor status to direct hire. In other cases, it might involve recruiting new staff.

On the other hand, concerns were raised bout the possible unintended consequences of ongoing national efforts to limit the size of government institutions throughout the country. As noted, Law 617 mandates that CARs limit spending on staff and administrative expenses to 30% of total budgets. Although this mandate is not strictly enforced at this time, it may, nonetheless, be making it more difficult to address some of the contractor abuses. At least one interviewee recommended that the staffing requirements for CARs be reviewed at the national level with an eye to increasing permissible levels in some cases.

9.4.3. CAR directors general

Interviewees indicated serious concerns about the qualifications and professionalism of some individuals serving as CAR directors. In some cases, specific references were made to blatant political actions by the directors. In response to a widespread recognition of these problems, a few CAR directors have been summarily replaced. In Cardique, for example, a senior manager in MAVDT was named acting CAR director after the previous director was removed from office. Officially, the term for all CAR directors ended on December 31, 2003. At that time new directors were appointed according to a set of guidelines established under Decree 3345. In some instances, the previous directors were reelected under the new rules. The process for selecting the new CAR directors established in Decree 3345 involves the following steps:

- the board of directors makes a public announcement asking for candidates;
- the board of directors selects a private or public institution with experience on selecting personnel;
- candidates submit their CVs;
- the CVs are evaluated by the selected institution;
- the institution determines which candidates exceed the minimum requirements;
- the institution interviews those candidates;
- the institution ranks the candidates according to their qualifications;
- the institution presents the list of preselected candidates to the board of directors; and
- the board of directors elects the director general

At this point, the process is so new that it is not possible to evaluate it. Nonetheless, based on our interviews, there appears to be some basis for at least cautious optimism. In several cases, the new directors were given high marks for their initial actions. Such praise was heard from

industry representatives and NGOs alike. Of course, it is early in the term of the new directors. Further, at least one interviewee recommended that the new selection process be modified to include a more formal set of ethical standards for CAR directors, as well as members of the board of directors and senior management.

10. REGULATORY CAPTURE

10.1. Introduction

Both regulatory capture and corruption appear to be significant problems in environmental regulatory institutions at both the national and regional levels. We use these terms to refer to situations where interest groups exert undue influence on the activities of environmental authorities, so that instead of acting to further social welfare, they act to further the interests of select groups. Corruption involves violation of laws—for example, bribery and intimidation—but regulatory capture does not. In this chapter we review the existing literature on these issues, along with the results of our interviews. Section 10.2 presents information on corruption and regulatory capture in Colombian institutions in general. Section 10.3 explores how these problems affect CARs. Section 10.4 discusses the problem as it relates to CAR boards of directors. Finally, Section 10.5 discusses the role of NGOs as a champion of civil society in CARs' decisionmaking. Finally, Section 10.6 discusses recent proposed reforms aimed at curbing corruption and regulatory capture in CARs.

10.2. Evidence on Colombian institutions in general

Because corruption and regulatory capture are, by their nature, covert, hard evidence of these activities in CARs is scarce. Numerous studies have documented high levels of regulatory capture and corruption in Colombian government institutions in general. Saez (2003), which is based on a national survey of stakeholders in the public and private sectors, concludes that "…the incidence of capture of legislative, executive and regional authorities in Colombia is higher than any other country in the region" (933). The survey results that Saez uses to support this conclusion include the following: 70% of private company respondents said that bribes are "very common" at Colombian regulatory agencies (935); approximately 30% of public employee respondents said that the purchase of public posts is a frequent practice; and on average, public employee respondents said 50% of Colombian government contracts involve a bribe (940). Saez identifies three factors that contribute to state capture in Colombia: virtually unregulated private-sector financing of political campaigns, the influence of the drug trade on legislative decisionmaking, and "clientelism"—the practice of obtaining votes through promises of government posts (936). Seligson (2001) reaches similar conclusions. Relying on a telephone survey of 2,400 residents of Colombia's major cities, he found that 70% of survey respondents believe that corruption is "common" or "very common" in Colombia.

Those same studies find that corruption is a particular problem at *regional* levels of government (Saez 2003; Transparency for Colombia Corporation 2001). For example, Transparency for Colombia Corporation (2001) finds that just as governance has been decentralized, so too has administrative corruption (20).

10.3. Evidence on CARs

Vargas (2003) suggests that regulatory capture is a serious issue in CARs. Using a *Contraloría General* methodology to evaluate internal control systems, Vargas classified the majority of CARs as at medium or high risk of corruption and concludes that their processes and procedures represent failures in compliance with legal and oversight requirements (58).

Among our interviewees, however, only a few considered CARs rife with outright corruption, such as bribery and other illegal activities. Notwithstanding their views on outright corruption, most of our interviewees concurred that regulatory capture is a widespread problem in CARs. In other words, most believed that the functioning of CARs is unduly influenced by local interest groups. Most important, at least eight interviewees argued that political concerns play too strong a role in CARs' sanitation and other environmental investment decisions—a significant problem, since the vast majority of such investments in Colombia are made by CARs. For example, reforestation and wastewater treatment projects are sometimes spatially targeted to maximize political payoffs instead of ecological benefits. (On this point, it is worthwhile noting that public works projects are notoriously tied to politics in many countries.)

Aside from the allocation of investment funds, permitting and licensing are additional CAR functions subject to regulatory capture, in the view of our interviewees. Many interviewees felt that a significant share of the representatives of nongovernmental organizations on CAR boards of directors are phony—that is, the NGOs they purport to represent are shell organizations that front for industrial or political interests.

Although most of the stakeholders interviewed agreed that regulatory capture, if not corruption, was a serious issue in CARs, not all did. Several interviewees stated that reports of corruption and regulatory capture in CARs are overblown. One interviewee said that in his experience as a delegate of MAVDT on the board of directors of a southern CAR, he saw little evidence of corruption or regulatory capture. Another interviewee stated that corruption is a systemic problem in Colombia, and CARs are no more or less corrupt than other Colombian institutions. Although outright corruption exists in some CARs, he said, it is not a problem in most CARs. Regarding regulatory capture, this interviewee said that mayors on CAR boards of

directors represent legitimate political interests, and it is unfair to characterize them as unduly beholden to private interests. The fact that they attempt to funnel investments to their constituents is to be expected. Furthermore, he said, mayors have incentives to promote environmental protection as well as economic development. In any case, they do not have the power to redirect investments to benefit their constituents at the expense of others. In this interviewee's view, accusations of corruption are a political ploy designed to consolidate political power at the national level.

10.4. CAR boards of directors

A problem identified by several interviewees is that many members of boards of directors are focused on obtaining contracts from the CAR for various interest groups and / or for themselves. Further, it was suggested that voting rules and other procedures effectively downplay minority views on the boards of directors. As discussed below, industry representatives told us that spurious NGOs were sometimes created to fill the requisite seats on the board. A nonindustry interviewee complained that the current composition of the boards facilitates regulatory capture. In his view, civil society was not adequately represented, since the mayors on the boards often have strong ties to the private sector and focus disproportionately on wealthy municipalities.

10.5. NGOs

One mechanism for minimizing the exertion of undue influence of interest groups on the activities of regulatory authorities is to introduce certain counterbalancing forces. Sunlight, as it is often referred to, is a potentially powerful counterbalancing force against excessive interest group influence. Colombia's 1991 Constitution and Law 99 create numerous mechanisms for sunlight to shine on regulatory decisions via the use of public participation. As discussed in Blackman et al. (2004), the primary mechanism provided under Law 99 for public participation in the formulation and implementation of environmental policy is that NGOs serve on the boards and councils of advisory bodies, at both the national and the CAR level. At the national level, Law 99 guarantees NGOs seats on the National Environmental Council and the Technical Advisory Council (Arts. 14 and 11). At the regional level, Law 99 mandates that the board of directors of each CAR include two representatives of environmental NGOs (Art. 26). To be eligible to serve on the board of directors of a CAR, environmental NGOs must be approved by the mayor of the municipality in which they operate (Law 99 Art. 106).

Overall, this NGO-focused approach to ensuring public participation in policy formulation has yielded mixed results. Although Colombian NGOs have proliferated since passage of the 1991 Constitution—Transparency for Colombia Corporation (2001) counts more than 5,346—this participation does not necessarily indicate that Colombia has strong NGOs capable of speaking for the public in environmental policymaking. In fact, as described in Blackman et al. (2004), national-level NGO participation in SINA has generally been limited. Two factors have contributed to this state of affairs: a general weakening of Colombia's national-level NGOs, and a diminution of opportunities for effective participation.

NGO participation at the CAR level is widely recognized to be particularly problematic. For example, the *Contraloría General* found that the use of representatives from NGOs on CARs' boards of directors has been the subject of cronyism—spurious NGOs are often created by local political and business interests to fill seats on the board (*Contraloría* 2002b). Inadequate regulation from MAVDT has contributed to this problem (*Contraloría* 2002b).

Most of our interviewees agreed with the *Contraloría*'s findings. There was wide agreement among interviewees that participation of NGOs on CAR boards of directors has been unsuccessful, mainly because of spurious NGOs. Ironically, legitimate NGOs see participation on the CAR boards as problematic and, as a result, decline to participate. Interviewees in several CARs reported major problems recruiting NGOs to their boards. In fact, in a number of instances plans were being discussed to create investment projects that would attract NGOs. A few interviewees insisted that such problems are not universal, however. They pointed out that the quality of governance varies widely across CARs, and in those that function well, NGO participation is a functional vehicle for public participation.

NGOs working at the local level, particularly in rural areas, also confront problems both from lack of security and from a perception by the government that they are sympathetic to terrorists (Transparency for Colombia Corporation et al. 2001).

Notwithstanding problems with NGO participation on CAR boards of directors, several interviewees believed that NGOs are very important at the local level—much more so than at the national level. Many NGOs are very close to local communities and are engaged in implementing concrete, small projects. But several respondents agreed that these NGOs are not strong enough or organized enough to play a significant role at the national level.

10.6. Proposed reforms of CAR governance

10.6.1. Background

Alvaro Uribe's campaign for president included pledges to reform CARs and AAUs. Once elected, Uribe made the reform of CARs and AAUs part of his National Development Plan, and in April 2003, his administration introduced into Congress four reforms to Law 99 designed to mitigate several of the perceived problems with CARs AAUs.

The proposed reforms must survive four separate debates in Congress to be approved. Although Congress can modify the reforms, MAVDT has only limited authority to do so. MAVDT, however, does reserve the option of withdrawing the reform altogether. As of mid-February 2004, sources in MAVDT were suggesting that the reforms were no longer viable and would not be presented for further debate. The Uribe administration may introduce new reforms, but to our knowledge has no concrete plans to do so at this point.

As for the political context of the April 2003 proposed reforms, it is worth noting that, according to one interviewee, they came at a low point in the relationship between MAVDT and the CARs. Among the national governance institutions, CARs enjoy particularly strong support in the House of Representatives. Unlike senators, members of the House of Representatives are elected by specific regions and tend to have close ties to the CARs in their regions.

10.6.2. Content of reforms

The Uribe administration proposed four reforms of Law 99 in April 2003. The reform that attracted the most attention was a proposal to change the composition and selection of CAR boards of directors.[17] According to MAVDT, the current composition of the boards facilitates regulatory capture and, as a result, fails to adequately represent civil society. More specifically, the mayors on the boards of directors tend to have strong political ties to the private sector and tend to disproportionately represent wealthy, powerful municipalities. The bill introduced by

[17] The second reform proposed in April 1993 was aimed at giving AAUs greater autonomy from the municipalities they serve. One of the principal means of doing so was to change the composition of AAU boards of directors. The third proposed reform involved changing the way environmental fees established under Law 99 (effluent, compensation, and water use fees) are collected, administered, and allocated to ensure greater accountability and transparency. Finally, the fourth proposed reform was to create Watershed Basin Councils (*Consejos de Cuencas Hidrográficas*), which were to assume some of the CARs' management responsibilities.

the Uribe administration proposed replacing two of the four mayors on each board with new representatives—one from the National Parks System, and one from Colombia's university system. In addition, it proposed that mayors be elected at the national level by the National Association of Municipalities instead of by the *Asembleas Corporativas*. The bill also proposed changing the manner in which private-sector representatives are elected. Finally, it proposed better integrating CARs and the five research institutes.

10.6.3. Negative views

Except for those within MAVDT, virtually all of our interviewees expressed negative opinions of the proposed reforms. Indeed, as MAVDT itself recognizes, there is considerable opposition to the reforms among ex-MMA staff. The negative opinions fell into the following five categories.

First, several interviewees complained that the reforms were rushed to Congress without the requisite study, consultation, and input from appropriate stakeholders. They argued that an objective study of the performance of CAR boards of directors and directors general was needed before reforms could be written. One also argued that the best and brightest policymakers and academics were not involved in writing the reforms, as they were in writing Law 99.

Second, several interviewees commented that the proposed reforms were minor and irrelevant and not likely to have much impact, mainly because they represented a top-down approach to problems that needed to be solved by bottom-up participatory efforts. One interviewee called tinkering with institutional design a waste of resources. He argued that the most effective way to improve the functioning of CARs was to increase the participation of civil society and to focus on developing effective projects and programs that change the culture of regulatory agencies. Another interviewee said that increasing the proportion of directors who represent the national government would have a limited impact because very few national bureaucrats understand and can operate effectively at the regional level.

Third, several interviewees argued that the proposed reforms were politically motivated. One interviewee who played an important role in designing and implementing Law 99 stated that the underlying agenda of the reforms was to replace CAR directors and directors general with individuals who were more sympathetic to the current administration. A second interviewee argued that the reforms were being pushed by national bureaucrats who regretted or opposed decentralization.

Fourth, one interviewee said that the reform measures would weaken important checks and balances that arise from the current autonomy of the CARs. More specifically, although this autonomy may somewhat hinder national-regional policy coordination, it prevents abuse, corruption, or bad governance at the national level from having too great an impact at the regional level. Weakening this risk-spreading mechanism was dangerous, he argued: even though the current administration might be relatively honest and efficient, future administrations might not be. The same interviewee also felt that reducing social control at the regional level would very likely engender more corruption, not less. A second interviewee also said it would be a "big mistake" to try to impose more central control on CARs.

Finally, several interviewees expressed concerns about the effect of the reforms on NGOs. The proposal to require NGOs to have been in existence for two years before being eligible to serve on a CAR board was universally decried by our interviewees. Interviewees said that developing criteria related to actual activities of the NGOs and continuing to work to improve governance in CARs would have a better chance of improving NGOs' participation in CAR policymaking. Not surprisingly, interviewees also decried the proposal to reduce the number of NGO representatives on the CAR boards of directors. Interviewees said that it would be better to work to increase transparency in the management of the CARs and strengthen participation by legitimate NGOs.

10.6.4. Alternative proposals

Several interviewees suggested alternative strategies for improving the functioning of CARs. As noted above, one interviewee suggested putting more power into the hands of civil society and focusing on creating good programs and projects to improve the culture of the regulatory agencies. A second interviewee suggested creating a national environmental fund and having CARs compete for these funds by proposing investment projects. A third interviewee suggested a gradualist approach to environmental decentralization that would entail ranking the regulatory capacity of CARs on a scale of 1 to 4. Autonomy would be granted according to each CAR's ranking. As CARs improved and earned higher rankings, they would be given greater autonomy. Colombia has a similar program for decentralization in the agricultural sector.

11. CONFLICTS OF INTEREST RELATED TO SANITATION INFRASTRUCTURE

The CARs' original mission was to promote integrated regional development by, among other things, building sanitation infrastructure including wastewater treatment, drinking water and irrigation facilities. As discussed in Section 3.4.3, although Law 99 redefines CARs as regional environmental regulatory authorities and assigns primary responsibility for sanitation infrastructure to municipalities, it also mandates that CARs retain certain responsibilities for developing infrastructure—a dictate that clearly has the potential to create conflicts of interest. In particular, when CARs finance, plan, own, and/or operate sanitation infrastructure, their incentives to strictly enforce environmental regulations governing this infrastructure are clearly compromised.

Below we present data on CARs' infrastructure investments; consider legal, political, and economic factors driving investments in infrastructure; and discusses various options for mitigating the problem.

11.1. Data

As discussed in Chapter 7, MAVDT data indicate that CARs collectively devoted 30% of all money spent on investment to wastewater treatment plants, a higher percentage than any of the other categories (or meta-categories) of investment defined in Chapter 7. On the face of it, this statistic suggests that sanitation infrastructure is a major focus of CAR investment. However, further examination of the CAR-level data indicates that this investment comprised a relatively small number of very expensive treatment plants. In 2001, all 33 CARs funded 11 plants, each of which cost 9,078,200,454 pesos.

11.2. Factors driving investments in infrastructure

Several political, economic, and legal factors are driving CARs' continued investments in sanitation infrastructure. Perhaps most import, the Uribe administration has explicitly mandated such investments. Its 2002–2006 National Development Plan directs CARs to help finance sanitation infrastructure using their self-generated revenue. According to the president of ASOCARs, the national association of regional environmental authorities, CARs oppose this provision of the National Development Plan on the grounds that is creates conflicts of interest.

A closely related factor is that, given the sources of revenues assigned to CARs by Law 99, some CARs have very significant fiscal resources. Hence, in the view of some policymakers, given the current fiscal crisis and scarcity of national funding for regional investment, CARs are the logical institutions to finance municipal sanitation infrastructure. Presumably, this view informed the provision of the current National Development Plan cited above.

Finally, local political considerations evidently provide significant incentives for CARs to develop sanitation infrastructure. Large municipalities typically provide the lion's share of CARs' self-generated revenues via property taxes, and also wield considerable—and in the view of many, disproportionate—influence on CARs' decisionmaking (see Section 10, above). According to several interviewees, CARs focus on municipal sanitation infrastructure as a means of funneling investment funds to these large municipalities.

11.3. Policy options

Strategies have been proposed to mitigate the potential conflicts of interest. One option is restrict CARs' role in developing sanitation infrastructure to planning and financing—that is, to prohibit CARs from owning or operating such infrastructure. Presumably, given this limited role, incentives for strict enforcement of environmental regulations would not be compromised, or at least not to the degree they would be if CARs played a more important role.

This strategy is problematic, however. According to stakeholders interviewed for this report, although most CARs prefer to restrict their roles to planning and financing wastewater treatment plants, practical considerations tend to push them into owning and operating them. Specifically, in many cases, CARs finance and / or build such plants with the intention of turning over responsibility for the plants to municipalities. However, municipalities are reluctant to assume this responsibility because the plants are not profitable—user fees are not sufficient to cover expenses and / or the plants do not meet environmental guidelines and therefore leave the owner liable for fines and retributive fees. Several stakeholders interviewed for this report cited the example of wastewater treatment plants on the Bogotá River. Municipalities have refused to assume ownership of these plants, which were built by CARs mainly with IADB funds. One potential solution is for CARs to require municipalities to demonstrate a clear commitment to ownership before undertaking any infrastructure investments. For example, before financing infrastructure, Corantioquia requires municipalities to provide 50% cofinancing.

A second means of mitigating potential conflicts of interest inherent in developing infrastructure is to simply prohibit CARs from playing any role in infrastructure development.

Given the fiscal realities described above, this does not seem a particularly realistic strategy, however. In discussing this option, one department official suggested that were this option to be pursued, CARs would be stripped of both responsibility for infrastructure development and a portion of the property tax revenue now used for this purpose. Perhaps not surprisingly, she suggested that both the responsibility and the revenue be shifted to departments. Clearly, this strategy would necessitate major legal reforms, which may be politically problematic.

A third means of mitigating potential conflicts of interest inherent in developing infrastructure is for CARs to create separate internal divisions—one for building infrastructure, and another for regulating it. However, the case studies prepared for this report suggest that many CARs already have separate divisions for investment and regulatory oversight. Therefore, to the extent conflicts of interest exist, this institutional structure may not be very effective at mitigating them.

12. RELATIONSHIPS BETWEEN CARs AND OTHER SINA ENTITIES

12.1. National-regional coordination

12.1.1. Negative views

As discussed in Chapter 3, the decentralized design of Law 99 creates tension between MAVDT and CARs. Law 99 gave CARs a great deal of administrative and fiscal autonomy. But it also gave the Ministry of Environment the role of leading SINA and, in particular, of overseeing and coordinating CARs' activities. Unfortunately, evidence suggests that national-regional coordination has been sorely lacking. For example, of the documents reviewed for this report, Booz-Allen & Hamilton's 1997 evaluation of SINA presents what may be the most frankly critical assessment of this relationship. The report states,

> Currently, each component of the system conceived of in Law 99 of 1993 is working in an independent and divergent manner—each executes its own Action Plan based on its subjective interpretation of the National Environmental Plan, adapting it according to its own regional needs...
>
> The problem arises principally from the absence of leadership on the part of the central axis of the system, in particular, a failure to coordinate actions, assign work, process information, and evaluate results in accordance with national intentions…[this failure] results in duplication of efforts and an increase in operational costs. (4)
>
> …with the lack of a system leader, [each CAR] interprets its function as an individual entity, and not…as part of the system. (5)
>
> Management of relations between MMA and CARs, territorial entities, research institutes and urban environmental authorities are dispersed. This dispersion generates, on the one hand, inconsistency in decisions on environmental matters, and, on the other hand, ambiguous and contradictory administrative action, and what's worse, the absence of a unique sectoral policy. (18)

Other major evaluations of SINA generally concur that coordination between MMA and CARs is weak. For example, Galán (1998) finds that "erratic relations" between MMA and the CARs

have significantly impaired the operation of SINA. He recommends increased integration of CARs into the planning and policy formulation carried out by MMA (12).

In general, the interviews conducted for this study echoed previous studies' findings that the Ministry of Environment is not able exert sufficient control over the planning and functioning of CARs. A number of interviewees suggested that the directors general of some CARs were extremely powerful, perhaps too powerful relative to the other players in the environmental management system. At least one interviewee said that some CAR directors general have more power than the minister of MAVDT. In fact, many CARs have strong links to Congress, which in turn can exert influence on MAVDT, including via the budget process. It was also mentioned that the minister of MAVDT has called meetings that CAR directors have decided not to attend—apparently on more than a few occasions.

12.1.2. Positive views

Several interviewees espoused three of the fundamental arguments for continued decentralized environmental administration—presumably the same arguments that motivated the decentralization embodied in the 1991 Constitution and in Law 99. First, some interviewees said that autonomy enables CARs to operate independently of local political pressures at the municipal and department levels. Second, several interviewees said that autonomy insulated CARs from bad governance at the national level. Third, two interviewees said that decentralization encourages public participation and social control at the regional level. Finally, several interviewees argued forcefully that given Colombia's size and diversity, central administration of the environment is simply inefficient or downright impractical. For example, one mentioned that, as a former DNP official in charge of approving CARs' investments, he had no information with which to evaluate proposals—an illustration of a broader problem faced by national officials trying to make decisions about environmental matters at the CAR level. Two interviewees argued that decentralization is the principal reason that Colombia's environmental regulatory system functions as well as it does. Prior to decentralization, *de facto* the majority of the country lacked environmental regulation altogether. This remains the situation in Latin America countries where environmental regulation is more centralized.

12.1.3. Coordination mechanisms

As discussed in Chapter 3, national authorities have a variety of mechanisms to ensure that CARs act in accordance with national policies. First, CARs are required to submit 10-year, 3-

year, and 1-year action plans that tie in with the National Development Plan drafted by the executive branch. The *Contraloría* can set in motion procedures to remove CAR directors general from office for failure to comply with these requirements or failure to carry out their plans. In addition, CARs can be sued in court for developing plans that do not comport with the National Development Plan. Second, the national Department of National Planning must approve CAR investment projects. Third, CAR boards of directors include a representative of MAVDT as well as a representative of the president of Colombia. Fourth, Colombia's control organizations can discipline CARs for failure to implement plans or for abuse of office. Fifth, national authorities have some control over the salaries of CAR staff. Finally, in the past, the Ministry of Environment and other national institutions have contributed investment funds—or have allocated funds contributed by multilateral institutions—and this power of the purse has given them some sway over CAR investment projects. As discussed in Blackman et al. (2004), other countries with decentralized environmental management systems have relied heavily on cofinancing to coordinate activities at the national and regional levels.

The effectiveness of those mechanisms is limited, however. First, as discussed in Section 5, MADVT has very poor information about the investment, policy implementation, and regulatory enforcement activities of CARs. Performance indicators typically reflect regulatory processes rather than impacts. For example, CARs often report on the amounts of money spent rather than how these investments affect environmental quality. MAVDT's information about environmental quality at the regional level is also poor. Effective coordination is simply not possible without such basic information. Second, as discussed in Blackman et al. (2004, Section 6.7), levels of staffing in the national office of the Delegate *Procuraduría* for Environmental Affairs are inadequate to monitor or evaluate the performance of CARs, and the *Contaloría* is severely hampered by lack of data. As for regulations that mandate intensive planning at the regional level, as discussed in Section 3, previous evaluations have concluded that even when CARs do fulfill their planning requirements, they often do so simply to fulfill the letter of the law, rather than to actually orient resource management. New planning requirements established in 2001 may mitigate this problem somewhat. Finally, as discussed in Blackman et al. (2004, Section 4), the current fiscal situation and a decline in multilateral funding constrain MAVDT's ability to cofinance investment.

National authorities have two major environmental funds at their disposal to facilitate cofinancing—FONAM and the National Royalty Fund established under the 1991 Constitution. However, as discussed in detail in Section 8, various characteristics of each fund reduce their effectiveness as a mechanisms for coordinating national and regional environmental policy:

each fund alone probably has insufficient resources to have the desired impact; several of the funds have goals other than coordinating national-regional environmental management and/or entail legal restrictions that would leave MAVDT with limited discretion in deciding how to disburse funds; some of the funds have been plagued by poor management; and some have limited resources outside national appropriations.

One reform option advanced by several interviewees for improving national-regional coordination is to give more decisionmaking authority to MMA and less to CARs. Some interviewees thought that the autonomy of CARs could be restricted legally by decree, without attempting to push reform legislation through Congress. For example, currently, CARs merely inform MAVDT about their budgets—they do not have to get approval of these budgets. It might be possible to decree that they obtain actual approval.

Another proposed option is to consolidate all of the environmental funds that CARs can access into a single decisionmaking process. At least in principle, such an approach might enable MAVDT to exert more control over the allocation of these funds.

12.2. CARs, AAUs, and municipalities

This section considers financial and jurisdictional issues affecting CARs, municipalities, and AAUs.

12.2.1. AAU finances

AAU's precarious financial situation affects their relationship with CARs and municipalities. From 1996 to 1998, AAUs received funding from three main sources: revenue generated through the mechanisms established under Law 99 (principally property taxes); transfers from municipalities for environmental management support; and national contributions, which were divided between credits from the World Bank for capacity building (US $20 million) and ordinary funds from the MAVDT budget. Property tax revenues and the World Bank credits were the largest sources. After 1998, however, these sources of funding were substantially reduced. The Constitutional Court declared unconstitutional Article 9 of Decree 1339 of 1994, which had granted AAUs half the property taxes raised by municipalities.[18]

[18] The court decision held that these resources must be invested in the urban perimeter, but CARs—not AAUs—are responsible for this investment.

From 1995 to 1998, AAUs' self-generated resources totaled 188,755 million pesos, of which 86% was generated by the Bogotá Urban Environmental Authority (DAMA), 11% by the Cali Urban Environmental Authority (DAGMA), 2% by the Barranquilla Urban Environmental Authority (DADIMA), and 1% by the Aburrá Valley Urban Environmental Authority (AVMA). DAMA's disproportionate allocation results from a special transfer that entities within its jurisdiction are required to make for environmental investment. All of DAMA's funds from property taxes are dedicated exclusively to the Río Bogotá decontamination project. DADIMA's and AVMA's low allocations are mainly the result of a recent decision by the cities of Barranquilla and Medellín not to transfer property taxes to the AAUs, a noncompliance issue that has sparked a legal battle.

After 2000, the AAUs stopped receiving national funds. This, combined with their limited ability to generate their own resources, has placed AAUs in a precarious financial situation.

12.2.2. Jurisdiction and financial issues

Some interviewees cited actual and potential conflicts of jurisdiction among the CARs, municipalities, and AAUs—for example, cases in which multiple permits are mandated by different agencies, sometimes with conflicting requirements.

Financial conflicts between CARs and municipalities are particularly contentious, however. As noted in Chapter 8, in principle, the CARs receive at least 15% of the revenues from property taxes collected in their jurisdictions. Administratively, these revenues are collected by the municipalities. However, many of the CARs claim that they don't receive their full allocations because of artificially low valuations and because the mayors often retain some of the funds for their own uses. The mayors are said to retain funds through (i) the use of intricate accounting procedures and (ii) the use of in-kind, rather than cash, payments to the CARs. In the latter case, the mayors—particularly powerful ones—sometimes argue that certain investment projects undertaken within their jurisdiction should have been financed by the CARs. Therefore, the municipalities (unilaterally) net out the costs of these projects in allocating revenues to CARs. The interviewees indicate that the CAR directors general tend not to fight these actions, for a variety of reasons. How do the mayors exert such influence? First, they are often members of the CAR boards of directors, and although they supposed to represent all the mayors in the CAR, they often focus on their own interests. Lack of transparency facilitates this type of corruption. Second, the mayors tend to form coalitions with other board members.

Financial conflicts between CARs and AAUs can be equally contentious. Several CARs, including Cardique and CRA, are disputing the disposition of the property taxes collected by the AAUs in their areas (Cartagena and Baranquilla, respectively). In the case of CRA, for example, interviewees reported that a recent judicial decision awarded the full 15% of the property taxes collected in Baranquilla to the AAU (BAMA). Although many observers believe this decision will not stand up to appeal, final resolution may take many years. In the meantime, the parties have reached an agreement to split the revenues equally. A similar situation exists in Cartagena.

13. CONCLUSION

This section is split into two parts. The first part describes the 11 principal findings of our study, emphasizing the main challenges facing CARs. The second part discusses 12 actions that can help overcome these challenges.

13.1. Findings

1. Reliable data on environmental quality and institutional performance are urgently needed to facilitate environmental management.

There is general recognition in Colombia that (i) a well-managed and well-functioning system for collecting and disseminating data on environmental quality and institutional performance are indispensable for environmental management, and (ii) Colombia's current system is inadequate. Many of our interviewees—from both inside and outside the government—cited lack of such a system as a critical contributor to SINA's failings and, in particular, an inability to coordinate environmental management at the CAR level.

Efforts to develop a consistent system of indicators and improve the management of Environmental Information System are underway at the national level and at the CAR level. But even were there agreement on indicators, Colombia would need to make substantial progress to implement them, given SINA's limited capacity for data collection. Colombia's data collection infrastructure—including environmental laboratories, measuring stations, documentation centers, and basic cartography—is clearly inadequate. For example, 40% of the country's CARs either have no environmental laboratories or have laboratories that do not function at a minimal level.

2. Significant financial and jurisdictional conflicts exist among CARs on the one hand and territorial entities meant to be cooperative partners within SINA on the other.

Significant financial and jurisdictional battles are taking place between CARs and the Urban Environmental Authorities (*Autoridades Ambientales Urbanas,* AAUs,) and between CARs and municipalities, all institutions that need to—and by law are supposed to—cooperate to facilitate environmental management. Specifically, some municipalities appear to be resisting making full payments of property taxes to their CARs as required under Law 99, and some AAUs are seeking a greater say in the allocation of funds raised in their jurisdictions. Further, the precise

roles and jurisdictions of the different agencies, particularly AAUs and CARs, are confused and sometimes in conflict. Some regulated firms report being inspected by multiple authorities, sometimes based on different criteria. Several court cases are pending, although interim cooperative agreements have been reached pending resolution of these cases.

3. Detailed, albeit limited, data suggest that CARs do not prioritize environmental risks adequately.

An examination of a limited sample of data on CARs' investment spending suggests that they do not appropriately prioritize environmental risks and allocate investment funds accordingly. In 2001, as a group, CARs allocated 28% of their investment funds to projects involving the protection of flora and fauna and only 5% to industrial pollution control projects other than wastewater treatment plants. Although this statistic is based on limited data and must be interpreted cautiously, given the severity of industrial pollution problems in Colombia, it suggests that, for whatever reason, CAR investments may focus disproportionately on natural resource conservation. In addition, an examination of individual CAR allocations of 2001 investment funds suggests that CARs' allocations of investment spending across different risks do not comport particularly well with the severity of these risks.

4. Overall performance varies significantly across CARs and appears to be correlated with the CAR's age, geographic size, and level of poverty.

Lack of data on environmental quality and institutional functioning makes it difficult to measure how well CARs are performing their principal function, environmental protection. Although limited, the performance data compiled for this report suggest that overall performance is correlated with certain historical and socioeconomic characteristics. Specifically, CARs that perform well tend to be those that were established prior to Law 99 of 1993 and have relatively low levels of poverty and geographically small jurisdictions. Surprisingly, neither the financial characteristics of CAR, attributes related to employment, or technical capital appear to be correlated with measured performance.

5. Although the distribution of financial resources across CARs is highly unequal, opportunities may exist to mitigate inequities by encouraging CARs to take advantage of unexploited prospects for revenue generation, and to rationalize national contributions.

The distribution of total financial resources across CARs is extremely uneven, with total as well as per capita budgets of the richest CAR a full two orders of magnitude greater than those of the poorest. The distribution of self-generated revenues, which account for the lion's share of all

resources, varies even more. Two-thirds of total financial revenues for all 33 of Colombia's CARs accrue to just 7 CARs.

Statistical analysis of the variation of financial resources across CARs suggests some opportunities may exist to even out this skewed distribution. Although variation in the property tax revenues generated by the CARs depends on levels of economic activity in their jurisdictions, variation in other sources of CAR revenue is not so easily explained. This finding that suggests there may be unexploited opportunities for revenue generation in some CARs.

Based on 2002 data, the allocation of national contributions (versus self-generated revenues, such as property taxes) to CARs does not follow readily discernible patterns. For example, national allocations do not appear to be correlated with levels of economic activity or urbanization. However, some evidence suggests that changes in national contributions between 2002 and 2003 are correlated with levels of income and urbanization in CARs.

6. Human and technical resources vary markedly across CARs. Human resource difficulties are exacerbated by conflicting national-level polices and by clientelism—the practice of obtaining political support through promises of employment—particularly in the use of contractors.

Environmental management capacity varies markedly, and shortages of human and technical resources are partly to blame. The number of employees per CAR (both permanent and contracted) varies enormously across the 33 CARs, even after normalizing for population differences. The same is true of levels of education of CAR staff. Although variation in permanent employment levels is, not surprisingly, closely related to the size of the operations budgets of the individual CARs, the number of contractors engaged by the CARs cannot be readily explained by easily measured factors, such as budgetary, economic, or demographic differences. This finding is consistent with anecdotal evidence suggesting that clientelism plays a role in contracting practices.

Strategies to address this excessive reliance on contractors are complicated by clear tensions between two policy objectives. On the one hand, there is a national goal to limit operational spending and staff size across all government agencies. On the other hand, there is growing recognition of the need to limit reliance on contractors by CARs. A related human resources issue is the professionalism of CAR directors. Recent reforms aimed at mitigating this problem by changing the selection procedures for CAR directors general appear promising, although it is too early to make definitive judgments.

Like the distribution of human resources, the distribution of technical resources across CARs is highly uneven. Although the availability of technical resources like computers is clearly related to the size of the operations budgets of the individual CARs, there appears to be a strong (inverse) correlation between computer use and poverty levels. This suggests that an increase in budget resources, by itself, may not fully address the infrastructure and related problems faced by many of the CARs. For example, if our measure of poverty is serving as a proxy for computer literacy in the workforce, or for the strength of the infrastructure available to support computer networks, then these technological support issues may need to be addressed before one can effectively expand the use of computers in CARs.

7. Certain interest groups appear to exert undue influence on the activities of some CARs, such that instead of acting to further social welfare, they act to further the interests of select groups.

Many stakeholders interviewed for this report indicated that excessively close ties between CAR directors general and interest groups are too common and that similar problems exist between interest groups and members of the CAR boards of directors. Further, we were told repeatedly that NGOs, which in principle could serve to balance pressures from organized interest groups, are relatively weak. In fact, some of the NGOs represented on boards of directors were referred to as "spurious" because they were established for the express purpose of filling a designated seat on the board and did not represent a significant segment of civil society.

8. The participation of CARs in financing, owning, and operating sanitation infrastructure weakens their incentives to stringently regulate that infrastructure.

Although Law 99 redefines CARs as regional environmental regulatory authorities and assigns primary responsibility for sanitation infrastructure to municipalities, it also mandates that CARs retain certain responsibilities for developing infrastructure, a dictate that clearly has the potential to create conflicts of interest. In particular, in cases where CARs finance, plan, own, and/or operate sanitation infrastructure, their incentives to strictly enforce environmental regulations governing this infrastructure may be compromised. Several political, economic, and legal factors are driving CARs' continued investments in sanitation infrastructure. Perhaps most import, the Uribe administration has explicitly mandated such investments.

9. Coordination between MAVDT and CARs is inadequate, partly as a result of tensions inherent in the design of SINA.

Law 99 assigned the Ministry of Environment the role of leading SINA and, in particular, overseeing and coordinating the activities of CARs. A basic element of sound management, national-regional coordination is important for ensuring that CARs address environmental problems deemed of highest priority to Colombia, minimizing discrepancies in the enforcement and implementation, and taking advantage of economies of scale in policy and program implementation and in investment. Unfortunately, considerable evidence—including major evaluations of SINA—suggests that the ministry's performance in this area has been inadequate.

Poor coordination between MAVDT and CARs stems in part from contradictions in the design of SINA as established in Law 93. CARs have a great deal of autonomy. For example, the lion's share of their funding comes from internal sources—property taxes levied by municipalities, taxes on energy generation and petroleum extraction, and effluent fees—and they have a great deal of control over how these funds are spent. Other countries with decentralized environmental management systems face the same problem of coordinating national and regional authorities. Indeed, such tensions seem to be inherent in decentralized systems.

National authorities in Colombia have a variety of mechanisms at their disposal to ensure that CARs act in accordance with national policies. First, CARs are required to submit 10-year, 3-year, and 1-year action plans that tie in with the National Development Plans drafted by the executive branch. Second, the National Department of Planning must approve CARs' investment projects. Third, CARs' boards of directors include a representative of MAVDT, as well as a representative of the president of the republic. Fourth, Colombia's control organizations can discipline CARs for failure to implement plans or for abuse of office. Fifth, national authorities have some control over the salaries of CAR staff. Finally, in the past, MAVDT and other national institutions have contributed investment funds—or have allocated funds contributed by multilateral institutions—and this power of the purse has given them some sway over CARs' investment projects.

Several factors limit the effectiveness of these mechanisms, however. MAVDT has very poor information about the investment, policy implementation, and regulatory enforcement activities of CARs. In addition, levels of staffing in the national office of the Delegate *Procuraduría* for Environmental Affairs are not adequate to monitor or evaluate the performance of CARs, and the *Contaloría* is severely hampered by lack of data. As for regulations that mandate intensive

planning at the regional level, previous evaluations have concluded that even when CARs do fulfill their planning requirements, they often do so simply to fulfill the letter of the law rather than to actually orient resource management. Finally, the current fiscal situation and a decline in multilateral funding severely constrain MAVDT's ability to cofinance investment.

10. Enforcement of environmental regulations by CARs is inadequate.

CARs are principally responsible for enforcing environmental regulations in Colombia. Unfortunately, a wide variety of environmental regulations in Colombia are not consistently enforced. For example, of the effluent fees that CARs charge to polluters, only one-third are actually collected (Gómez Torres 2003, 40). Enforcement varies markedly across CARs, across sectors, and across sizes and types of firms. Contributing factors include a lack of political will and inadequate access to police assistance, as well as several of the problems discussed in this section and in Blackman et al. (2004)—regulatory capture, low levels of human and technical capacity, poor information systems, reliance on voluntary regulation, and inadequate regulations.

11. Voluntary regulation used by CARs is often ineffective.

CAR's reliance upon voluntary clean production agreements and voluntary environmental guides has raised a number of serious concerns. Many voluntary clean production agreements appear to have simply legitimized and perpetuated noncompliance with existing command-and-control regulations. The legal standing and purpose of environmental guides is not clear. In particular, confusion exists in the regulated community about whether compliance with voluntary environmental guides is a substitute for compliance with actual regulations. Also, the guides promote abatement strategies that are not always the most appropriate.

13.2. Recommendations

1. Improve data collection, management and dissemination.

Because information is the cornerstone of improved environmental management within CARs—as well as within SINA as a whole—MAVDT should move quickly to improve data collection and management at the CAR level and collate and integrate these data nationally. Toward this end, MAVDT can undertake the following efforts. Perhaps most important, it can move quickly to establish a system of indicators of both environmental quality and CAR performance. It is essential that the indicators be limited in number and sufficiently simple so that the system can be implemented despite the modest data collection and management

capacity expected to prevail in CARs in the medium term. It is also very important that the system be consistent across CARs to ensure that data from different CARs can be compared and aggregated at national level.

Second, MAVDT can work with CARs to improve their capacity to use the system of indicators. Third, as discussed in Blackman et al. (2004), MAVDT can improve management and analysis of data at the national level by clarifying the regulatory underpinnings of the Environmental Information System and improving its general management. Fourth, MAVDT can make the indicators an integral component of the planning process that requires CARs to formulate and disseminate 1-year, 3-year, and 10-year environmental plans. The indicators can be used to help CARs develop these plans and also help both CARs and national-level policymakers evaluate implementation efforts. Finally, for reasons discussed below, all data that CARs collect on environmental quality and the performance of environmental institutions should be freely and publicly available, and significant resources should be devoted to disseminating these data via the Internet and other means.

2. Improve priority setting by requiring CARs to undertake comparative risk assessments.

To improve CAR priority setting, MAVDT can require that each CAR periodically perform an assessment of the relative importance of various risks to human health and the environment in its territory. Furthermore, MAVDT can require that CARs use this comparative risk assessment to guide its allocation of financial, human, and technical resources. MAVDT can take specific steps to make these requirements feasible. First, as discussed above, it can improve data collection and management at the CAR level. Second, it can develop a standard methodology for comparative risk assessments that is practical given the capacity for data collection and analysis that will prevail among CARs in the medium term. Third, it can provide technical assistance and training in comparative risk assessment by, among other things, developing user-friendly training manuals and holding workshops. Fourth, it can develop means of certifying third parties to assist CARs in carrying out risk assessments. Finally, it can develop regulations requiring CARs to link the results of comparative risk assessments to the resource allocations included in their three-year action plans.

3. Strengthen the participation of representatives of civil society on CAR boards of directors.

To balance the influence of private-sector interests on CAR boards, MAVDT and CARs can seek to strengthen the participation of the members who represent civil society, including representatives of NGOs, MAVDT, departments, and the president of the republic. CARs and

MAVDT can strengthen NGO participation by funding projects and programs to build NGOs' capacity at the local level, creating networks and associations among NGOs and between Colombian and international NGOs, and involving NGOs in CAR activities. In addition, a number of broad-brush measures can help strengthen NGOs, including continuing to promote environmental education and ensuring free availability of environmental data.

Steps can also be taken to professionalize the representatives of public-sector institutions on the boards of directors, including representative of MAVDT, the departments, and the office of the president. For example, following on MAVDT's recent decision to establish an office of CAR management staffed with all of MAVDT representatives to CAR boards, other public institutions represented on boards of directors could develop similar offices staffed by a relatively small group of professionals hired and trained to serve in these positions. These professionals could be organized into a central office within each relevant public institution to maximize information sharing and learning. Ideally, CAR management offices of each of the public institutions would meet periodically to share lessons learned and coordinate their activities.

4. Require top CAR managers and members of boards of directors to meet minimum professional criteria as well as financial disclosure requirements.

Steps can be taken to professionalize and enhance transparency of CAR management and oversight. First, in accordance with recent reforms of the election process for directors general (Decree 3345 of 2004), MAVDT can establish national minimum professional criteria for other top positions in CARs. Individual CARs would be allowed to establish stricter criteria but not weaker ones. The principal aim is to ensure that top CAR staff and most members of boards of directors possess the technical qualifications and / or professional experience needed to perform their jobs effectively and to discourage hiring and promotion based on purely political criteria. The professional criteria should take into account the fact that regional diversity implies that different qualifications may be appropriate in different CARs. Independent third parties, such as universities and professional associations, should be responsible for assessing the extent to which candidates meet the criteria. Professional experience and education could substitute for each other in meeting the criteria. Even if the criteria are not legally binding, a voluntary system of evaluation and public disclosure may have a positive impact and serve as a first step toward a more comprehensive system.

Second, MAVDT can establish financial disclosure requirements for CAR senior managers—including directors general and most public-sector board members—as well as regulations

governing what types of conflicts of interest disqualify candidates from service. Financial disclosures need to be vetted by a credible, independent qualified party, but they need not be publicly available.

5. Reconstitute CAR boards of directors.

Given the apparent weakness of NGOs on CAR boards of directors, one option for strengthening the voice of civil society in the medium term is to increase representation of technically competent, qualified individuals who meet minimum professional standards and financial disclosure requirements. For example, draft legislation introduced by the Uribe administration in 1993 proposed replacing two of the four mayors on the board of directors with a representative of the National Parks System, and a representative of the national university system.

6. Hold an annual public meeting of CAR and MAVDT representatives.

An annual meeting of MAVDT and CAR directors general that is fully open to the public could serve a number of purposes including: improving CAR-MAVDT coordination; disseminating best practices among CARs in order to raise average levels of regulatory capacity; and increasing transparency and information sharing. In addition, an annual meeting of the type described would enable CARs to publicly report on their activities, and would thereby create incentives for improved institutional performance.

7. Improve national-regional coordination.

MAVDT should aggressively explore new strategies for improving coordination between MAVDT and CARs. A necessary condition for the success of virtually any coordination mechanisms is the establishment of a system for collecting data on the institutional performance of CARs (the topic of a separate recommendation). These data are needed for planning coordinated activities, monitoring compliance with such plans, and monitoring overall institutional performance. Actively disseminating such data—or even just publicly disclosing it—can create strong incentives for compliance with coordinated plans and for improved institutional performance.

Beyond this general point about information, a number of more specific coordination mechanisms are available. These fall into two categories: "carrots"—i.e., rewards for cooperative behavior—and "sticks"—sanctions for non-cooperative behavior. Carrots are likely to be more effective in the case of resource-poor CARs while sticks are more likely to be

effective in the case of resource-rich CARs. Among the mechanisms that involve sticks, one is to strengthen the capacity and authority of SINA's control organizations which, in theory, are responsible for ensuring that CARs activities comport with the law.

A second stick mechanism is to enhance MAVDT authority over CAR management and spending decisions. For example, standards and processes might be developed that allow MAVDT to undertake a periodic formal evaluation of CAR directors general and to remove them in the case of blatant violations of MAVDT policy directives.

Alternatively, or in addition, MAVDT might be endowed with the authority to approve certain CAR budget and / or investment decisions on the basis of a set of clear standards. To minimize the potential for bureaucratic morass, MAVDT would be given a limited time to approve or reject budgets. In addition, a formal dispute resolution mechanism could be established to facilitate the overall process.

Among possible coordination mechanisms that involve carrots, one option would be to enhance MAVDT's ability to cofinance investment projects at the regional level. In countries with a decentralized environmental structure, cofinancing is often the most important tool national authorities have to ensure national-regional coordination. One disadvantage of this approach is that it would be less effective with CARs that have relatively large amounts of self-generated funds.

National environmental funds are likely the most efficient and transparent means of enhancing cofinancing. MAVDT could rely upon existing mechanisms—the National Royalty Fund, the Environmental Compensation Fund, the National Environmental Fund (*Fondo Nacional Ambiental*, FONAM), and the National Fund for Environmental Action. However, as discussed in Section 8.2.4, these funds have significant structural characteristics that render them less than ideal for the purpose at hand: each fund alone has resources that might not be sufficient to have the desired impact; several of the funds have goals other than coordinating national-regional environmental management and / or entail legal restrictions that would leave MAVDT with limited discretion in deciding how to disburse funds; some have been plagued by poor management; and some have limited resources outside national appropriations. Given these constraints, MAVDT might consider efforts to consolidate and restructure the existing funds or create a new fund. Evidently, MAVDT is currently attempting to establish a consolidated application process for these funds, although the funds themselves would remain separate.

Ideally, the fund used to improve national-regional coordination—whether a modification of an existing mechanism or a new one—would have the following features: CARs would submit proposals for cofinancing to MAVDT, which would evaluate and select proposals using clear and transparent criteria. In establishing these criteria, MAVDT's broad aim would be to maximize net benefits (benefits to human health and the environment net of total costs) and also to further national-regional coordination and reduce disparities across CARs in both regulatory capacity and access to environmental services. Thus, the proposal selection criteria would include such factors as the degree to which the project comports with national and regional environmental plans, the capacity of the particular CAR to implement the project, the level of environmental infrastructure in the particular CAR relative to other CARs, the need for capacity building in the particular CAR relative to other CARs, and the magnitude of the potential net benefits to human health and the environment from the proposed projects.

Conventional mechanisms would be used to ensure that project funds are well spent. First, to ensure full commitment to the project, CARs would be required to supply a significant percentage of capital from their own coffers. Second, they would be required to collect clear, transparent baseline data, establish performance milestones based on specific monitorable criteria, and provide periodic progress reports on the extent to which these milestones have been met. Finally, clear failure to meet milestones would disqualify a CAR from future cofinancing. Note that these mechanisms would help bolster MAVDT's ability to monitor CAR activities.

Finally, the annual meeting discussed above constitutes a mechanism for enhancing CAR-MAVDT coordination that involves both carrots and sticks.

8. Balance and rationalize distribution of financial resources across CARs.

The executive branch can take steps to balance and rationalize the distribution of financial resources across CARs. First, it can develop clear objectives and processes for allocating national resources to CARs. These objectives and processes should be subject to periodic revision to account for changing conditions and policy directions. Second, MAVDT can help low-income CARs build capacity for generating revenue by, for example, identifying and exploiting underutilized tax instruments. Finally, as discussed above, national environmental funds could be consolidated and rationalized.

9. Develop guidelines to minimize conflicts of interests arising from CARs' involvement in developing sanitation infrastructure.

Potential conflicts of interest arising from CAR involvement in developing sanitation infrastructure should be minimized. The most effective means of achieving this end would be to simply prohibit CARs from having any involvement in developing sanitation infrastructure. Although not unreasonable as a long-term policy goal, in the medium term, given the paucity of other sources of funds for sanitation infrastructure and consequent national pressures to use CARs' self-generated funds for this purpose, this drastic measure may not be politically feasible.

A more practical approach in the short term may be to prohibit CARs from operating or owning sanitation infrastructure. Hence, their role in developing sanitation infrastructure would be strictly limited to providing cofinancing. Although it would not completely eliminate conflicts of interest, this prohibition would likely dampen them. Similarly, conflicts of interest could be dampened by requiring CARs to create independent administrative divisions to finance sanitation infrastructure.

10. Take action at the national level to resolve jurisdictional and financial disputes between AAUs and CARs.

Continuing jurisdictional and financial disputes between CARs and AAUs—including numerous court cases—have needlessly drained scarce resources, precluded cooperation between the two institutions, and sowed uncertainty, confusion, and mistrust in the regulated community. National-level authorities, including MAVDT and, if necessary, the legislature, should clarify lines of authority and financial relationships between AAUs and CARs and develop workable and efficient dispute resolution mechanisms. Because the situation is complex, a blue-ribbon panel of independent experts might be convened to develop more specific recommendations and build consensus around them.

11. Develop national guidelines governing staffing.

Measures can be taken to ameliorate the interrelated problems in CAR staffing, including clientelism, high rates of turnover, and reliance on contractors to perform important functions. First, MAVDT can develop rules prohibiting CARs from contracting out defined core functions. Second, it can establish professional standards for both permanent employees and, perhaps more importantly, contractors. Finally, it can introduce more flexibility into national guidelines governing the percentage of funding that can be devoted to operational spending.

12. Eliminate CARs that chronically perform poorly.

One option for improving the functioning of the regional environmental management systems in Colombia is to eliminate CARs that chronically perform poorly by consolidating them with contiguous well-functioning CARs. Unfortunately, until information management systems are improved, evaluating the performance of individual CARs will remain a difficult, subjective, and extremely contentious exercise. Once indicators and management systems are in place, however, rules could be established mandating that CARs meet minimum performance standards.

The process of developing these standards could be closely tied to efforts (that are presumably now underway) to require CARs to set specific quantifiable goals in their three-year action plans and systematically monitor their progress. Ideally, this performance evaluation system would measure CARs' direct impacts on environmental quality—for example, the hectares they reforest and water pollution they reduce each year. In addition, the new system could take stock of process-related proxies for CARs' environmental impacts, such as the extent to which they complete planning activities, collect environmental quality data, and carry out monitoring actions.

CARs that chronically fail to meet minimum performance standards and cannot show good cause for this failure would be subject to elimination by consolidation. Procedures to carry out these activities would need to be established, possibly including some form of legislative approval. Even if never carried out, this threat could provide strong incentives for improved performance.

Unfortunately, a performance evaluation system involving such severe sanctions would create strong incentives for poorly performing CARs to block improvements in information management systems. To prevent this, the two policy initiatives could be staggered—the evaluation system could be initiated after information systems have been upgraded. Thus, this system would appear to be more practical in the medium or long term than the short term.

REFERENCES

Access Initiative. 2004. Available at www.accessinitiative.org. March.

Agustin Codazzi Geographic Institute (IGAC) and Ministry of Agriculture (Corpoica). 2002. "Coverage and Actual Use of Soil." Colombia.

Belsley, D., E. Kuh, and R. Welsch. 1980. *Regression Diagnostics.* John Wiley & Sons.

Blackman, A., R. Morgenstern, and E. Topping. 2005. "Institutional Analysis of Colombia's Autonomous Regional Corporations (CARs)." October. *Resources for the Future Report*: Washington, DC. Available at http://www.rff.org/Documents/RFF-Rpt-SINA.pdf

Booz-Allen & Hamilton of Colombia Ltd. 1997. "Institutional Strengthening of the Ministry of Environment. Project of Decree Law and Exposition of Motives." May. Bogotá.

Colombian Environmental Information System (SIAC). 2002. *Profile of the State of Natural Resources and the Environment in Colombia 2001.* July.

———. 2002b. *Concepts, Definitions and Environmental Information Instruments in Colombia.* July.

Contraloría, Environmental Sectoral Studies Directorate. 2002a. Ortiz Pérez, Néstor, Jesús Mena, Otto Reyes. "Institutionality and the Environment." In Carlos Ossa Escobar, *Colombia between Exclusion and Development.*

———. 2002b. "State of Natural Resources and the Environment 2001–2002." August. Bogotá.

———. 2003a. "Report of the Government Audit with Integral Abbreviated Focus." Ministry of Environment, Housing and Territorial Development. 2002." June. Bogotá.

———. 2003b. "State of Natural Resources and the Environment 2002–2003." May. Bogotá.

Dillinger, W., and S.B. Webb. 1999. "Decentralization and Fiscal Management in Colombia." Washington, DC: World Bank."

Duraiappah, A. K. 1998. "Poverty and Environmental Degradation: A Review and Analysis of the Nexus." *World Development* 26(12): 2169–79.

Esterling Lara Sánchez, Angel. 2003. "Evaluation and Perspectives on the Consensus Agreements for Cleaner Production in Colombia." April. Bogotá.

Esterling Lara, Angel. Consultant, World Bank. 2004. "Country Environmental Analysis of Colombia. Job Report." Bogotá: World Bank.

Galán S., Alberto. 1998. "Rationalization of Spending in SINA: Institutional Firming towards Decentralization." Contract DNP-075-98, Final Report, Executive Summary. December. Bogotá.

Gómez Torres, Mary. 2003. "Fiscal Policy for Environmental Management in Colombia." XV Regional Seminar on Fiscal Policy, Economic Commission for Latin America and the Caribbean." January. Santiago.

González, Francisco L. de G., Jorge Ajumada Barona, Mauricio Galindo Caballero. 2002. "Evaluation of Environmental Institutional Development Projects. Colombia: Environmental Program CO-0041." June. Bogotá.

Interinstitutional Committee on Indicators. 2002. "Advance in Sustainable Development Indicators in Colombia." Available at http://www.medioambiente.gov.ar/documentos/novedades/seminario_indicadores_desarrollo/J_Canal.pdf. April.

Ministry of the Environment and Regional Autonomous Corporation of Valle del Cauca. 2002. Voices of SINA. Report to the National Environmental System." April. Bogotá.

Morgenstern, R.D. J-S. Shih, and S. Sessions. 2000. Comparative Risk Assessment: An International Comparison of Methodologies and Results. *Journal of Hazardous Materials* 78: 19-39.

Peña Villamil, Fanny. 2003. "Compendium of Information on Sustainable Development Indicators in Colombia." In Angel Esterling Lara (2004), "Country Environmental Analysis of Columbia." Bogotá: World Bank.

Planning Unit of Mining and Power. "Environmental Impact Module for 1996." In Angel Esterling Lara (2004), Documents compiled for "Country Environmental Analysis of Colombia." Bogotá: World Bank.

Rodríguez Becerra, Manuel. 1994. *Memoir of the First Minister of Environment. February 7–August 6.* August, Bogotá.

Saez, Felipe. 2003. "Corruption, Institutional Performance, and Governance: Developing an Anticorruption Strategy for Colombia." In *Colombia: The Economic Foundation of Peace.* Washington, DC: World Bank, 2003.

Sánchez Triana, Ernesto. 1999. "Autonomous Corporations: From Economic Development to Environmental Conservation." June. Bogotá.

Sánchez Triana, Ernesto and Gabriel Medina. 1994. "Compliance and Application of Environmental Legislation." From *Industrial Pollution in Colombia.* Sánchez Triana and Uribe Botero. DNP and UNDP. August. Colombia.

Seligson, Mitchell. Casals & Associates. 2001. "Transparency and Anti-Corruption Activities in Colombia: A Survey of Citizen Experiences." October.

SIAC. *See* Colombian Environmental Information System.

Transparency for Colombia Corporation and Transparency International. Lozano Ramírez, Juan, Daniel Mazuera Gómez, Rosa Inés Ospina Robledo, Marta Lucía Tamayo Rincón. 2001. "National Integrity Systems. Colombia 2001. Country Study Report."

Vargas, César. 2003. "Ranking de Desempeño de las Corporaciones Autonomas Regionales. Tomo II: Análisis de Resultados." September. Bogotá.

APPENDIX A: RFF STAKEHOLDER INTERVIEWS

A1. Interviews conducted for CARs study, March 8–12, 2004

March 8, 2004

- Camilo Santos, Office of the Environment, State of Cundinamarca (Bogotá)
- Francisco Canal, Executive Director, ASOCARs (Bogotá)
- Juan Carlos Iazza, Subdirector of Environmental Affairs, ASOCOLFLORES (Bogotá)

March 9, 2004

- Leonardo Muñoz, Director of Planning, Information and Regional Coordination,
- MAVDT (Bogotá)
- Rosalba Ordoñez, Director of Planning, MAVDT (Bogotá)

March 10, 2004

- Francisco Zapata Ospino, Director General, CORANTIOQUIA (Medellín)
- Nicolas Alberio Echeverry, Office of the Environment, State of Antioquia (Medellín)
- Augustine Chavez, Director General, CARDIQUE (Cartegena)
- Edgar Mateus Hernandez, Director AAU (Cartegena)
- Evelyn Espita, Chemist and Sanitary Engineer, SINGENTA, S.A. (Cartegena)
- Roxana Segovia de Cabrales, Director Fundacion Mamonal, Board of Directors, CARDIQUE (Cartegena)

March 11, 2004

- Angela Peña Marin, Executive Director, GAIA (Medellín)
- Carlos Anibal Palacio, Director, Corporación Empresarial ProAburrá Norte (Medellín)
- Julio Maya and Herman Marain, Director and employee CELBA (Medellín)

- José Gomez, Plant Manager and Octavio Nieto, Quality Control Manager, INVESA (Medellín)
- Jorge Mario Gallego, Chief of Department of Industrial Security, ENKA de Colombia (Medellín)
- Sergio Bustamante Perez, Director of Area Metropolitan del Valle de Aburrá (Medellín)
- Lilliana Marie Castilla, Corporación CEA (Cartegena)
- Ana Verena Vargas, Chief of Environmental Quality, C.I., Oceanos S.A. (Cartegena)
- Dayro Banquez, Director de OKAWA Environmental Foundation (Cartegena)
- Antonio Berasteguil, Superintendent of the Environment, PETCO [Petrochemical Colulmbia] (Cartegena)

March 12, 2004

- Enrique Rozo, Funcionamio Especializado SIYP (Baranquilla)
- Hugues LaCouture and Armando Carmacho, Special Advisors to the chief, BAMA (Baranquilla)
- Ing. Mario René Bernal Poveda, Jefe de Ingeneria y Montages, COLCERAMICA (Cundinamarca)
- Juan Carlos Velasco, Subdirector, CRA (Bogotá)
- Ignacio de la Hoz, Assistant to the sub director CRA (Bogotá)

A2. Interviews conducted for SINA study, December 4–12, 2003 (all Bogotá)

December 4, 2003

- Carlos Costa, Director of Environmental Policy, National Planning Department (DNP)
- Juan Pablo Bonilla, Vice Minister of Environment, Ministry of Environment, Housing and Territorial Development (MAVDT)
- Pedro A. Chavarro, Office of the Vice-Minister of Environment, MAVDT
- Santiago Villegas, Director of Planning, MAVDT

- Mauricio Rivera, Office of Potable Water and Basic Sanitation, MAVDT
- Marcela Bonilla, Office of Sustainable Development, MAVDT

December 5, 2003

- Claudia Arias, Office of General Secretary, MAVDT
- Juan Carlos Riascos, Director, National Parks Unit
- Diana Gaviria, National Parks Unit
- Andrés Guerrero, National Parks Unit
- Fernando Gast, Director, Alexander von Humboldt Institute
- Carlos Costa, Director of Environmental Policy, DNP
- Luz Marina Arévalo, Subdirector of Planning and Regulation, DNP
- Jhon Berajano, Environmental Unit, DNP
- Elisa Moreno, Coordinating Office for State Reform, DNP

December 9, 2003

- Eduardo Uribe, Program Director, Environmental Economics, Universidad de los Andes.
- Sergio Barrera, Professor, School of Engineering, Universidad de los Andes.
- Gloria Sanclemente, Director of the Legal Office, MAVDT

December 10, 2003

- Gerardo Viña, Consultant, Former Director, Environmental Sector, MAVDT
- Fabio Arjona Hincapié, Director, Conservation International Colombia, and Former Vice-Minister, Ministry of Environment (MMA)
- Rafael Colmenares, Executive Director, ECOFONDO
- Julio Cesar del Valle, Secretary, Asociación Nacional de Empresas de Servicios Publicos Domiciliarios y Actividades Complementarias e Inherentes (ANDESCO)

- Mauricio López, Technical Secretary, ANDESCO.
- Carlos Herrera, Manager for Environmental Affairs, Asociación Nacional de Empresas de Colombia (ANDI)

December 11, 2003

- Julio Carrizosa Umaña, Professor, Universidad Nacional, and Former Director, INDERENA
- Elsa M. Escobar, Director, Fundación Natura.
- Álvaro Villate Supelano, Contralor Delegate for Environment, Contraloría
- Ricardo Botero Villegas, Director, Sectoral Studies, Contralorea
- Ernesto Guhl Nanetti, Consultant, Former Vice Minister of the Environment, MMA
- Manuel Rodríguez Becerra, Former Minister of the Environment (MMA)

December 12, 2003

- Adriana María Guillén, Environmental and Agrarian Issues, Procuraduría
- Claudia Sampedro, Attorney and Professor, Universidad Externado
- Carlos Rodríguez, Director, Tropenbos International, Colombia
- Leonardo Muñoz, Acting Director, CRA

APPENDIX B. CASE STUDIES

B1. CAR (Bogotá)

B1.1. Basic descriptive data

Established prior to Law 99 of 1993, CAR is situated in Colombia's central highlands and surrounds Bogotá (Figure 1). The lion's share of CAR's territory—99 of its 106 municipalities—is in the state of Cundinamarca and the remainder is in Boyacá.

In terms of the basic descriptive statistics presented in Table 4.1, CAR is below average in only one dimension—geographic size. It comprises approximately 19,000 square kilometers, compared with 36,000 square kilometers for the average corporation. In every other category, however, CAR is well above average. In general, it is a relatively populous, prosperous, and urbanized corporation. Its population (9.2 million) is seven times the average (1.3 million). Its GDP (9.5 trillion pesos) is 2.6 times the average (3.8 trillion pesos). Its poverty rate (21%) is less than half that of the average (52%), and its literacy rate (89%) is several percentage points higher than the average (84%). Finally, 91% of its population is urbanized, compared with just 60% for the average corporation.

B1.2. Administrative structure

CAR has the basic administrative structure mandated by Law 99 (see Section 3.2.2). Its corporate assembly comprises 106 mayors and is chaired by the governors of Cundinamarca and Boyacá. Its board of directors comprises 4 mayors of various municipalities, the mayor of Bogotá, the governors of Cundinamarca and Boyacá, a representative of MAVDT, a representative of the president of the republic, two NGO representatives, one representative of an indigenous community, and two representatives of industry. CAR's current director is Gloria Lucia Alverez Pinzon, an environmental lawyer, who previously worked at MAVDT and at ASOCARs. She was chosen in the most recent round of elections and, therefore, has been in the job only since January 2004.

In addition to this basic administrative structure, CAR has an internal structure of its own design. It has a central administrative unit located in Bogotá with a staff of approximately 140 permanent employees, and seven regional units, each of which has a staff of 21 to 42.

Altogether, approximately 230 permanent staff—almost two-thirds of the total—are in the regional units. According to CAR interviewees, most CARs have centralized offices rather than this type of decentralized structure.

The central administrative unit comprises six offices, two of which have cross-cutting responsibilities—the Office of Internal Control with a staff of 7, and a General Secretariat of Legal Affairs with a staff of 30. In addition, the central administrative unit includes four subdirectorates: Planning, with a staff of 30; Administration and Finances, with a staff of 50; Environmental Supply, with a staff of 30; and Corporate Environmental Management, with a staff of 30.

B1.3. Environmental risks and data

CAR has yet to establish a system of environmental indicators. However, it has a well-developed geographic information system (GIS) and is attempting to develop a system for collecting and updating data.

Table A1.1 ranks the severity of different environmental risks faced by CAR relative to those faced by other corporations. This ranking is based on the analysis and data presented in Section 7.1.5 and summarized in Table 7.5.

Table B1.1. Relative severity of environmental risks faced by CAR

Type of risk	Relative severity
Soil erosion	High
Flora and fauna degradation	Low
Natural disaster prevention	Low
Water pollution	Medium
Air pollution	High
Solid Waste	Low

According to CAR staff interviewed for this report, the types of environmental risks it faces vary across the different regions. In the northeast part of CAR (regions 1, 2, and 3), the principal

problems are water pollution in the Bogotá River, generated in part by the leather industry in Villapinzon at the river's headwaters; urban sprawl outside Bogotá; pollution from informal enterprises; air pollution; environmental degradation from mining; and ecosystem destruction from potato cultivation in mountainous areas. In the Rio Negro area (region 6), important problems include inadequate wastewater treatment and forest clearing for agriculture. In the Urate area (region 5), environmental problems include cattle ranching, inadequate wastewater treatment, deforestation, and wetlands degradation. In the remaining three regions (4 and 7), major problems are urban sprawl and inadequate wastewater treatment.

B1.4. Performance

B1.4.1. Overall performance

According to the statistical analysis of overall performance presented in Section 6.2, CAR is ranked 11th or 9th among the 32 CARs for which data are available, depending on whether performance is measured by GRADE1 or GRADE2.

B1.4.2. Strengths and weaknesses

According to CAR staff interviewed for this report, CAR's main strengths are plentiful natural resources, a location in the nation's capital (and consequent access to policymakers and a high profile), mayors who participate in governance, and wastewater treatment.

According to these same interviewees, CAR's principal weaknesses are high turnover among staff, lack of coordination with the rest of SINA (CAR was described as "an island" in this sense), limited financial resources, slow responsiveness to environmental problems, poor incentives for managers to improve matters, and a weak culture of environmental protection among the population CAR serves. The problem of lack of coordination with the rest of SINA was blamed on MAVDT—in particular, its failure to provide leadership, resources, a national system of indicators, and a national development plan that deals adequately with the environment. Slow responsiveness to environmental problems was attributed to a paucity of financial, human, and technical resources relative to the magnitude of the problems. Interviewees thought managerial incentives could be improved by developing indicators of institutional performance, lengthening the terms of directors general, and selecting staff on merit rather than for political reasons.

An industry interviewee responsible for representing his firm to CAR had a different view of the corporation's strengths but largely echoed the above assessment of its weaknesses. The interviewee thought that CAR was particularly good at territorial planning and also praised its decentralized administrative structure and the current director general's support for voluntary environmental regulation. However, like the interviewees at CAR, he thought that the corporation's performance was impaired by high staff turnover, too much politics and not enough technical expertise in staffing, and very slow responsiveness to clients, particularly with regard to permitting. Like CAR staff interviewees, he attributed this slow response to inadequate human and financial resources.

B1.4.3. Permitting and licensing

All of our interviewees agreed that CAR permitting and licensing are abysmally slow. CAR staff estimated that on average, both permitting and licensing take one to two years. The interviewee noted that in CAR's permit filing system, the ratio of pending applications to permits already granted is approximately 100 to 1. At least one permit has been pending for 20 years. Furthermore, CAR does not have an inventory of polluters and therefore does not know how many of the sources that need to be permitted have applied for permits.

Corroborating that dismal assessment, the head of a trade association with hundreds of member firms estimated that 95% of his members had begun the process of obtaining a permit from CAR, but fewer than 5% had actually received a permit. Another industry representative stated that of the nine permits his company was required to obtain from CAR (for solid waste, air emissions, water emissions and water use), only seven have been granted and these took between one and three years to obtain.

According to CAR interviewees, permitting is the responsibility of the regional offices, and the long delays in the permitting process have several causes. First, CAR regional offices must interact with other SINA entities, namely the departments, to grant them, and the delays result from poor coordination. More importantly, CAR has not developed an adequate system for permitting. These interviewees say that a program is now underway to improve this system.

According to a trade representative, an important cause of long delays in permitting is the unclear, confusing, and incomplete regulations governing permitting, but internal management problems are a contributing factor. These include poor overall organization and problems with staff—specifically, high turnover, low moral, a poor customer service ethic, the short terms of

CAR directors general, and a drastic cut in staff (of approximately 300 persons) several years ago.

B1.4.4. Enforcement

Like permitting, enforcement is the responsibility of CAR's regional offices. According to CAR interviewees, enforcement is virtually negligible because of a lack of staff, technical capacity, and logistical capacity. Poor enforcement apparently extends to effluent fees. According to a CAR interviewee, less than 2% of effluent fees that are charged are actually collected. An industry trade association said enforcement was much stricter for large firms than for small ones. A second industry representative stated that his firm (a large one) was inspected once a year and that the inspection was announced in advance.

B1.5. Priority setting

Table 7.6A shows how CAR allocated its investment budget in 2001. Seventy-five percent of total spending was allocated to one wastewater treatment plant. The remaining funds were spent on protected areas, research, operations, and water quantity projects. According to CAR interviewees, CAR does not have complete discretion over its investment budget—it is required by law to spend half of the property tax that comes from Bogotá on the wastewater treatment plant for the Bogotá River.

The analysis in Section 7.1.5 along with Table 7.5 indicates the degree to which the 2001 allocation of CAR's investment funds corresponded to the severity of environmental risks it faces. Overall, investments appear to have been prioritized adequately. The table shows that CAR underinvested in only one area—soil erosion control.

According to CAR interviewees, in the past, the corporation did not have a well-defined process for allocating investment funds. Starting in 2004, however, it instituted a new process. First, municipalities propose investment projects. The Planning Office of the central unit of CAR then allocates funds to these projects to comport with the three-year action plan (PAT). An additional criterion is cofinancing—projects with outside financing are favored. Criteria for selecting investment projects are now in writing. Although the regional offices solicit projects and promote them, they are not actually involved in selecting projects.

CAR interviewees stated that the corporation's three priority programs are cleanup of the Bogotá River, promotion of clean production agreements, and recovery and restoration of the Laguna Fuquene.

B1.6. Financial resources

Tables 8.1, 8.2, and 8.4 show the sources of CAR's financial resources in 2003. In absolute terms, CAR's total 2003 revenues (82 trillion pesos) were well above the average (17 trillion pesos) (Table 8.1). Spending per inhabitant tells a different story, however. In 2003, CAR spent 8,880 pesos per inhabitant, while the average corporation spent 1,285 per inhabitant (Table 8.2). CAR received no national contributions in 2003. All of its revenue was self-generated (Table 8.1). More than three-quarters of tax revenues was generated by property taxes and 11% by water fees (Table 8.4). Thirty-five percent of CAR's revenue was spent on operations, almost 10 percentage points more than the average (Table 8.1). In addition, as discussed in Section 7.1.3 and indicated by Table 7.2.2, 22% of CAR's investment spending in 2001 actually appeared to entail operations, not investment per se. Thus, in percentage terms, CAR's operational spending was probably higher than 35%.

B1.7. Human and technical resources

B1.7.1. Human resources

Table 9.1 presents information on staffing in CAR for 2002, the most recent year for which data are available for all corporations. In 2002, CAR had the largest staff of any corporation—its total staff of 840 personnel was 4.7 times the average of 179 employees per corporation. As a result, even though CAR is relatively populous, it has a lower-than-average number of inhabitants per employee (Table 9.2). It is important to note that in 2003, CAR cut its staff by almost half—from 840 to approximately 440—because of budget deficits. In 2002, CAR relied very little on contractors. Only 23 of its staff of 840 were contractors. Only 49% of CAR's permanent employees were college educated, well below the corporation average of 66%.

According to stakeholders interviewed for this report, two critical problems with the staffing of CAR are low rates of professionalism and high rates of turnover. According to CAR interviewees, approximately 250 of the staff of 450 are "nonprofessionals." This information is consistent with that presented in Table 9.1 suggesting low levels of education. Private-sector interviewees complained that CARs staff did not have requisite technical expertise. According

to CAR interviewees, the corporation was undertaking a restructuring designed to increase professionalization. The restructuring was to include developing written standards for administrators.

With regard to turnover, both CAR and private-sector interviewees saw it as a problem, and both sets of interviewees attributed the problem in part to clientelism. Specifically, the corporation has had several directors general in the past several years, and each has brought in his or her own employees.

B1.7.2. Technical resources

As illustrated by Table 9.5, per capita levels of computerization in CAR were below average in 2002, no doubt because of CAR's relatively large staff. However, as Tables 9.8 and 9.9 show, CAR had a relatively large number of hydrological, meteorological, and air quality monitoring stations in 2002. According to CAR staff interviewed, one of CAR's current priorities is obtaining accreditation for its laboratory.

B1.8. Regulatory capture

Interviews for this report did not generate much information about regulatory capture. There is no clear evidence of capture from the composition of the board of directors. CAR's current board of directors includes two mayors from large municipalities (population over 100,000) and two mayors from smaller municipalities (population under 20,000). Industrialists on the board include representatives of the flower and potato industries. According to an industry representative interviewed, NGO pressure in CAR is not particularly strong.

B1.9. Conflicts of interest related to sanitation infrastructure

As noted above, in recent years, the largest share of CAR's investment funds has been devoted to wastewater treatment infrastructure (Table 7.2), apparently at least partly because of regulations mandating such allocations. CAR staff interviewed for this report did not believe that this situation necessarily gave rise to conflicts of interest. Their concern regarding CAR's participation in building wastewater infrastructure mainly focused on the issue of transfer of ownership. As discussed in Section 11, the problem is that CAR develops and builds projects, but municipalities refuse to assume ownership because they do not want to pay operating costs. According to one interviewee, this is a problem with several of the older CARs that have a long tradition of building sanitation infrastructure, including CVC, Cortalima, CVS, Carder, and

Corpocaldes. He thinks the solution is to make clear binding agreements with municipalities about ownership prior to developing the infrastructure.

B2. Corantioquia

B2.1. Basic descriptive data

Corantioquia was established by Law 99 of 1993. Situated in the northwest highlands of Colombia in the state of Antioquia, it contains the greater Valle de Aburrá metropolitan area, including the city of Medellín (Figure 1). Approximately three-quarters of Corantioquia's area are in the Rio Cauca watershed and the remainder is in the Rio Magdelena watershed. In terms of the basic descriptive statistics presented in Table 4.1, Corantioquia is below average in only one dimension—only 47% of its population is urban, compared with 59% for all CARs. In every other category, however, Corantioquia is either average or above average. Its population (1.2 million) is virtually the same as the corporation average (1.3 million). Like CAR, it is relatively prosperous. Its GDP (5.7 trillion pesos) is well above average (3.8 trillion pesos), its poverty rate (41%) is below the average (52%), and its literacy rate (88%) is several percentage points above the average (84%).

B2.2. Administrative structure

Corantioquia has the basic administrative structure mandated by Law 99 (see Section 3.2.2). The current director is Francisco Zapata Ospino who was reelected director general this past winter. Zapata is an environmental lawyer, a former president of ASOCARs, and a member of the national legislature that approved Law 99 of 1993.

Beyond its mandated overall administrative structure, Corantioquia has a decentralized internal structure of its own design. Headquartered in Medellín, the central unit comprises eight offices with a total staff of about 135: an Office of Administrative and Financial Support with a staff of 55; an Office of Territory with a staff of 29; an Office of Communications with a staff of 20; an Office of Natural Resources with a staff of 14; an Office of Participation with a staff of 6; an Office of Legal Affairs with a staff of five lawyers plus 3 to 5 other people; an Office of Internal Affairs with a staff of 3; and an Office of Territorial Coordination with a staff of 3. In addition to these eight central offices in Medellín, Corantioquia has eight regional offices, each of which has a staff of 14 to 18 persons. Collectively, the regional offices have a total staff of 123. Hence, Corantioquia's staff is split more or less evenly between the central office and the eight regional offices. Corantioquia developed a plan for decentralization in 1995 and implemented it in 1998. The motivation was to reduce costs and increase services. Corantioquia staff interviewed for

this report stated that Corantioquia has decentralized its operations to an unusual extent. For example, regional offices have control over licensing and permitting.

B2.3. Environmental risks and data

According to Corantioquia staff interviewees, this corporation has developed a system of hundreds of environmental indicators but has not yet implemented it.

Table A1.1 presents a ranking of the severity of different environmental risks faced by Corantioquia relative to those faced by other corporations. This ranking is based on the analysis and data presented in Section 7.1.5 and summarized in Table 7.5.

Table B2.1. Relative severity of environmental risks faced by Corantioquia

Type of risk	Relative severity
Soil erosion	High
Flora and fauna degradation	Low
Natural disaster prevention	Low
Water pollution	Medium
Air pollution	High
Solid Waste	Medium

B2.4. Performance

B2.4.1. Overall performance

According to the statistical analysis presented in Section 6.2, Corantioquia's overall performance is average. It ranks 15th whether GRADE1 or GRADE2 is used as the measure.

B2.4.2. Strengths and weaknesses

According to Corantioquia staff interviewees, the corporation's main strengths are efficiency and effectiveness in spending; rapid response to client needs; cooperative relationships with clients; and a commitment to improving the quality of services. Corantioquia interviewees attributed the corporation's responsiveness partly to its practice of establishing temporary offices in each municipality every several weeks to hear complaints and take action.

Several NGO interviewees also assessed Corantioquia's overall strengths and weaknesses. Several of these interviewees considered Corantioquia's decentralized structure its primary strength. But several cited the lack of real NGO participation as a weakness, along with a lack of continuity and cohesion in programs. One interviewee also stated that Corantioquia is generally democratically run, with a minimum of corruption, and has a good process for making investment decisions. Private-sector interviewees had mainly positive assessments of Corantioquia's performance, although they complained about delays in permitting and staff turnover.

B2.4.3. Permitting and licensing

Interview evidence on licensing and permitting from Corantioquia staff on the one hand and from private-sector stakeholders on the other was contradictory. According to Corantioquia interviewees, a process has been established that limits the length of the licensing and permitting processes to 24 to 26 days. Furthermore, according to these interviewees, critical components of this process include the delegating of responsibility for permitting and licensing to the corporation's regional authorities; an initial consultation with a lawyer to map out a plan of action for obtaining the permit or license; the ability of Corantioquia's director general to monitor the progress of every permit application; the creation of interdisciplinary teams—including both lawyers and technicians—to handle the application process; and an effort to establish cooperative rather than confrontational relationships with clients.

None of our private-sector interviewees shared that rosy assessment of Corantioquia's permitting and licensing performance, however. Rather, these interviewees complained of delays lasting four months to more than a year, which they said were common. According to one interviewee, reasons for delays include small staff and high turnover, which means that institutional memory is lost.

B2.4.4. Enforcement

Our private-sector interviewees were very few in number and came from large, modern, highly visible firms. All suggested that Corantioquia's enforcement was not insignificant. According to these interviewees, Corantioquia regulators collect effluent and water use fees; check that facilities have solid waste disposal contracts; require annual testing of liquid effluents in the Corantioquia laboratory; and make random unannounced inspections. In addition, the CAR depends on third parties to detect and report violations.

B2.5. Priority setting

Table 7.6A shows how Corantioquia allocated its investment budget in 2001. Note that 26% of the investment budget was spent on projects that appeared to be operations-related. This may account for the unusually low percentage of revenue spent on operations (11%) as reported in MAVDT statistics (Table 8.1). Among the 22 categories of investment spending, Corantioquia allocated 28% of its 2001 investment budget to forest and ecosystem management, 12% to research, 9% to protected areas, and 6% to air pollution control.

The analysis described in Section 7.1.5 and summarized in Table 7.5 analyzes the degree to which the 2001 allocation of investment funds corresponds to the severity of environmental risks Corantioquia faces. The table shows that Corantioquia overinvested in flora and fauna preservation and underinvested in water pollution control.

Corantioquia's director general described the process used to allocate investment funds as follows. Mayors of municipalities submit proposals to the corporation's regional offices. Decisions about funding are made at headquarters by a technical group that consists of a representative of the planning office, the director of the region in question, technical experts, and the subdirector of the topical area. According to Corantioquia staff interviewees, the purpose of the technical group is to help ensure that decisionmaking is based on the merits of the proposals rather than on politics. The criteria used favor projects that have cofinancing, comport with Corantioquia's three-year plan, are the second stage of a multistage project, and are a priority of the subregional director. Corantioquia also seeks to fund groups that have capacity sufficient to carry out the project and have demonstrated positive past performance.

B2.6. Financial resources

Tables 8.1, 8.2, and 8.4 show the sources of Corantioquia financial resources in 2003. In absolute terms, Corantioquia's total 2003 revenues (47 trillion pesos) were almost three times the average (17 trillion pesos) (Table 8.1). Spending per inhabitant was also well above average. In 2003, this CAR spent 39,000 pesos per inhabitant, while the average corporation spent just over 1,000 per inhabitant (Table 8.2). In 2003, Corantioquia received national contributions amounting to 2% of its total revenue—well below the corporation average of 28% (Table 8.1). Forty-seven percent of Corantioquia's self-generated resources were derived from property taxes and 39% from investments (Table 8.4). Eleven percent of Corantioquia's revenue was spent on operations, almost 16 percentage points below the average (Table 8.1). However, as discussed in Section 7.1.3 and indicated by Table 7.2.2, 26% of Corantioquia's investment spending in 2001 actually appeared to entail operations, not investment per se.

B2.7. Human and technical resources

B2.7.1. Human resources

Table 9.1 presents information on Corantioquia's staffing in 2002, the most recent year for which data are available for all corporations. In 2002, Corantioquia's total staff of 331 was almost two times the average of 179 employees per corporation. However, the ratio of Corantioquia's inhabitants to its employees (3,556) was well below the average for all CARs (15,550) (Table 9.2). In 2002, Corantioquia's employed 65 contractors, 16% of the total staff. Only approximately 50% of Corantioquia's employees (both contractors and permanent) were college educated, a percentage well below the corporation average of 66%.

Interview evidence on staff turnover from Corantioquia staff and private-sector stakeholders were not consistent. On the one hand, Corantioquia staff cited rates of turnover below 5% over the past three years. As noted above, however, more than one private-sector stakeholder interviewed for this report complained of high turnover among Corantioquia staff. That said, complaints about politics in hiring and decisionmaking were relatively few and minor.

B2.7.2. Technical resources

As illustrated by Table 9.5, per capita levels of computerization in 2002 were below average in 2002, no doubt because of Corantioquia's relatively large staff. As Tables 9.8 and 9.9 show, no

information is available on the Corantioquia's hydrological, meteorological, and air quality monitoring stations in 2002.

B2.8. Regulatory capture

As with interviewee evidence on Corantioquia's permitting performance and staff turnover, interviewees offered mixed reviews on regulatory capture and corruption. Corantioquia staff interviewed for this report said they had instituted measures that effectively shielded the corporation against regulatory capture and corruption. These measures included strict rules governing the process of selecting investment projects; explicit, well-defined lines of authority and administration; and a requirement to abide by PATs. According to the Corantioquia interviewees, mayors on the board of directors do not exert undue influence on Corantioquia's decisionmaking. Although clearly not objective, this view is consistent with the fact that all four mayors on the current board of directors are from small municipalities, a result of an internal agreement among mayors in Corantioquia to represent all subregions of the CAR by electing mayors from various subregions to one-year terms. Corantioquia interviewees said that the main overtly political pressure exerted in the board of directors is from NGOs, which have evolved into a mechanism for clientelism. Nevertheless, they stated that changes in the composition of the board to increase representation of academics and technical experts would reduce political pressures.

NGO stakeholder interviewed for the report had a conflicting view of the pressures exerted by members of the board of directors. They were typically of the opinion that mayors, industrialists, and representatives of the government have considerable sway on the board of directors, while NGOs and representatives of black and indigenous communities have relatively little influence.

The history of NGO participation on the board of directors strongly suggests that NGO participation has been weak. The process for selecting NGOs operates as follows. Corantioquia places public notices in local newspapers to alert NGOs of an upcoming election of board members. NGOs then submit applications for eligibility to vote in elections of NGOs as well as eligibility to be on the board of directors. Minimum qualifications to participate in the election include four years of experience as an environmental NGO, experience with three projects within the CAR, and a written proposal for its planned activities on the board. Corantioquia, with help of an outside NGO, develops a list of NGOs who are eligible to vote and the candidates for election, and then holds elections.

Notwithstanding this seemingly solid process, however, NGO participation in this CAR has been week. NGO interviewees recounted several incidences in which board elections had to be delayed because not enough NGOs could be found to vote or to serve on the board. Evidently, only 14 NGOs voted in the most recent election.

B2.9. Conflicts of interest related to sanitation infrastructure

According to Corantioquia staff interviewees, the CAR has recently changed the way it participates in sanitation investments to avoid conflicts of interest as well as refusal by municipalities to assume ownership of this infrastructure. Corantioquia now requires municipalities to finance at least 50% of the investment in sanitation infrastructure and to sign agreements that they will ultimately assume ownership of the infrastructure.

B2.10. Relationships with other SINA entities

Interviewees from Corantioquia and AMVA, the AAU for the Valle de Aburrá, described significant conflicts between the two regulatory authorities. Clearly, pollution sources in both jurisdictions have cross-boundary impacts. For example, air polluters under the jurisdiction of AMVA have severe impacts on those living in areas under the jurisdiction of Corantioquia. Similarly, facilities discharging liquid effluents in areas under the jurisdiction of Corantioquia affect those living in Medellín. Although ideally, such problems could be mitigated by cooperation between Corantioquia and AMVA, evidently, such cooperation is limited. A related problem is that the jurisdictions of Corantioquia and AMVA are sometimes not well defined—it is not clear under current law which regulatory agency has jurisdiction over certain pollution and natural resources problems. Another issue is that the two regulatory agencies' different requirements and procedures cause confusion and duplication for firms operating in both jurisdictions.

Perhaps the most obvious conflict between Corantioquia and AMVA, however, concerns finances. Both authorities depend largely on property taxes generated in the Valle de Aburrá metropolitan area. These property taxes are collected by municipal authorities and then handed over to Corantioquia and AMVA. The past decade has witnessed repeated lawsuits and considerable conflict over the split of these property taxes between the two regulatory agencies. These lawsuits have yet to be fully resolved. To avoid continued conflict, Corantioquia and AMVA have recently resorted to voluntary agreements to resolve their financial disputes.

B3. Cardique

B3.1. Basic descriptive data

The Autonomous Regional Corporation of the Dique Canal, known as Cardique, was created following passage of Law 99 of 1993. Located on the Caribbean coast, Cardique comprises the Cartagena District and 20 municipalities in the northern and central part of the state of Bolívar.

Cardique has divided its jurisdiction into four ecoregions: (i) the coastal zone, comprising the Cartagena District and the Clemencia and Santa Catalina municipalities; (ii) the Ciénaga de la Virgen watershed basin, comprising the municipalities of Santa Rosa, Turbaco, and Villanueva; (iii) the Dique canal region, comprising the municipalities of Arjona, Arroyo Hondo, Calamar, Mahates, Marialabaja, San Cristóbal, San Estanislao de Kostka, Soplaviento, and Turbana; and (iv) the Montes de María region, comprising the municipalities of Córdoba Tetón, el Carmen de Bolívar, el Guamo, San Jacinto, San Juan de Nepomuceno, and Zambrano.

In terms of the basic descriptive statistics presented in Table 4.1, Cardique is decidedly below average in geographic size—it comprises approximately 7,100 square kilometers, compared with 36,000 square kilometers for the average corporation. Cardique is slightly more populous and more urbanized than the average CAR, with a higher overall GDP, but it has a higher poverty rate as well. Its population (1.5 million) is almost 20% above average (1.3 million). Its GDP (5.4 trillion pesos) is about 40% above the average (3.8 trillion pesos). Its poverty rate (92%) is almost twice the national average (52%), and its literacy rate (83%) is virtually the same as the average (84%). Finally, 82% of its population is urbanized, compared with just 60% for the average corporation.

B3.2. Administrative structure

Cardique has the basic administrative structure mandated by Law 99 (see Section 3.2.2). Its corporate assembly comprises 18 mayors. Cardique's current director general is Augustine Chavez. He was elected in the most recent round of elections and has been in the job only since January 2004.

B3.3. Environmental risks and data

Cardique has yet to establish a system of environmental indicators. However, it is expanding its systems for collecting and updating environmental data.

Table A.3.1 presents a ranking of the severity of different environmental risks faced by Cardique relative to those faced by other corporations. This ranking is based on the analysis and data presented in Section 7.1.5 and summarized in Table 7.5.

Table B3.1. Relative severity of environmental risks faced by Cardique

Type of risk	Relative severity
Soil erosion	Low
Flora and fauna degradation	High
Natural disaster prevention	High
Water pollution	Medium
Air pollution	Medium
Solid Waste	Low

According to Cardique staff interviewed for this report, the coastal and inland areas face different types of environmental risks. Clean water, including coastal pollution, is a potentially serious problem in the Cartagena area. Air pollution is a growing concern in Cartagena as well. In the inland areas, protection of flora and fauna is the major concern. As in neighboring CRA, there is a strong interest in promoting ecotourism.

B3.4. Performance

B3.4.1. Overall performance

According to the statistical analysis of overall performance presented in Section 6.2, Cardique is ranked 30th or 26th, depending on whether performance is measured by the index GRADE1 or GRADE2.

B3.4.2. Strengths and weaknesses

Based on the interviews conducted for this report, Cardique's main strengths appear to be its plentiful natural resources and its location on the Caribbean coast.

According to these same interviewees, Cardique's principal weaknesses are high turnover among staff and contractors; excessive number of contractors, including some with no-show jobs; lack of coordination with the rest of SINA; limited financial resources; slow responsiveness to environmental problems; slow processing of permits; poor incentives for managers to improve matters; and a weak culture of environmental protection among the population Cardique serves.

B3.4.3. Permitting and licensing

All of our interviewees agreed that Cardique permitting and licensing are extremely slow. Although no reliable data were available, both staff and industry representatives estimated that on average, permitting and licensing take considerably more than a year.

B3.4.4. Enforcement

According to various interviewees, enforcement is weak because of a lack of staff, technical capacity, and logistical capacity. It was widely asserted that enforcement was much stricter for large firms than for small ones. Large firms are generally inspected once a year, and the inspection is always announced in advance.

B3.5. Priority setting

Table 7.6D shows how Cardique allocated its investment budget in 2001. Seventeen percent of total spending was allocated to coastal management and 16% to water quantity. The remaining funds were spent on protected areas, research, operations and other projects.

The analysis in Section 7.1.5 along with Table 7.5 indicate the degree to which Cardique's 2001 allocation of investment funds corresponded to the severity of the environmental risks it faced. Overall, Cardique's investments do not appear to have been prioritized adequately. The table shows that Cardique overinvested in solid waste and underinvested in two areas, forestry and natural disasters. Only for soil salinity was the estimated severity of risk in line with the investment priority. In two other areas the case is ambiguous. For water pollution the liberal estimate of investment spending is in line with the calculated severity of the problem, but

according to the conservative estimate, there was underinvestment. For air pollution, the calculated severity indicates medium, but the liberal and conservative estimates of spending indicate high and low, respectively.

According to various interviewees, in the past, the corporation did not have a well-defined process for allocating investment funds. Several interviewees said that too much money was being spent on small, relatively uncoordinated projects. Although the details were sketchy, starting in 2004, Cardique instituted a new process for allocating funds.

B3.6. Financial resources

Tables 8.1, 8.2, and 8.4 show the sources of Cardique's financial resources in 2003. In absolute terms, total 2003 revenues (8.7 million pesos) were just slightly more than the average (17 million pesos) (Table 8.1). Spending per inhabitant tells a similar story. In 2003, Cardique spent 573 pesos per inhabitant, while the average corporation spent 1,285 pesos per inhabitant (Table 8.2). Cardique received 13% of its total revenues (1,160 million pesos) from national contributions in 2003. The remaining 87% of revenues was self-generated. Other than income from capital sources, the largest single source of Cardique's revenues in 2003 was associated with the sale of goods and services. Presumably because property tax revenues are being held in escrow as a result of an ongoing dispute with the newly formed Urban Environmental Authority, Cardique received only very modest revenues (54 million pesos) from property taxes. Taken together, all sources of self-generated revenues declined by 13% from 2002 to 2003 (Table 8.7). Cardique's 2003 operations budget totaled 2 billion pesos, which represented 23% of its total budget, well below the national average of 37%. Fifty-eight percent of operations spending came from national contributions and the remaining 42% was derived from self-generated revenue. One hundred percent of Cardique's investment budget (6.7 billion pesos) was self-generated.

B3.7. Human and technical resources

B3.7.1. Human resources

Table 9.1 presents information on staffing in Cardique for 2002, the most recent year for which data are available for all corporations. In 2002, Cardique had only 31 permanent employees. Only two corporations (Cra and Corpoboyaca) had smaller permanent staffs than Cardique. In 2002, Cardique relied a great deal on contractors. Its 163 contractors constituted 84% of the total

workforce—the highest such ratio for any CAR. Educational levels of both staff and contractors, measured as the percentage of the total with at least a college education, were slightly below the average for all corporations.

According to stakeholders interviewed for this report, Cardique faces three critical problems with the staffing: low rates of professionalism, a strong emphasis on political factors in selecting both employees and contractors, and high rates of turnover. Private-sector interviewees complained that Cardique's staff does not have the requisite technical expertise.

Both CAR and private-sector interviewees saw high rates of turnover as a problem, and both sets of interviewees attributed the problem in part to clientelism. Specifically, the corporation has had several directors general in the past several years, and each has brought in his own employees. On the positive side, it was noted that the board recently approved an "administrative restoration" that requires more staff to be hired on a permanent basis while the use of contractors is being reduced.

B3.7.2. Technical resources

As illustrated by Table 9.5, the number of computers per employee in Cardique (2.2) was considerably above average in 2002. If accurate, this suggests that Cardique has one of the highest rates of computerization among all the corporations. Although we were not able to confirm this, it is possible that this high rate of computerization is related to the heavy reliance on contractors.

As shown in Table 9.7, Cardique recorded a high score for systemization of hydrological, meteorological, biological and other processes in 2001–2002. According to several interviewees, Cardique has a strong laboratory for analyzing chemical samples and also some high-quality technical staff.

B3.8. Regulatory capture

Interviews for this report did not generate much credible information about regulatory capture in Cardique. There is no clear evidence of capture from the composition of the board of directors. However, one interviewee did indicate that many contracts were funneled to friends of members of the board of directors. The same interviewee said there were cases where contractors were paid multiple times for the same service. Unfortunately, we were not able to validate these assertions.

B3.9. Conflicts of interest related to sanitation infrastructure

The interviews did not reveal particular conflicts related to sanitation infrastructure.

B3.10. Relationships with other SINA entities

Several interviewees cited actual and potential conflicts between Cardique and the Urban Environmental Ministry as major problems. Particular areas of contention include the overlapping jurisdiction of authority and the competition for funds. It was suggested that the origin of some of the jurisdictional conflict could be traced back to Law 99, and that multiple permits were often mandated by different agencies, sometimes with different (and conflicting) requirements. Several interviewees reported on a legal battle that is currently underway between Cardique and the Urban Environmental Authority. The courts are expected to decide the issues soon. In the meantime, certain funds are being held in escrow.

B4. CRA

B4.1. Basic descriptive data

Located along the Caribbean coast, CRA was created following passage of Law 99 of 1993. CRA comprises the Baranquilla district and 21 other municipalities.

In terms of the basic descriptive statistics presented in Table 4.1, CRA is well below average in geographic size—it comprises approximately 3,300 square kilometers, compared with 36,000 square kilometers for the average corporation. However, CRA is somewhat more populous and considerably more urbanized, prosperous, and literate than the average corporation. CRA's population (2.3 million) is almost double the size of the average corporation (1.3 million). Its GDP (8.6 trillion pesos) is more than double that of the typical corporation (3.8 trillion pesos). Its poverty rate (30.4%) is slightly more than half the national average (52%), and its literacy rate (91.6%) is well above the average (84%). Finally, 92% of its population is urbanized, compared with just 60% for the average corporation.

B4.2. Administrative structure

CRA has the basic administrative structure mandated by Law 99 (see Section 3.2.2). Its corporate assembly comprises 22 mayors. Like many other CAR directors general, CRA's director has been in office only since January 2004. Unfortunately, he was out of town during our visit, but we were able to meet several subdirectors and other senior managers.

B4.3. Environmental risks and data

Table A.4.1 presents a ranking of the severity of different environmental risks faced by CRA relative to those faced by other corporations. This ranking is based on the analysis and data presented in Section 7.1.5 and summarized in Table 7.5.

Table B4.1. Relative severity of environmental risks faced by CRA

Type of risk	Relative severity
Soil erosion	N / A
Flora and fauna degradation	High
Natural disaster prevention	Low
Water pollution	High
Air pollution	Medium
Solid Waste	Low

Individuals interviewed for this report indicated that the predominant types of environmental risks in CRA vary considerably between the coastal and inland areas. Clean water, including coastal pollution, are potentially serious problems in some areas. Air pollution is a growing concern in Baranquilla as well. In the inland areas, the protection of flora and fauna is the major concern. As in Cardique, there is strong interest in promoting ecotourism in the area.

B4.4. Performance

B4.4.1. Overall performance

According to the statistical analysis of overall performance presented in Section 6.2, CRA's performance is very good. It ranks second or fifth depending on whether GRADE1 or GRADE2 is used to measure performance.

B4.4.2 Strengths and weaknesses

Based on the interviews conducted for this report, CRA's main strengths appear to be its plentiful natural resources, its location on the Caribbean coast, and the interest in ecotourism.

According to these same interviewees, CRA's principal weaknesses are high turnover among staff and contractors, excessive number of contractors, limited financial resources, and slow processing of permits.

B4.4.3. Permitting and licensing

All of our interviewees agreed that CRA's permitting and licensing are extremely slow. Although no reliable data were available, several interviewees estimated that on average, permitting and licensing take more than a year.

B4.4.4. Enforcement

According to various interviewees, enforcement is quite weak because of a lack of staff, technical capacity, and logistical capacity. It was asserted that enforcement is much stricter for large firms than for small ones.

B4.5. Priority setting

Table 7.6C shows how CRA allocated its investment budget in 2001. Thirty-eight percent of total spending was allocated to wastewater treatment. The remaining funds were spent on protected areas, coastal protection, research, operations and other projects. According to several interviewees, CRA does not have complete discretion over its investment budget. For example, it is required by law to spend certain funds on water pollution projects in Baranquilla, and other specific locations. A number of interviewees suggested there was not an overarching plan for investment spending and too much money was being spent on a small, uncoordinated projects.

The analysis in Section 7.1.5 along with Table 7.5 indicate the degree to which CRA's 2001 allocation of investment funds corresponded to the severity of the environmental risks it faces. Overall, CRA's investments do not appear to have been prioritized adequately. The table shows that CRA underinvested in air pollution and overinvested in solid waste. In the area of water the situation is ambiguous. The liberal estimate of investment spending is in line with the calculated severity of the problem. Based on the conservative estimate, there was underinvestment in water pollution. (Data are not available to judge the case of soil salinity).

B4.6. Financial resources

Tables 8.1, 8.2, and 8.4 show the sources of CRA's financial resources in 2003. In absolute terms, CRA's total 2003 revenues (13.7 million pesos) were below the average (17 million pesos) (Table

8.1). Spending per inhabitant tells a similar story. In 2003, CRA spent 591 pesos per inhabitant, while the average corporation spent 1,285 pesos per inhabitant (Table 8.2). CRA received 7% of its total revenues (927 million pesos) in national contributions in 2003, and the remaining 93% of revenues was self-generated. The largest single source of CRA's revenues in 2003 was electricity taxes. The second largest source was property taxes. Several interviewees indicated that property tax revenues would have been higher except for an ongoing dispute between CRA and the Urban Environmental Authority of Baranquilla. Pending resolution of the dispute, certain funds are being held in escrow. Taken together, all sources of self-generated revenues declined by 20% from 2002 to 2003 (Table 8.7). The 2003 operations budget totaled 2.3 billion pesos, which represented 17% of its total budget, well below the national average of 37%. (Note, however, that this may be the result of a heavy reliance on contractors if these contractors were paid out of investment funds.) Forty percent of operational spending in 2003 came from national contributions, and the remaining 60% was derived from self-generated revenue. All of CRA's investment budget (10.8 billion pesos) was self-generated.

B4.7. Human and technical resources

B4.7.1. Human resources

Table 9.1 presents information on staffing in CRA for 2002, the most recent year for which data are available for all corporations. In 2002, CRA had only 26 permanent employees, the smallest number of any corporation. CRA relied very heavily on contractors—it employed 134 contractors. Thus, contractors constituted 83.8 percent of the total workforce, the second-highest such ratio for any corporation. At the same time, educational levels of both staff and contractors at CRA, measured as the percentage of the total with at least a college education, were considerably above the corporation average. One hundred percent of the staff was reported as having a college degree (or more), and 87.3 percent of the contractors had a college degree (or more).

According to stakeholders interviewed for this report, two critical problems with the staffing of CRA are the strong emphasis on political factors in selecting both employees and contractors, and high rates of turnover.

B4.7.2. Technical resources

As illustrated by Table 9.5, the number of computers per employee in CRA (2.62) was considerably above average in 2002. If accurate, this suggests that CRA has the second-highest

rate of computerization among all the corporations. Although we were not able to confirm this, it is possible that this high rate of computerization is related to the heavy reliance on contractors.

As shown in Tables 9.7, CRA recorded a relatively low score for systemization of hydrological, meteorological, biological, and other processes in 2001–2002. There were no data on hydrological or meteorological stations for CRA. In the course of our interviews, we were informed that CRA does not have its own laboratory for analyzing chemical samples but relies instead on private-sector labs.

B4.8. Regulatory capture

Interviews for this report did not generate much credible information about regulatory capture in CRA.

B4.9. Conflicts of interest related to sanitation infrastructure

The interviews did not reveal particular conflicts related to sanitation infrastructure.

B4.10. Relationships with other SINA entities

A number of interviewees cited actual and potential conflicts between CRA and the Urban Environmental Ministry (BAMA) as major problems. Apparently, the mayor of Baranquilla is trying to create a metropolitan district that includes the mayors of four surrounding municipalities. If successful, this new district would challenge the authority and, most importantly, the funding of CRA. Several interviewees estimated that about 95% of the economic activity within the jurisdiction of CRA—and the corresponding tax revenues—was generated within Baranquilla and the four surrounding municipalities.

TABLES

Table 4.1. Basic data									
CAR	**Population 2004**	**GDP 2001**[a]	**Area**	**Urban Population 2004**	**Established before Law 99 of 1993**	**Municipalities**	**Poverty 1995**[a]	**Literacy 1993**[a]	**Borders AAU**
		(billions of pesos)	(km^2)	(%)	(0=no 1=yes)		(% municip. > 53% basic needs not met)	(%)	(0=no 1=yes)
source	ASOCARS	DANE	ASOCARS	ASOCARS			DANE	DANE	
CAM	982,263	3,434	18,710.2	62.6	0	37	35.1	85.0	1
CAR	9,224,309	9,525	18,681.5	90.5	1	106	20.9	88.6	1
CARDER	1,009,556	3,187	3,541.1	76.2	1	14	14.3	89.5	0
CARDIQUE	1,516,622	5,379	7,137.9	82.4	0	18	92.2	82.8	1
CARSUCRE	667,517	1,226	5,071.8	73.5	0	17	91.7	74.0	0
CAS	907,691	5,085	25,880.8	48.8	0	75	43.7	87.3	0
CDA	204,576	325	180,557.2	23.0	0	18	100.0	81.3	0
CDMB	1,155,760	6,475	4,715.4	88.9	1	13	43.7	87.3	0
CODECHOCO	331,780	746	47,873.8	47.8	1	24	90.5	68.1	0
CORALINA	81,453	477	50.5	72.5	0	2	0.0	95.3	0
CORANTIOQUIA	1,177,150	5,708	34,870.7	47.1	0	81	41.1	88.0	1
CORMACARENA	754,946	3,618	85,482.3	66.1	0	10	48.3	87.1	1
CORNARE	648,064	3,143	8,136.3	44.5	1	26	41.1	88.0	1
CORPAMAG	1,196,540	3,163	23,214.7	71.9	1	23	85.7	80.9	2
CORPOAMAZONIA	868,712	1,017	226,039.7	41.7	1	37	82.5	81.2	0
CORPOBOYACA	1,093,827	3,625	16,070.1	48.7	0	87	34.9	85.4	0
CORPOCALDAS	1,144,134	4,063	7,415.4	65.3	1	25	8.0	89.0	0
CORPOCESAR	1,019,490	3,292	22,369.3	64.5	1	25	87.5	79.8	0
CORPOCHIVOR	192,009	636	3,097.1	27.4	0	25	34.9	85.4	0
CORPOGUAJIRA	472,938	2,544	20,670.4	70.5	1	13	54.6	85.1	0
CORPOGUAVIO	94,949	100	3,663.2	22.0	0	9	20.8	88.7	0
CORPOMOJANA	179,138	329	5,634.7	55.9	0	7	91.7	74.0	0
CORPONARIÑO	1,731,725	3,118	31,648.2	45.7	1	62	69.0	80.5	0
CORPONOR	1,435,977	3,601	21,930.0	75.5	1	40	52.5	83.9	0
CORPORINOQUIA	796,707	2,350	173,858.9	43.4	0	61	60.6	83.7	1
CORPOURABA	635,484	3,082	18,993.7	47.6	1	19	41.1	88.0	0
CORTOLIMA	1,302,998	5,075	23,981.5	64.0	1	47	28.2	85.4	1
CRA	2,321,446	8,643	3,333.4	93.6	0	22	30.4	91.6	1
CRC	1,312,582	3,062	30,613.2	38.6	1	39	79.0	80.5	0
CRQ	603,185	1,752	1,935.3	85.0	1	12	0.0	89.3	0
CSB	518,757	1,840	19,501.8	39.5	0	27	92.2	82.8	0
CVC	4,460,850	21,509	21,306.8	86.5	1	41	0.0	91.1	1
CVS	1,348,591	4,042	25,045.0	50.1	1	28	96.2	75.2	0
AVERAGE	1,254,295	3,793	34,577	59.4	0.5	33	51.9	84.3	0.4

[a] Converted from department-level data using area or population weights.

Table 6.1A. Performance variables: Direct measures

CAR	REFOREST (%hectares reforested of total susceptible) 2002	*SCORE*	SOLIDWASTE (% municipalities with legal solid waste disposal) 2002	*SCORE*	REDUCE_H20_PLN (reductions TSS+BOD per $ GDP) 2002	*SCORE*	CLEAN_PDN_GOALS (% clean pdn. goals achieved) 2002	*SCORE*
CAM	0.01	6.71	0.54	54.05	0.11	0.80	1.00	100.00
CAR	0.02	12.75	0.57	56.73	2.27	16.85	0.70	70.00
CARDER	0.02	12.57	1.00	100.00	0.00	0.00	1.00	100.00
CARDIQUE	0.01	6.62	0.05	4.76	0.00	0.00	0.48	47.50
CARSUCRE	0.01	6.04	0.16	15.79	0.00	0.00	0.50	50.00
CAS	0.00	1.49	0.36	36.49	0.32	2.38	0.30	30.00
CDA	0.00	0.14	0.13	12.50	0.00	0.00	0.65	65.00
CDMB	0.13	72.76	0.62	61.54	13.45	100.00	0.80	80.00
CODECHOCO	0.05	30.53	0.03	3.23	0.00	0.00	0.00	0.00
CORALINA	0.00	0.24	1.00	100.00	0.25	1.84	0.83	83.33
CORANTIOQUIA	0.01	3.63	0.70	70.00	2.00	14.89	0.09	9.00
CORMACARENA	0.00	0.59	0.10	10.00	0.00	0.00	0.00	0.00
CORNARE	0.00	0.82	0.31	30.77	4.19	31.15	0.59	58.50
CORPAMAG	0.00	0.98	0.10	10.00	0.00	0.00	0.60	60.00
CORPOAMAZONIA	0.00	0.18	0.26	25.81	0.00	0.00	0.30	30.00
CORPOBOYACA	0.01	4.46	0.15	14.94	0.00	0.00	0.70	70.00
CORPOCALDAS	0.03	14.37	0.93	92.59	0.00	0.00	0.70	70.00
CORPOCESAR	0.00	0.84	0.04	4.00	0.00	0.00	0.30	30.00
CORPOCHIVOR	0.17	100.00	0.16	16.00	0.00	0.00	0.40	40.00
CORPOGUAJIRA	0.01	4.98	0.13	13.33	0.00	0.00	0.30	30.00
CORPOGUAVIO	0.01	3.64	0.88	87.50	0.00	0.00	0.00	0.00
CORPOMOJANA	0.00	1.51	0.00	0.00	0.00	0.00	0.00	0.00
CORPONARIÑO	0.00	1.58	0.44	43.75	0.00	0.00	0.70	70.00
CORPONOR	0.00	1.25	0.18	17.50	0.00	0.00	0.92	92.00
CORPORINOQUIA	0.00	0.00	0.16	15.63	0.00	0.00	0.00	0.00
CORPOURABA	0.00	0.75	0.11	10.53	0.04	0.32	0.70	70.00
CORTOLIMA	0.00	0.66	0.30	29.79	1.44	10.73	0.55	55.00
CRA	0.04	20.58	0.83	82.61	0.00	0.00	0.75	75.00
CRC	0.01	4.01	0.02	2.44	2.00	14.89	0.85	85.00
CRQ	0.06	33.25	0.58	58.33	1.18	8.77	0.95	95.00
CSB	0.00	0.35	0.04	4.17	0.00	0.00	0.70	70.00
CVC	0.02	9.58	0.45	45.24	0.43	3.23	0.71	71.20
CVS	0.01	3.27	0.14	14.29	0.00	0.00	0.60	60.00
AVERAGE	0.02	10.94	0.35	34.68	0.84	6.24	0.54	53.53

Table 6.1B. Performance variables: Process-related proxies								
CAR	**RAIDS** 2002	***SCORE***	**SEIZURES** (of logs, flora, fauna) 2002	***SCORE***	**VALUE_ FINES** 2002	***SCORE***	**EFF_PERMIT** (% effluent sources permitted) 2002	***SCORE***
CAM	123.99	1.19	128.74	30.57	111180.52	0.02	0.17	18.45
CAR	147.78	1.41	216.60	51.43	184071.13	0.03	0.23	24.55
CARDER	88.92	0.85	0.00	0.00	0.00	0.00	0.47	49.68
CARDIQUE	41.94	0.40	0.00	0.00	50.33	0.00	0.22	23.66
CARSUCRE	10458.54	100.00	169.76	40.31	305157.07	0.06	0.29	30.91
CAS	18.27	0.17	113.23	26.88	0.00	0.00	0.04	4.68
CDA	0.56	0.01	20.02	4.75	0.00	0.00	0.13	13.31
CDMB	964.31	9.22	398.88	94.71	303531.25	0.06	0.31	33.27
CODECHOCO	0.00	0.00	0.00	0.00	0.00	0.00	0.16	17.03
CORALINA	310.07	2.96	127.13	30.18	740395.97	0.14	0.33	35.48
CORANTIOQUIA	12.76	0.12	41.87	9.94	305756.20	0.06	0.39	41.76
CORMACARENA	30.34	0.29	10.31	2.45	13519.24	0.00	0.00	0.00
CORNARE	0.00	0.00	42.98	10.21	438641.55	0.08	0.94	100.00
CORPAMAG	475.81	4.55	137.37	32.62	21667.15	0.00	0.76	80.60
CORPOAMAZONIA	0.00	0.00	2.58	0.61	484.64	0.00	0.13	13.31
CORPOBOYACA	0.00	0.00	81.61	19.38	0.00	0.00	0.38	40.22
CORPOCALDAS	710.74	6.80	0.00	0.00	238271.42	0.04	0.12	12.58
CORPOCESAR	0.00	0.00	0.00	0.00	0.00	0.00	0.11	11.83
CORPOCHIVOR	565.43	5.41	128.21	30.44	0.00	0.00	0.02	2.64
CORPOGUAJIRA	151.18	1.45	0.00	0.00	0.00	0.00	0.19	20.28
CORPOGUAVIO	8.28	0.08	5.52	1.31	545236423.9	100.00	0.17	18.51
CORPOMOJANA	167.10	1.60	332.41	78.93	17356.62	0.00	0.00	0.00
CORPONARIÑO	50.18	0.48	148.74	35.32	3040.87	0.00	0.07	7.57
CORPONOR	166.40	1.59	74.56	17.70	297791.70	0.05	0.43	45.90
CORPORINOQUIA	3.41	0.03	3.59	0.85	462.19	0.00	0.82	87.44
CORPOURABA	96.74	0.92	79.10	18.78	33015.50	0.01	0.01	0.66
CORTOLIMA	532.41	5.09	116.37	27.63	60119.42	0.01	0.63	66.98
CRA	9584.55	91.64	421.17	100.00	93817.88	0.02	0.71	76.04
CRC	225.14	2.15	97.55	23.16	7122.49	0.00	0.71	76.04
CRQ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19
CSB	3093.11	29.57	80.91	19.21	6220.41	0.00	0.20	21.29
CVC	0.00	0.00	0.00	0.00	0.00	0.00	0.78	83.47
CVS	478.04	4.57	0.00	0.00	3656.53	0.00	0.32	34.14
AVERAGE	863.82	8.26	90.28	21.44	16618841.03	3.05	0.31	33.10

Table 6.1C. Performance variables: Process-related proxies						
CAR	**ENVIRO_PDM** (% municip. with environmental section of PDM)	***SCORE***	**WATER_MGMT_PLAN** (% CAR area under watershed management plan) 2002	***SCORE***	**ENVIRO_POT** (%municip. with environmental component of POT) 2002	***SCORE***
CAM	1.00	100.00	1.00	100.00	0.97	95.59
CAR	1.00	100.00	0.02	1.95	0.90	84.31
CARDER	1.00	100.00	0.77	76.77	1.00	100.00
CARDIQUE	0.00	0.00	0.12	12.32	0.81	68.92
CARSUCRE	1.00	100.00	0.04	3.69	0.79	65.65
CAS	0.00	0.00	0.14	13.90	0.58	31.65
CDA	0.75	75.00	0.26	26.26	0.63	38.82
CDMB	1.00	100.00	0.31	30.50	0.85	74.90
CODECHOCO	1.00	100.00	0.00	0.40	0.39	0.00
CORALINA	1.00	100.00	1.00	100.00	0.50	18.42
CORANTIOQUIA	1.00	100.00	0.30	30.50	0.86	77.57
CORMACARENA	1.00	100.00	0.38	37.79	1.00	100.00
CORNARE	1.00	100.00	0.00	0.07	0.96	93.72
CORPAMAG	1.00	100.00	0.55	55.36	0.80	67.37
CORPOAMAZONIA	1.00	100.00	0.00	0.36	0.90	84.21
CORPOBOYACA	0.48	48.28	0.03	2.51	0.79	66.24
CORPOCALDAS	1.00	100.00	0.33	32.72	0.89	81.87
CORPOCESAR	1.00	100.00	0.00	0.00	0.80	67.37
CORPOCHIVOR	1.00	100.00	0.20	20.19	0.96	93.47
CORPOGUAJIRA	0.67	66.67	0.89	88.61	0.73	56.49
CORPOGUAVIO	1.00	100.00	0.12	11.67	1.00	100.00
CORPOMOJANA	1.00	100.00	0.41	41.26	0.71	53.38
CORPONARIÑO	0.63	62.50	0.16	16.22	0.73	56.66
CORPONOR	1.00	100.00	0.05	5.33	0.85	75.53
CORPORINOQUIA	0.83	82.81	0.00	0.33	0.70	51.56
CORPOURABA	1.00	100.00	0.00	0.00	1.00	100.00
CORTOLIMA	0.85	85.11	0.54	53.92	0.53	23.63
CRA	1.00	100.00	0.02	1.78	0.91	85.81
CRC	1.00	100.00	0.13	13.12	0.56	28.37
CRQ	1.00	100.00	0.00	0.00	1.00	100.00
CSB	1.00	100.00	0.09	8.86	0.67	45.61
CVC	0.10	9.52	0.14	13.98	0.95	92.23
CVS	1.00	100.00	0.00	0.39	0.89	82.52
AVERAGE	0.86	85.75	0.24	24.27	0.81	68.54

Table 6.1D. Performance variables: process-related proxies						
CAR	**DIS_PREV _PLAN** (% municip. with disaster prevention plan) 2002	***SCORE***	**ENV_ED _PLAN** (% municip. with environmental education plans) 2002	***SCORE***	**SOIL_ZONING** 2002	***SCORE***
CAM	0.00	0.00	0.00	0.00	0.97	97.30
CAR	0.00	0.00	0.00	0.00	0.97	97.14
CARDER	0.86	17.14	0.07	1.43	1.00	100.00
CARDIQUE	0.00	0.00	0.57	11.43	0.48	47.62
CARSUCRE	0.16	3.16	0.16	3.16	0.72	72.22
CAS	0.00	0.00	0.00	0.00	0.00	0.00
CDA	1.00	20.00	1.13	22.50	0.00	0.00
CDMB	0.85	16.92	0.00	0.00	0.62	61.54
CODECHOCO	0.00	0.00	0.00	0.00	0.29	29.03
CORALINA	0.00	0.00	0.00	0.00	0.00	0.00
CORANTIOQUIA	1.00	20.00	0.54	10.75	0.83	82.72
CORMACARENA	0.00	0.00	0.00	0.00	0.47	46.67
CORNARE	0.00	0.00	0.00	0.00	0.96	96.00
CORPAMAG	1.10	22.00	0.03	0.67	0.97	96.67
CORPOAMAZONIA	0.16	3.23	0.00	0.00	0.58	57.50
CORPOBOYACA	0.00	0.00	0.00	0.00	0.75	74.71
CORPOCALDAS	1.96	39.26	1.96	39.26	0.81	81.48
CORPOCESAR	0.00	0.00	0.00	0.00	0.40	40.00
CORPOCHIVOR	0.00	0.00	0.00	0.00	0.72	72.00
CORPOGUAJIRA	0.00	0.00	0.00	0.00	0.27	26.67
CORPOGUAVIO	0.88	17.50	4.38	87.50	1.00	100.00
CORPOMOJANA	2.00	40.00	2.00	40.00	0.43	42.86
CORPONARIÑO	0.52	10.31	0.52	10.31	0.05	4.69
CORPONOR	2.00	40.00	2.00	40.00	0.63	62.50
CORPORINOQUIA	0.00	0.00	0.00	0.00	0.00	0.00
CORPOURABA	0.00	0.00	0.00	0.00	0.89	89.47
CORTOLIMA	5.00	100.00	5.00	100.00	0.64	63.83
CRA	0.00	0.00	0.43	8.70	0.87	86.96
CRC	0.00	0.00	0.00	0.00	0.02	2.44
CRQ	2.00	40.00	2.00	40.00	1.00	100.00
CSB	0.29	5.83	0.42	8.33	0.75	75.00
CVC	0.00	0.00	0.00	0.00	1.00	100.00
CVS	0.00	0.00	0.04	0.71	0.79	78.57
AVERAGE	0.60	11.98	0.64	12.87	0.60	60.17

Table 6.2. CAR performance rankings: GRADE 1 and GRADE 2

CAR	GRADE 1	GRADE 2
CAM	6.03	1.61
CAR	5.16	1.56
CARDER	6.58	2.12
CARDIQUE	2.23	0.59
CARSUCRE	4.91	0.72
CAS	1.45	0.68
CDA	2.80	0.78
CDMB	7.41	3.18
CODECHOCO	1.78	0.32
CORALINA	4.71	1.85
CORANTIOQUIA	4.72	1.00
CORMACARENA	N/A	0.10
CORNARE	5.21	1.21
CORPAMAG	5.30	0.70
CORPOAMAZONIA	3.15	0.56
CORPOBOYACA	3.42	0.91
CORPOCALDAS	5.75	1.81
CORPOCESAR	2.53	0.34
CORPOCHIVOR	4.79	1.56
CORPOGUAJIRA	3.09	0.49
CORPOGUAVIO	6.31	0.94
CORPOMOJANA	3.97	0.00
CORPONARIÑO	3.18	1.14
CORPONOR	4.99	1.10
CORPORINOQUIA	2.38	0.16
CORPOURABA	3.91	0.81
CORTOLIMA	6.21	0.96
CRA	7.32	1.82
CRC	3.51	1.08
CRQ	5.77	1.97
CSB	3.88	0.74
CVC	4.30	1.31
CVS	3.80	0.80
AVERAGE	4.39	1.06

Table 6.3. Variables used in econometric analysis

Variable type	Name	Explanation	Mean
Dependent			
	GRADE 1	Sum 14 scaled performance variables	7.34
	GRADE 2	Sum 4 scaled performance variables	2.80
Explanatory			
Socioeconomic	GDP	Log of 2001 GDP	9.98
	AREA	Log land area in k^2	12.33
	PERCURBAN	% population in urban areas 2004	59.43
	PRELAW99	Age of CAR: 1=prior to Law 99 of 1993, 0=after	0.55
	POVERTY	% of municipalities where basic needs not met for > 50% population 1995	51.89
Financial	TOTAL03PERCAP	Total spending/million inhabitants 2003	17.5
	PERC_NAT03	% total spending contributed by national government 2003	0.28
	PERC_OP03	% total spending on operations 2003	0.37
	ECF	Log of contributions from the Environmental Compensation Fund 1999–2003	21.80
Human, technical	EMPTOTPERCAP	CAR employment/million inhabitants 2002	266.67
	PERC_CONT	% CAR staff temporary contractors 2002	0.41
	COMPPERCAP	Computers per CAR staff in 2002	1.12

Table 6.3. Variables used in econometric analysis (continued)

Variable type	Name	Explanation	Mean
Dependent			
	GRADE 1	Sum 14 scaled performance variables	7.34
	GRADE 2	Sum 4 scaled performance variables	2.80
Explanatory			
Socioeconomic	GDP	Log of 2001 GDP	9.98
	AREA	Log land area in k^2	12.33
	PERCURBAN	% population in urban areas 2004	59.43
	PRELAW99	Age of CAR: 1=prior to Law 99 of 1993, 0=after	0.55
	POVERTY	% of municipalities where basic needs not met for > 50% population 1995	51.89
Financial	TOTAL03PERCAP	Total spending/million inhabitants 2003	17.5
	PERC_NAT03	% total spending contributed by national government 2003	0.28
	PERC_OP03	% total spending on operations 2003	0.37
	ECF	Log of contributions from the Environmental Compensation Fund 1999-2003	21.80
Human, technical	EMPTOTPERCAP	CAR employment/million inhabitants 2002	266.67
	PERC_CONT	% CAR staff temporary contractors 2002	0.41
	COMPPERCAP	Computers per CAR staff in 2002	1.12

Table 6.4. CAR performance regression results. Model 1: Socioeconomic and historical regressors		
	GRADE 1	**GRADE2**
ln_gdp	–0.246	0.111
	(0.76)	(0.9)
ln_area	–0.143	–0.172
	(0.63)	(2.08)**
percurban	0.027	0.002
	(1.46)	(0.36)
prelaw99	0.722	0.324
	(1.47)	(1.75)*
poverty	–0.016	–0.006
	(1.72)*	(1.64)
Constant	6.53	1.809
	(3.22)***	(2.35)**
Observations	32	33
R-squared	0.46	0.56
Absolute value of t statistics in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%		

Table 6.5. CAR performance regression results. Model 2: Human and technical capital regressors		
	GRADE 1	**GRADE 2**
emptotpercap	0.001	0
	(0.86)	(0.83)
perc_contracted	–2.335	–0.425
	(1.67)	(0.68)
comppercap	0.945	0.287
	(2.30)**	(1.57)
Constant	4.062	0.815
	(7.73)***	(3.52)***
Observations	32	33
R-squared	0.17	0.11
Absolute value of t statistics in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%		

Table 6.6. CAR performance regression results. Model 3: Financial regressors		
	GRADE1	**GRADE2**
total03percap	0.01	0.001
	(0.64)	(0.16)
perc_nat03	0.511	–0.39
	(0.32)	(0.64)
perc_op03	–3.679	–1.185
	(1.39)	(1.12)
Constant	5.439	1.589
	(6.15)***	(4.39)***
Observations	32	33
R-squared	0.16	0.21
Absolute value of t statistics in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%		

Table 6.7. CAR performance regression results. Model 4: ECF contribution regressor		
	GRADE 1	**GRADE 2**
ln_envf_total	0.388	0.01
	(1.22)	(0.07)
Constant	–4.218	0.673
	(0.64)	(0.23)
Observations	19	20
R-squared	0.08	0
Absolute value of t statistics in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%		

Table 7.1. Total CAR investment spending 2001:
Percentage investment spending by category

Category	% total projects (534)	% total investment (331,418,153,000 pesos)
FLORA AND FAUNA (sum 1–3)	25	28
1. Forest and ecosystem management	22	25
2. Protected areas	3	2
3. Green markets	1	0
INDUSTRIAL POLLUTION (sum 4–9)	14	35
4. Air pollution control	1	1
5. Solid and hazardous waste management	2	1
6. Clean technologies	1	0
7. Industrial pollution other/general	5	2
8. Wastewater infrastructure	2	30
9. Water quality other	3	0
WATER QUANTITY (sum 10–12)	8	5
10. Drinking water supply	2	2
11. Water quantity	7	3
12. Irrigation	0	1
OTHER (sum 13–22)	51	33
13. Water other/general	4	4
14. Soil conservation	1	1
15. Coastal/marine management	4	3
16. Natural disaster prevention	0	2
17. Mosquito control	0	0
18. Research information	11	5
19. Environmental education	8	2
20. Operations-related general activities	14	11
21. Joint com. and territorial entity activities	7	3
22. Other or undetermined	2	2

Table 7.2A. 2001 Total investment and percentage investment in each category: Categories 1–3 (top % for each CAR = % of total projects; bottom % = % of total $ investment)

CAR	Total projects	Total investment ('000 pesos)	1. Forest and ecosystem management	2. Protected areas	3. Green markets	FLORA AND FAUNA CONSERVATION (1+2+3)
CAM	84		18	0	0	18
		2,953,691	24	0	0	24
CAR	36		6	11	0	17
		93,184,000	1	4	0	5
CARDER	3		33	0	0	33
		225,000	22	0	0	22
CARDIQUE	22		14	0	0	14
		5,654,876	13	0	0	13
CARSUCRE	10		10	0	0	10
		897,859	6	0	0	6
CAS	10		10	10	0	20
		4,730,000	4	6	0	11
CDA	11		55	0	0	55
		695,000	58	0	0	58
CDMB	20		5	5	10	20
		27,690,464	1	1	1	2
CODECHOCO	6		50	0	0	50
		612,563	53	0	0	53
CORALINA	12		17	0	0	17
		1,592,350	16	0	0	16
CORANTIOQUIA	37		22	3	3	27
		33,249,000	22	9	0	32
CORMACARENA	9		44	11	0	56
		804,174	51	15	0	66
CORNARE	1		0	0	0	0
		10,529,113	0	0	0	0
CORPAMAG	15		20	0	0	20
		1,787,589	18	0	0	18
CORPOAMAZONIA	11		18	0	0	18
		2,643,560	15	0	0	15
CORPOBOYACA	18		28	0	0	28
		3,903,494	10	0	0	10
CORPOCALDAS	17		29	18	0	47
		4,935,000	37	5	0	42
CORPOCESAR	9		33	0	0	33
		2,944,546	32	0	0	32
CORPOCHIVOR	3		0	0	0	0
		200,000	0	0	0	0
CORPOGUAJIRA	12		17	0	0	17
		3,066,259	8	0	0	8

Table 7.2A. 2001 Total investment and percentage investment in each category: Categories 1–3 (continued)
(top % for each CAR = % of total projects; bottom % = % of total $ investment)

CAR	Total projects	Total investment ('000 pesos)	1. Forest and ecosystem management	2. Protected areas	3. Green markets	FLORA AND FAUNA CONSERVATION (1+2+3)
CORPOGUAVIO	21		33	5	0	38
		5,299,960	40	1	0	40
CORPOMOJANA	8		13	0	0	13
		722,610	14	0	0	14
CORPONARIÑO	15		20	7	0	27
		1,857,149	14	1	0	15
CORPONOR	15		13	0	7	20
		3,914,631	28	0	21	49
CORPORINOQUIA	10		20	0	0	20
		3,970,635	28	0	0	28
CORPOURABA	11		27	9	0	36
		2,390,391	72	1	0	73
CORTOLIMA	10		50	0	0	50
		6,001,214	51	0	0	51
CRA	10		30	0	0	30
		7,699,000	28	0	0	28
CRC	12		25	0	0	25
		17,630,814	21	0	0	21
CRQ	13		31	0	0	31
		2,686,077	30	0	0	30
CSB	16		38	0	0	38
		734,009	48	0	0	48
CVC	25		16	0	0	16
		60,985,200	77	0	0	77
CVS	12		25	0	0	25
		15,227,925	20	0	0	20
ALL	524		22	3	1	25
		331,418,153	25	2	0	28

Table 7.2B. 2001 percentage investment spending in each category: Categories 4–9
(top number for each CAR = % of total projects; bottom number = % of total $ investment)

CAR	4. Air pollution control	5. Solid and haz. waste management	6. Clean technologies	7. Industrial pollution other/general	8. Wastewater infrastructure	9. Water quality other	INDUSTRIAL POLLUTION (SUM 4–9)
CAM	0	1	0	6	1	11	19
	0	5	0	4	3	0	12
CAR	3	3	3	0	6	0	14
	0	1	0	0	75	0	76
CARDER	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
CARDIQUE	0	5	0	9	0	0	14
	0	5	0	8	0	0	13
CARSUCRE	0	0	0	0	0	10	10
	0	0	0	0	0	4	4
CAS	0	0	10	0	0	0	10
	0	0	2	0	0	0	2
CDA	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
CDMB	5	10	0	0	5	0	20
	1	3	0	0	59	0	63
CODECHOCO	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
CORALINA	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
CORANTIOQUIA	3	0	0	8	0	0	11
	6	0	0	4	0	0	9
CORMACARENA	0	0	0	0	11	0	11
	0	0	0	0	10	0	10
CORNARE	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
CORPAMAG	0	0	0	0	7	0	7
	0	0	0	0	2	0	2
CORPOAMAZONIA	0	0	18	0	0	0	18
	0	0	6	0	0	0	6
CORPOBOYACA	6	6	0	17	0	6	33
	1	4	0	24	0	7	37
CORPOCALDAS	0	0	6	6	0	0	12
	0	0	1	28	0	0	28
CORPOCESAR	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
CORPOCHIVOR	0	33	0	0	0	0	33
	0	60	0	0	0	0	60
CORPOGUAJIRA	0	0	0	8	0	0	8
	0	0	0	11	0	0	11

Table 7.2B. 2001 percentage investment spending in each category: Categories 4–9 (continued)
(top number for each CAR = % of total projects; bottom number = % of total $ investment)

CAR	4. Air pollution control	5. Solid and haz. waste management	6. Clean technologies	7. Industrial pollution other/general	8. Wastewater infrastructure	9. Water quality other	INDUSTRIAL POLLUTION (SUM 4–9)
CORPOGUAVIO	0	0	0	11	0	0	11
	0	0	0	5	0	0	5
CORPOMOJANA	0	0	0	3	0	0	3
	0	0	0	0	0	0	0
CORPONARIÑO	0	0	0	0	0	0	0
	0	0	7	0	0	0	7
CORPONOR	0	0	4	0	0	0	4
	0	0	0	7	0	0	7
CORPORINOQUIA	0	0	0	6	0	0	6
	0	0	0	10	0	10	20
CORPOURABA	0	0	0	15	0	3	18
	0	0	0	0	0	0	0
CORTOLIMA	0	0	0	0	0	0	0
	0	0	0	0	10	0	10
CRA	0	0	0	0	17	0	17
	0	10	0	0	0	0	10
CRC	0	12	0	0	0	0	12
	0	0	0	0	8	0	8
CRQ	0	0	0	0	63	0	63
	0	8	0	0	8	0	15
CSB	0	7	0	0	4	0	11
	0	13	0	6	6	6	31
CVC	0	4	0	12	2	5	23
	4	8	0	20	4	4	40
CVS	1	0	0	4	2	0	8
	0	0	0	0	0	0	0
ALL	1	2	1	5	2	3	14
	1	1	0	2	30	0	35

Table 7.2C.2001 percentage investment spending in each category: Categories 10–13
(top number for each CAR = % of total projects; bottom number = % of total $ investment)

CAR	10. Drinking water supply	11. Water quantity	12. Irrigation	WATER QUANTITY TOTAL (10+11+12)	13. Water other/general
CAM	1	13	0	14	1
	7	16	0	23	7
CAR	0	8	3	11	8
	0	2	2	3	6
CARDER	0	0	0	0	33
	0	0	0	0	36
CARDIQUE	0	14	0	14	9
	0	16	0	16	10
CARSUCRE	0	10	0	10	0
	0	9	0	9	0
CAS	10	0	0	10	0
	6	0	0	6	0
CDA	0	0	0	0	0
	0	0	0	0	0
CDMB	5	0	0	5	0
	8	0	0	8	0
CODECHOCO	17	0	0	17	0
	30	0	0	30	0
CORALINA	0	0	0	0	8
	0	0	0	0	20
CORANTIOQUIA	0	3	0	3	3
	0	1	0	1	2
CORMACARENA	0	11	0	11	0
	0	16	0	16	0
CORNARE	0	0	0	0	0
	0	0	0	0	0
CORPAMAG	0	7	0	7	33
	0	10	0	10	34
CORPOAMAZONIA	0	0	0	0	0
	0	0	0	0	0
CORPOBOYACA	0	17	0	17	6
	0	20	0	20	9
CORPOCALDAS	0	6	0	6	0
	0	8	0	8	0
CORPOCESAR	11	11	0	22	0
	7	16	0	23	0
CORPOCHIVOR	0	0	0	0	0
	0	0	0	0	0
CORPOGUAJIRA	0	17	0	17	0
	0	45	0	45	0

Table 7.2C. 2001 percentage investment spending in each category: Categories 10–13 (continued)
(top number for each CAR = % of total projects; bottom number = % of total $ investment)

CAR	10. Drinking water supply	11. Water quantity	12. Irrigation	WATER QUANTITY TOTAL (10+11+12)	13. Water other/general
CORPOGUAVIO	0	10	0	10	5
	0	27	0	27	9
CORPOMOJANA	0	13	0	13	13
	0	46	0	46	2
CORPONARIÑO	0	0	0	0	0
	0	0	0	0	0
CORPONOR	0	0	0	0	7
	0	0	0	0	3
CORPORINOQUIA	0	20	0	20	0
	0	26	0	26	0
CORPOURABA	0	0	0	0	0
	0	0	0	0	0
CORTOLIMA	10	0	0	10	0
	15	0	0	15	0
CRA	0	0	0	0	20
	0	0	0	0	33
CRC	0	0	0	0	8
	0	0	0	0	3
CRQ	0	8	0	8	0
	0	32	0	32	0
CSB	6	0	0	6	13
	15	0	0	15	12
CVC	4	0	0	4	0
	2	0	0	2	0
CVS	0	8	0	8	0
	0	1	0	1	0
ALL	2	7	0	8	4
	2	3	1	5	4

Table 7.2D. 2001 percentage investment spending in each category: Categories 14–22
(top number for each CAR = % of total projects; bottom number = % of total $ investment)

CAR	14. Soil conservation	15. Coastal/marine management	16. Natural disaster prevention	17. Mosquito control	18. Research information	19. Environmental education	20. Operations-related general activities	21. Joint community and territorial entity activities	22. Other or undetermined
CAM	0	7	0	0	8	12	14	6	0
	0	0	0	0	6	7	19	3	0
CAR	0	0	0	0	17	8	22	3	0
	0	0	0	0	4	1	3	0	0
CARDER	0	0	0	0	0	0	33	0	0
	0	0	0	0	0	0	42	0	0
CARDIQUE	0	14	0	0	5	5	9	14	5
	0	17	0	0	5	4	11	7	4
CARSUCRE	0	20	0	0	20	10	20	0	0
	0	13	0	0	33	4	30	0	0
CAS	0	0	0	0	40	10	10	0	0
	0	0	0	0	56	4	21	0	0
CDA	0	0	0	0	9	9	9	9	9
	0	0	0	0	7	12	17	5	1
CDMB	5	0	0	0	30	5	10	5	0
	11	0	0	0	4	2	9	1	0
CODECHOCO	0	17	0	0	0	0	0	17	0
	0	15	0	0	0	0	0	2	0
CORALINA	0	25	0	0	8	17	25	0	0
	0	35	0	0	12	8	9	0	0
CORANTIOQUIA	3	0	0	0	27	5	8	8	5
	3	0	0	0	12	2	26	2	9
CORMACARENA	0	0	0	0	0	11	11	0	0
	0	0	0	0	0	6	2	0	0
CORNARE	0	0	0	0	0	0	100	0	0
	0	0	0	0	0	0	100	0	0
CORPAMAG	0	7	0	0	0	0	7	7	13
	0	11	0	0	0	0	1	2	22
CORPOAMAZONIA	0	0	0	0	18	0	27	18	0
	0	0	0	0	15	0	49	15	0
CORPOBOYACA	6	0	0	0	0	0	0	6	6
	7	0	0	0	0	0	0	5	13
CORPOCALDAS	0	0	0	0	12	6	6	6	6
	0	0	0	0	7	2	5	6	0
CORPOCESAR	0	0	0	0	0	11	22	0	11
	0	0	0	0	0	3	27	0	15
CORPOCHIVOR	0	0	0	0	0	0	33	33	0
	0	0	0	0	0	0	31	9	0
CORPOGUAJIRA	0	0	0	0	8	8	17	17	8
	0	0	0	0	4	7	2	15	7

Table 7.2D. 2001 percentage investment spending in each category: Categories 14–22
(top number for each CAR = % of total projects; bottom number = % of total $ investment)

CAR	14. Soil conservation	15. Coastal/marine management	16. Natural disaster prevention	17. Mosquito control	18. Research information	19. Environmental education	20. Operations-related general activities	21. Joint community and territorial entity activities	22. Other or undetermined
CORPOGUAVIO	0	0	5	0	19	5	10	5	0
	0	0	0	0	5	6	4	4	0
CORPOMOJANA	0	0	0	0	13	13	25	13	0
	0	0	0	0	10	11	16	1	0
CORPONARIÑO	0	13	0	0	7	7	40	0	0
	0	3	0	0	1	7	69	0	0
CORPONOR	0	0	0	0	20	7	33	0	7
	0	0	0	0	11	5	18	0	9
CORPORINOQUIA	0	0	0	0	0	10	20	10	0
	0	0	0	0	0	8	8	14	0
CORPOURABA	0	18	0	0	0	9	18	18	0
	0	4	0	0	0	2	16	5	0
CORTOLIMA	0	0	0	0	0	10	20	0	0
	0	0	0	0	0	10	7	0	0
CRA	0	10	0	0	0	10	10	10	0
	0	10	0	0	0	4	12	1	0
CRC	0	0	0	0	17	8	8	25	0
	0	0	0	0	3	1	2	7	0
CRQ	0	0	0	0	0	8	23	8	8
	0	0	0	0	0	6	17	4	1
CSB	0	0	0	0	6	6	0	0	0
	0	0	0	0	1	2	0	0	0
CVC	4	0	0	0	4	20	4	8	0
	0	0	0	0	3	3	1	6	0
CVS	0	17	8	0	17	8	8	8	0
	0	38	35	0	2	2	0	1	0
ALL	1	4	0	0	11	8	14	7	2
	1	3	2	0	5	2	11	3	2

Table 7.3. Average annual concentrations of conventional air pollutants in Bucaramanga by monitoring area

City and monitoring area	PM10 (ug/m3)	TSP (ug/m3)	NO_2 (ppb)	SO_2 (ppb)	CO (ppm)†
Commercial centers	47	n/a	17	5	1
Downtown	69*	n/a	24	7	2
Industrial areas	58	n/a	13	4	1
Traffic areas	62*	n/a	20	6	1
Residential areas	52	n/a	15	5	1
DAMA standard	60	90	52	30	10

PM10 = particulate matter smaller than 10 micrograms
TSP = total suspended particulates
NO_2 = nitrogen dioxide
SO_2 = sulfur dioxide
CO = carbon monoxide
† = 8-hour standard
* = exceeds DAMA standard

Source: Esterling Lara (2004).

Table 7.4. Sectoral contributions to 1996 total emissions of air pollutants (%)

Sector	Particles	Sulfur oxides	NO_2	Hydrocarbons	CO
Electricity generation	7	43	66	1	6
Industry	48	41	21	11	7
Transport	4	5	8	77	83
Residential	41	11	6	10	4
Total percentage	100	100	100	100	100

Source: Planning Unit of Mining and Power, Environmental Impact Module for 1996.

Table 7.5A. Severity of risk versus percentage of 2001 total investment by CAR: Soil erosion

CAR	Cost of soil erosion (pesos)	% total investment in soil conservation
CAM	HIGH	LOW
CAR	HIGH	LOW
CARDER	LOW	LOW
CARDIQUE	LOW	LOW
CARSUCRE	LOW	LOW
CAS	HIGH	LOW
CDA	N/A	LOW
CDMB	MEDIUM	HIGH
CODECHOCO	N/A	LOW
CORALINA	N/A	LOW
CORANTIOQUIA	HIGH	HIGH
CORMACARENA	HIGH	LOW
CORNARE	HIGH	LOW
CORPAMAG	MEDIUM	LOW
CORPOAMAZONIA	N/A	LOW
CORPOBOYACA	HIGH	HIGH
CORPOCALDAS	MEDIUM	LOW
CORPOCESAR	LOW	LOW
CORPOCHIVOR	MEDIUM	LOW
CORPOGUAJIRA	LOW	LOW
CORPOGUAVIO	MEDIUM	LOW
CORPOMOJANA	LOW	LOW
CORPONARIÑO	MEDIUM	LOW
CORPONOR	N/A	LOW
CORPORINOQUIA	N/A	LOW
CORPOURABA	MEDIUM	LOW
CORTOLIMA	HIGH	LOW
CRA	N/A	LOW
CRC	MEDIUM	LOW
CRQ	LOW	LOW
CSB	LOW	LOW
CVC	HIGH	HIGH
CVS	N/A	LOW
% CARS UNDERinvest		54
% CARS OVERinvest		0

Table 7.5B Severity of risk versus percentage of 2001 total investment by CAR: Flora and fauna degradation

CAR	Annual average % change in forest cover 1986–1996	% total investment in flora and fauna conservation
CAM	LOW	MEDIUM
CAR	LOW	LOW
CARDER	LOW	MEDIUM
CARDIQUE	HIGH	LOW
CARSUCRE	HIGH	LOW
CAS	LOW	LOW
CDA	MEDIUM	HIGH
CDMB	LOW	LOW
CODECHOCO	MEDIUM	HIGH
CORALINA	N/A	MEDIUM
CORANTIOQUIA	LOW	HIGH
CORMACARENA	MEDIUM	HIGH
CORNARE	MEDIUM	LOW
CORPAMAG	HIGH	MEDIUM
CORPOAMAZONIA	MEDIUM	LOW
CORPOBOYACA	MEDIUM	LOW
CORPOCALDAS	HIGH	HIGH
CORPOCESAR	LOW	MEDIUM
CORPOCHIVOR	MEDIUM	LOW
CORPOGUAJIRA	MEDIUM	LOW
CORPOGUAVIO	LOW	HIGH
CORPOMOJANA	HIGH	LOW
CORPONARIÑO	LOW	MEDIUM
CORPONOR	LOW	HIGH
CORPORINOQUIA	HIGH	MEDIUM
CORPOURABA	MEDIUM	HIGH
CORTOLIMA	HIGH	HIGH
CRA	HIGH	MEDIUM
CRC	MEDIUM	MEDIUM
CRQ	HIGH	MEDIUM
CSB	HIGH	HIGH
CVC	LOW	HIGH
CVS	HIGH	MEDIUM
% CARS UNDERinvest		24
% CARS OVERinvest		24

Table 7.5C. Severity of risk versus percentage of 2001 total investment by CAR: Natural disaster prevention

CAR	Average % population affected by natural disasters 1997–2003	% investment in natural disaster prevention
CAM	MEDIUM	LOW
CAR	LOW	LOW
CARDER	MEDIUM	LOW
CARDIQUE	HIGH	LOW
CARSUCRE	HIGH	LOW
CAS	LOW	LOW
CDA	HIGH	LOW
CDMB	LOW	LOW
CODECHOCO	HIGH	LOW
CORALINA	LOW	LOW
CORANTIOQUIA	LOW	LOW
CORMACARENA	MEDIUM	LOW
CORNARE	LOW	LOW
CORPAMAG	HIGH	LOW
CORPOAMAZONIA	HIGH	LOW
CORPOBOYACA	MEDIUM	LOW
CORPOCALDAS	LOW	LOW
CORPOCESAR	HIGH	LOW
CORPOCHIVOR	MEDIUM	LOW
CORPOGUAJIRA	MEDIUM	LOW
CORPOGUAVIO	LOW	HIGH
CORPOMOJANA	HIGH	LOW
CORPONARIÑO	MEDIUM	LOW
CORPONOR	LOW	LOW
CORPORINOQUIA	HIGH	LOW
CORPOURABA	LOW	LOW
CORTOLIMA	MEDIUM	LOW
CRA	LOW	LOW
CRC	MEDIUM	LOW
CRQ	MEDIUM	LOW
CSB	HIGH	LOW
CVC	LOW	LOW
CVS	HIGH	HIGH
% CARS UNDERinvest		61
% CARS OVERinvest		3

Table 7.5D. Severity of risk versus percentage of 2001 total investment by CAR: Water pollution

CAR	% deaths from gastrointestinal disease	% investment in water supply and sanitation (conservative estimate)	% investment in water supply and sanitation (liberal estimate)
CAM	MEDIUM	HIGH	HIGH
CAR	MEDIUM	HIGH	HIGH
CARDER	MEDIUM	LOW	HIGH
CARDIQUE	MEDIUM	LOW	MEDIUM
CARSUCRE	MEDIUM	MEDIUM	MEDIUM
CAS	HIGH	HIGH	MEDIUM
CDA	HIGH	LOW	LOW
CDMB	HIGH	HIGH	HIGH
CODECHOCO	LOW	HIGH	HIGH
CORALINA	HIGH	LOW	HIGH
CORANTIOQUIA	MEDIUM	LOW	LOW
CORMACARENA	LOW	HIGH	MEDIUM
CORNARE	MEDIUM	LOW	LOW
CORPAMAG	LOW	MEDIUM	HIGH
CORPOAMAZONIA	LOW	LOW	LOW
CORPOBOYACA	LOW	HIGH	MEDIUM
CORPOCALDAS	HIGH	LOW	LOW
CORPOCESAR	HIGH	HIGH	MEDIUM
CORPOCHIVOR	LOW	LOW	LOW
CORPOGUAJIRA	LOW	LOW	LOW
CORPOGUAVIO	HIGH	LOW	MEDIUM
CORPOMOJANA	LOW	LOW	LOW
CORPONARIÑO	MEDIUM	LOW	LOW
CORPONOR	HIGH	LOW	MEDIUM
CORPORINOQUIA	MEDIUM	MEDIUM	MEDIUM
CORPOURABA	LOW	LOW	LOW
CORTOLIMA	MEDIUM	HIGH	HIGH
CRA	HIGH	LOW	HIGH
CRC	LOW	HIGH	HIGH
CRQ	HIGH	MEDIUM	MEDIUM
CSB	HIGH	HIGH	HIGH
CVC	MEDIUM	MEDIUM	MEDIUM
CVS	LOW	LOW	LOW
% CARS UNDERinvest		33	15
% CARS OVERinvest		15	15

Table 7.5E. Relative severity of risk versus relative intensity of 2001 investment by CAR: Air pollution

CAR	% deaths from respiratory illness	% total investment in air pollution management (conservative estimate)	% total investment in air pollution management (liberal estimate)
CAM	HIGH	LOW	MEDIUM
CAR	HIGH	HIGH	MEDIUM
CARDER	HIGH	LOW	LOW
CARDIQUE	MEDIUM	LOW	HIGH
CARSUCRE	LOW	LOW	LOW
CAS	LOW	LOW	MEDIUM
CDA	HIGH	LOW	LOW
CDMB	MEDIUM	HIGH	MEDIUM
CODECHOCO	LOW	LOW	LOW
CORALINA	MEDIUM	LOW	LOW
CORANTIOQUIA	HIGH	HIGH	HIGH
CORMACARENA	MEDIUM	LOW	LOW
CORNARE	HIGH	LOW	LOW
CORPAMAG	MEDIUM	LOW	LOW
CORPOAMAZONIA	MEDIUM	LOW	HIGH
CORPOBOYACA	LOW	HIGH	HIGH
CORPOCALDAS	MEDIUM	LOW	HIGH
CORPOCESAR	HIGH	LOW	LOW
CORPOCHIVOR	LOW	LOW	LOW
CORPOGUAJIRA	MEDIUM	LOW	HIGH
CORPOGUAVIO	HIGH	LOW	MEDIUM
CORPOMOJANA	LOW	LOW	LOW
CORPONARIÑO	LOW	LOW	HIGH
CORPONOR	LOW	LOW	HIGH
CORPORINOQUIA	HIGH	LOW	HIGH
CORPOURABA	LOW	LOW	LOW
CORTOLIMA	MEDIUM	LOW	LOW
CRA	MEDIUM	LOW	LOW
CRC	MEDIUM	LOW	LOW
CRQ	HIGH	LOW	LOW
CSB	LOW	LOW	HIGH
CVC	HIGH	HIGH	HIGH
CVS	LOW	LOW	LOW
% CARS UNDERinvest		55	33
% CARS OVERinvest		3	15

Table 7.5F. Relative severity of risk versus relative intensity of 2001 investment by CAR: Solid waste

CAR	% of solid waste disposed of legally	% total investment in solid waste management (conservative estimate)	% total investment in solid waste management (liberal estimate)
CAM	MEDIUM	HIGH	HIGH
CAR	LOW	HIGH	MEDIUM
CARDER	HIGH	LOW	LOW
CARDIQUE	LOW	HIGH	HIGH
CARSUCRE	HIGH	LOW	LOW
CAS	MEDIUM	LOW	MEDIUM
CDA	LOW	LOW	LOW
CDMB	HIGH	HIGH	MEDIUM
CODECHOCO	LOW	LOW	LOW
CORALINA	LOW	LOW	LOW
CORANTIOQUIA	MEDIUM	LOW	MEDIUM
CORMACARENA	MEDIUM	LOW	LOW
CORNARE	MEDIUM	LOW	LOW
CORPAMAG	HIGH	LOW	LOW
CORPOAMAZONIA	LOW	LOW	MEDIUM
CORPOBOYACA	MEDIUM	HIGH	HIGH
CORPOCALDAS	HIGH	LOW	HIGH
CORPOCESAR	HIGH	LOW	LOW
CORPOCHIVOR	LOW	HIGH	HIGH
CORPOGUAJIRA	MEDIUM	LOW	HIGH
CORPOGUAVIO	LOW	LOW	MEDIUM
CORPOMOJANA	LOW	LOW	LOW
CORPONARIÑO	HIGH	LOW	MEDIUM
CORPONOR	HIGH	LOW	HIGH
CORPORINOQUIA	HIGH	LOW	HIGH
CORPOURABA	LOW	LOW	LOW
CORTOLIMA	MEDIUM	LOW	LOW
CRA	LOW	HIGH	HIGH
CRC	HIGH	LOW	LOW
CRQ	MEDIUM	HIGH	HIGH
CSB	LOW	HIGH	HIGH
CVC	LOW	HIGH	MEDIUM
CVS	LOW	LOW	LOW
% CARS UNDERinvest		45	24
% CARS OVERinvest		18	24

Table 7.6A. Investment spending: Planned (PAT) versus actual (2001) for CAR

Category	**Spending** ('000 pesos)		**Spending** (%)		**Projects**	
	PAT	**Actual**	**PAT**	**Actual**	**PAT**	**Actual**
FLORA AND FAUNA (sum 1–3)	**1,369,000**	**5,035,000**	**2**	**5**	**1**	**6**
1. Forest and ecosystem management	0	1,133,000	0	1	0	2
2. Protected areas	1,369,000	3,902,000	2	4	1	4
3. Green markets	0	0	0	0	0	0
INDUSTRIAL POLLUTION (sum 4–9)	**30,671,000**	**70,907,000**	**43**	**76**	**1**	**5**
4. Air pollution control	0	410,000	0	0	0	1
5. Solid and hazardous waste management	0	600,000	0	1	0	1
6. Clean technologies	0	99,000	0	0	0	1
7. Industrial pollution other/general	0	0	0	0	0	0
8. Wastewater infrastructure	0	69,798,000	0	75	0	2
9. Water quality other	30,671,000	0	43	0	1	0
WATER QUANTITY (sum 10–12)	**20,500,000**	**3,226,000**	**29**	**3**	**4**	**4**
10. Drinking water supply	0	0	0	0	0	0
11. Water quantity	20,500,000	1,526,000	29	2	4	3
12. Irrigation	0	1,700,000	0	2	0	1
OTHER (sum 13–22)	**17,994,088**	**14,016,000**	**26**	**15**	**8**	**21**
13. Water other/general	0	6,030,000	0	6	0	3
14. Soil conservation	2,656,000	0	4	0	1	0
15. Coastal/marine management	0	0	0	0	0	0
16. Natural disaster prevention	0	0	0	0	0	0
17. Mosquito control	0	0	0	0	0	0
18. Research information	88	3,734,000	0	4	0	6
19. Environmental education	978,000	964,000	1	1	1	3
20. Operations-related general activities	7,878,000	3,088,000	11	3	2	8
21. Joint com. and territorial entity activities	6,482,000	200,000	9	0	4	1
22. Other or undetermined	0	0	0	0	0	0
TOTAL	**70,534,088**	**93,184,000**	**100**	**100**	**14**	**36**

Table 7.6B. Investment spending: Planned (PAT) versus actual (2001) for Corantioquia

Category	Spending ('000 pesos)		Spending (%)		Projects	
	PAT	Actual	PAT	Actual	PAT	Actual
FLORA AND FAUNA (sum 1–3)	**14,307,000**	**10,637,600**	**35**	**32**	**5**	**10**
1. Forest and ecosystem management	11,217,000	7,457,600	28	22	4	8
2. Protected areas	3,090,000	3,090,000	8	9	1	1
3. Green markets	0	90,000	0	0	0	1
INDUSTRIAL POLLUTION (sum 4–9)	**844,000**	**3,134,902**	**2**	**9**	**1**	**4**
4. Air pollution control	0	1,939,902	0	6	0	1
5. Solid and hazardous waste management	0	0	0	0	0	0
6. Clean technologies	0	0	0	0	0	0
7. Industrial pollution other/general	844,000	1,195,000	2	4	1	3
8. Wastewater infrastructure	0	0	0	0	0	0
9. Water quality other	0	0	0	0	0	0
WATER QUANTITY (sum 10–12)	**6,820,000**	**257,260**	**17**	**1**	**1**	**1**
10. Drinking water supply	0	0	0	0	0	0
11. Water quantity	6,820,000	257,260	17	1	1	1
12. Irrigation	0	0	0	0	0	0
OTHER (sum 13–22)	**18,389,000**	**19,219,238**	**46**	**58**	**14**	**22**
13. Water other/general	0	820,000	0	2	0	1
14. Soil conservation	1,360,000	1,060,000	3	3	1	1
15. Coastal/marine management	0	0	0	0	0	0
16. Natural disaster prevention	0	0	0	0	0	0
17. Mosquito control	0	0	0	0	0	0
18. Research information	4,520,000	4,145,806	11	12	4	10
19. Environmental education	2,260,000	810,000	6	2	1	2
20. Operations-related general activities	1,219,000	8,533,432	3	26	4	3
21. Joint com. and territorial entity activities	9,030,000	730,000	22	2	4	3
22. Other or undetermined	0	3,120,000	0	9	0	2
TOTAL	**40,360,000**	**33,249,000**	**100**	**100**	**21**	**37**

Table 7.6C. Investment spending: Planned (PAT) versus actual (2001) for CRA

Category	Spending ('000 pesos)		Spending (%)		Projects	
	PAT	Actual	PAT	Actual	PAT	Actual
FLORA AND FAUNA (sum 1–3)	**1,159,867**	**2,162,856**	**17**	**28**	**2**	**3**
1. Forest and ecosystem management	1,159,867	2,162,856	17	28	2	3
2. Protected areas	0	0	0	0	0	0
3. Green markets	0	0	0	0	0	0
INDUSTRIAL POLLUTION (sum 4–9)	**900,000**	**900,000**	**13**	**12**	**1**	**1**
4. Air pollution control	0	0	0	0	0	0
5. Solid and hazardous waste management	0	900,000	0	12	0	1
6. Clean technologies	0	0	0	0	0	0
7. Industrial pollution other/general	900,000	0	13	0	1	0
8. Wastewater infrastructure	0	0	0	0	0	0
9. Water quality other	0	0	0	0	0	0
WATER QUANTITY (sum 10–12)	**0**	**0**	**0**	**0**	**0**	**0**
10. Drinking water supply	0	0	0	0	0	0
11. Water quantity	0	0	0	0	0	0
12. Irrigation	0	0	0	0	0	0
OTHER (sum 13–22)	**4,636,144**	**4,636,144**	**69**	**60**	**4**	**6**
13. Water other/general	2,574,000	2,574,000	38	33	1	2
14. Soil conservation	0	0	0	0	0	0
15. Coastal/marine management	790,000	790,000	12	10	1	1
16. Natural disaster prevention	0	0	0	0	0	0
17. Mosquito control	0	0	0	0	0	0
18. Research information	272,144	0	4	0	1	0
19. Environmental education	0	272,144	0	4	0	1
20. Operations-related general activities	1,000,000	900,000	15	12	1	1
21. Joint com. and territorial entity activities	0	100,000	0	1	0	1
22. Other or undetermined	0	0	0	0	0	0
TOTAL	**6,696,011**	**7,699,000**	**100**	**100**	**7**	**10**

Table 7.6D. Investment spending: Planned (PAT) versus actual (2001) for Cardique

Category	Spending ('000 pesos)		Spending (%)		No. projects	
	PAT	Actual	PAT	Actual	PAT	Actual
FLORA AND FAUNA (sum 1–3)	**761,877**	**761,876**	**13**	**13**	**4**	**3**
1. Forest and ecosystem management	650,000	761,876	11	13	3	3
2. Protected areas	0	0	0	0	0	0
3. Green markets	111,877	0	2	0	1	0
INDUSTRIAL POLLUTION (sum 4–9)	**293,000**	**743,000**	**5**	**13**	**1**	**3**
4. Air pollution control	0	0	0	0	0	0
5. Solid and hazardous waste management	293,000	293,000	5	5	1	1
6. Clean technologies	0	0	0	0	0	0
7. Industrial pollution other/general	0	450,000	0	8	0	2
8. Wastewater infrastructure	0	0	0	0	0	0
9. Water quality other	0	0	0	0	0	0
WATER QUANTITY (sum 10–12)	**900,000**	**900,000**	**16**	**16**	**3**	**3**
10. Drinking water supply	0	0	0	0	0	0
11. Water quantity	900,000	900,000	16	16	3	3
12. Irrigation	0	0	0	0	0	0
OTHER (sum 13–22)	**3,700,000**	**3,250,000**	**65**	**57**	**15**	**13**
13. Water other/general	550,000	550,000	10	10	2	2
14. Soil conservation	0	0	0	0	0	0
15. Coastal/marine management	950,000	950,000	17	17	3	3
16. Natural disaster prevention	0	0	0	0	0	0
17. Mosquito control	0	0	0	0	0	0
18. Research information	600,000	300,000	11	5	2	1
19. Environmental education	200,000	200,000	4	4	1	1
20. Operations-related general activities	600,000	600,000	11	11	2	2
21. Joint com. and territorial entity activities	550,000	400,000	10	7	4	3
22. Other or undetermined	250,000	250,000	4	4	1	1
TOTAL	**5,654,877**	**5,654,876**	**100**	**100**	**23**	**22**

TABLE 8.1. CAR resources, 2003 (millions of pesos)

CAR	OPERATIONS			INVESTMENT			DEBT	Percentage Operations	TOTAL		
	National Contribution	Self-Generated Revenue	Total	National Contribution	Self-Generated Revenue	Total	Self-Generated Revenue		National Contribution	Self-Generated	Total Resources
CAM	1,180	1,394	2,574	0	5,152	5,152	0	33.3	1,180	6,545	7,725
CAR	0	28,312	28,312	0	46,124	46,124	7,487	34.6	0	81,924	81,924
CARDER	1,262	2,772	4,033	11	6,499	6,510	151	37.7	1,273	9,421	10,694
CARDIQUE	1,160	836	1,996	0	6,692	6,692	0	23.0	1,160	7,528	8,688
CARSUCRE	1,201	354	1,555	597	203	800	0	66.0	1,798	557	2,355
CAS	1,131	1,538	2,668	150	4,175	4,325	0	38.2	1,281	5,713	6,994
CDA	1,423	128	1,551	983	86	1,069	0	59.2	2,407	214	2,620
CDMB	0	5,738	5,738	0	43,334	43,334	1,021	11.5	0	50,093	50,093
CODECHOCO	924	1,809	2,733	367	628	996	0	73.3	1,292	2,437	3,729
CORALINA	1,301	48	1,350	434	1,401	1,835	0	42.4	1,736	1,449	3,185
CORANTIOQUIA	1,168	3,968	5,136	0	41,330	41,330	0	11.1	1,168	45,299	46,467
CORMACARENA	1,195	191	1,386	1,157	573	1,730	0	44.5	2,352	764	3,116
CORNARE	0	4,358	4,358	0	16,479	16,479	1,121	19.8	0	21,958	21,958
CORPAMAG	1,954	913	2,866	713	1,929	2,642	0	52.0	2,666	2,842	5,508
CORPOAMAZONIA	1,254	1,319	2,573	711	5,020	5,731	0	31.0	1,965	6,339	8,304
CORPOBOYACA	1,038	1,198	2,235	0	5,303	5,303	0	29.7	1,038	6,501	7,538
CORPOCALDAS	1,706	1,143	2,850	6	9,418	9,424	0	23.2	1,712	10,562	12,274
CORPOCESAR	1,531	541	2,071	0	1,027	1,027	0	66.8	1,531	1,568	3,099
CORPOCHIVOR	1,139	1,164	2,303	0	3,149	3,149	377	39.5	1,139	4,690	5,829
CORPOGUAJIRA	0	3,530	3,530	0	27,775	27,775	0	11.3	0	31,305	31,305
CORPOGUAVIO	0	3,064	3,064	0	4,975	4,975	0	38.1	0	8,038	8,038
CORPOMOJANA	1,277	23	1,300	664	100	764	0	63.0	1,941	123	2,064
CORPONARIÑO	959	1,817	2,777	614	2,077	2,691	0	50.8	1,573	3,894	5,468
CORPONOR	1,326	1,493	2,819	0	4,948	4,948	0	36.3	1,326	6,441	7,768
CORPORINOQUIA	1,082	2,278	3,360	200	4,265	4,465	0	42.9	1,282	6,543	7,824
CORPOURABA	1,999	436	2,435	740	2,613	3,353	0	42.1	2,739	3,049	5,788
CORTOLIMA	1,023	2,264	3,287	41	11,302	11,344	126	22.3	1,064	13,693	14,758
CRA	927	1,408	2,334	0	10,795	10,795	595	17.0	927	12,798	13,725
CRC	2,764	4,125	6,889	0	14,324	14,324	0	32.5	2,764	18,448	21,212
CRQ	2,516	970	3,486	316	4,431	4,747	0	42.3	2,831	5,401	8,232
CSB	1,347	140	1,486	1,040	191	1,231	0	54.7	2,387	331	2,717
CVC	0	28,484	28,484	0	107,265	107,265	0	21.0	0	135,749	135,749
CVS	104	2,771	2,875	0	12,537	12,537	1,089	17.4	104	16,397	16,501
TOTAL	35,890	110,524	146,414	8,743	406,122	414,865	11,968	25.5	44,634	528,614	573,248

TABLE 8.2. CAR spending per inhabitant, 2003
(thousands of pesos)

CAR	Spending per inhabitant
CAM	7.86
CAR	8.88
CARDER	10.59
CARDIQUE	5.73
CARSUCRE	3.53
CAS	7.70
CDA	12.81
CDMB	43.34
CODECHOCO	11.24
CORALINA	39.10
CORANTIOQUIA	39.47
CORMACARENA	4.13
CORNARE	33.88
CORPAMAG	4.60
CORPOAMAZONIA	9.56
CORPOBOYACA	6.89
CORPOCALDAS	10.73
CORPOCESAR	3.04
CORPOCHIVOR	30.36
CORPOGUAJIRA	66.19
CORPOGUAVIO	84.66
CORPOMOJANA	11.52
CORPONARIÑO	3.16
CORPONOR	5.41
CORPORINOQUIA	9.82
CORPOURABA	9.11
CORTOLIMA	11.33
CRA	5.91
CRC	16.16
CRQ	13.65
CSB	5.24
CVC	30.43
CVS	12.24
AVERAGE	12.85

TABLE 8.3. Regression results: Determinants of CAR spending (2003 data, billions of pesos)

	Log Total Spending	Log Total Self-Generated	Log Total National	Log Self-Gen. Investment	Log National Investment	Log Self-Gen. Operations	Log National Operations
Log GDP	0.463	0.8	–0.248	0.944	0.122	0.525	–0.152
	(2.41)**	(2.82)***	(1.63)	(3.15)***	(0.37)	(1.94)*	(1.12)
Log Land Area	0.102	0.081	0.109	0.015	–0.105	0.329	0.066
	(0.80)	(0.43)	(1.08)	(0.08)	(0.48)	(1.83)*	(0.73)
% Urban	0.000	–0.008	0.008	–0.012	–0.006	–0.001	0.005
	(0.01)	(0.49)	(0.90)	(0.70)	(0.33)	(0.04)	(0.71)
Pre-1999 Law	0.399	0.783	–0.182	0.635	–0.277	1.18	–0.101
	(1.39)	(1.86)*	(0.80)	(1.42)	(0.56)	(2.92)***	(0.50)
Poverty	–0.011	–0.019	–0.004	–0.022	0.015	–0.014	–0.005
	(2.09)**	(2.36)**	(0.84)	(2.58)**	(1.64)	(1.86)*	(1.27)
Constant	2.393	2.2	0.577	2.068	–1.255	0.528	0.4
	(3.54)***	(2.20)**	(1.08)	(1.96)*	(1.08)	(0.55)	(0.84)
Observations	33	33	33	33	33	33	33
R-squared	0.55	0.60	0.13	0.62	0.15	0.59	0.09
F statistic	6.61	8.24	0.81	8.81	0.93	7.76	0.52
Prob > F	0.00	0.00	0.556	0.00	0.479	0.00	0.759

Absolute value of t-statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 8.4. Self-generated resources from selected sources, 2003 (millions of pesos)

CAR	Property Tax	Electricity Tax	Goods and Serv. Sale	Forest Fees	Redistribution Fees	Water Fees	Contributions	Contractor Revenue	Licensing Fees	Penalties	Other income	Capital
CAM	2,267	0	523	0	0	0	2,637	0	0	0	47	1,384
CAR	88,548	5,587	1,835	0	73	12,264	0	12	108	338	1,386	3,568
CARDER	4,899	240	270	0	140	0	165	0	0	0	0	3,971
CARDIQUE	54	76	376	0	0	0	312	0	0	0	318	4,959
CARSUCRE	395	0	1	0	0	0	0	0	0	0	99	221
CAS	2,285	592	2	86	1,081	26	120	0	10	154	390	885
CDA	192	0	0	0	0	0	0	0	0	0	62	0
CDMB	9,223	60	22,157	0	0	0	1,648	0	0	0	1,245	13,155
CODECHOCO	5	0	201	1,037	0	0	0	0	144	1,270	7	106
CORALINA	461	158	57	0	12	2	5	0	0	3	6	1,404
CORANTIOQUIA	26,370	6,602	176	0	0	0	0	0	0	0	980	21,512
CORMACARENA	481	0	0	0	73	0	234	0	0	0	91	0
CORNARE	2,815	12,807	226	0	939	295	326	0	0	9	186	1,389
CORPAMAG	1,225	0	0	0	0	0	60	0	0	0	702	9
CORPOAMAZONIA	558	28	328	0	0	0	3,731	12	0	0	122	1,296
CORPOBOYACA	3,246	1,965	20	0	0	0	174	0	0	0	1,418	1,832
CORPOCALDAS	5,400	0	111	0	0	0	2,803	0	0	0	456	1,025
CORPOCESAR	1,202	0	67	0	0	0	0	0	0	0	159	545
CORPOCHIVOR	598	3,308	198	0	0	0	0	0	0	0	79	1,822
CORPOGUAJIRA	509	598	30	0	0	0	24,830	0	0	0	129	1,398
CORPOGUAVIO	237	7,325	17	0	0	0	0	49	0	0	18	2,466
CORPOMOJANA	42	0	11	0	6	0	0	0	5	0	0	87
CORPONARIÑO	2,750	0	729	0	0	0	126	316	0	0	28	627
CORPONOR	3,541	806	261	0	0	0	1,482	0	0	0	459	1,048
CORPORINOQUIA	3,274	220	449	0	0	120	25	0	0	0	191	5,053
CORPOURABA	640	0	159	0	220	0	282	0	0	0	509	1,712
CORTOLIMA	7,177	218	0	0	0	0	0	1,955	0	0	2,949	2,563
CRA	3,833	6,275	205	0	0	0	0	0	0	0	189	3
CRC	1,868	1,134	523	0	0	0	46	0	0	0	1,271	23,139
CRQ	3,345	0	787	0	0	0	588	0	0	0	46	1,416
CSB	153	0	0	107	0	0	0	0	37	0	0	0
CVC	30,102	2,897	196	20	370	3,248	2,645	0	245	33	1,294	147,501
CVS	2,698	1,276	197	258	70	0	15,971	266	92	17	126	148
TOTAL	210,391	52,174	30,112	1,508	2,985	15,954	58,211	2,610	642	1,824	14,962	246,245

TABLE 8.5. Regression results: Determinants of self-generated resources (2003 data, billions of pesos)

	Log Property Tax	Log Electricity Tax	Log Goods and Serv. Sales	Log Forest Fees	Log Redistrib. Fees	Log Water Fees	Log Contrib.	Log Contractor Revenue	Log Licensing Fees	Log Penalties	Log Other	Log Capital
Log GDP	1.077	0.325	0.547	–0.475	0.332	–0.255	–0.30	0.537	–0.131	–0.098	0.925	0.574
	(3.48)***	(0.92)	(0.72)	(2.12)**	(0.97)	(0.87)	(0.67)	(1.75)*	(0.35)	(0.19)	(2.63)**	(1.19)
Log Land Area	0.149	–0.139	–0.077	0.073	0.211	0.59	0.453	–0.381	0.134	0.694	0.033	0.165
	(0.72)	(0.59)	(0.15)	(0.49)	(0.93)	(3.04)***	(1.52)	(1.86)*	(0.54)	(2.01)*	(0.14)	(0.51)
% Urban	–0.012	–0.031	–0.024	0.017	–0.018	0.037	0.03	–0.017	0.007	0.013	–0.008	–0.039
	(0.69)	(1.61)	(0.58)	(1.33)	(0.95)	(2.26)**	(1.19)	(1.00)	(0.34)	(0.45)	(0.39)	(1.44)
Pre-1999 Law	0.261	0.361	0.768	0.22	0.219	1.313	0.305	-0.335	0.261	0.375	0.396	-0.116
	(0.57)	(0.69)	(0.68)	(0.66)	(0.43)	(3.02)***	(0.46)	(0.73)	(0.47)	(0.49)	(0.76)	(0.16)
Poverty	-0.032	-0.008	-0.008	0.002	-0.001	0.005	0.001	0.008	-0.012	-0.011	0.005	-0.032
	(3.61)***	(0.78)	(0.39)	(0.24)	(0.10)	(0.62)	(0.08)	(0.93)	(1.14)	(0.75)	(0.47)	(2.30)**
Constant	1.844	1.421	-1.414	-0.928	0.455	-2.081	-1.353	-0.852	-0.192	0.142	-2.251	3.974
	(1.69)	(1.15)	(0.53)	(1.17)	(0.38)	(2.03)*	(0.85)	(0.79)	(0.15)	(0.08)	(1.82)*	(2.33)**
Observations	33	33	33	33	33	33	33	33	33	33	33	33
R-squared	0.68	0.16	0.07	0.18	0.19	0.46	0.11	0.15	0.08	0.19	0.37	0.27
F statistic	11.46	1.04	0.42	1.15	1.25	4.63	0.7	0.95	0.44	1.23	3.23	2.04
Prob > F	0.00	0.413	0.83	0.358	0.316	0.004	0.63	0.465	0.818	0.324	0.021	0.105

Absolute value of t-statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 8.6. CAR spending, 2002 (millions of pesos)

CAR	OPERATIONS			INVESTMENT			DEBT	Percentage Operations	TOTAL		
	National Contribution	Self-Generated Revenue	Total	National Contribution	Self-Generated Revenue	Total	Self-Generated Revenue		National Contribution	Self-Generated	Total Spending
CAM	1,102	1,611	2,713	380	4,741	5,121	0	34.6	1,482	6,352	7,834
CAR	0	44,107	44,107	0	40,813	40,813	9,475	47.7	0	94,394	94,394
CARDER	1,194	3,063	4,258	369	7,682	8,051	0	34.6	1,563	10,745	12,308
CARDIQUE	1,097	462	1,559	0	8,192	8,192	0	16.0	1,097	8,654	9,752
CARSUCRE	1,231	533	1,765	701	1,430	2,131	0	45.3	1,932	1,963	3,896
CAS	1,097	1,915	3,012	0	5,253	5,253	0	36.4	1,097	7,168	8,265
CDA	1,383	64	1,447	644	133	777	0	65.1	2,027	197	2,224
CDMB	0	5,188	5,188	0	29,257	29,257	338	15.0	0	34,782	34,782
CODECHOCO	944	1,461	2,405	780	553	1,333	0	64.3	1,724	2,014	3,738
CORALINA	1,318	55	1,373	707	1,587	2,294	0	37.4	2,025	1,643	3,667
CORANTIOQUIA	3,452	5,235	8,687	0	36,714	36,714	0	19.1	3,452	41,949	45,401
CORMACARENA	0	204	204	261	113	374	0	35.3	261	317	578
CORNARE	0	1,653	1,653	0	12,529	12,529	1,158	11.7	0	15,339	15,339
CORPAMAG	1,829	1,197	3,026	1,043	2,546	3,589	0	45.7	2,872	3,743	6,615
CORPOAMAZONIA	1,286	1,305	2,591	410	3,812	4,222	0	38.0	1,696	5,118	6,814
CORPOBOYACA	1,012	1,042	2,054	0	6,346	6,346	0	24.5	1,012	7,388	8,400
CORPOCALDAS	1,676	812	2,487	59	6,989	7,048	0	26.1	1,735	7,801	9,536
CORPOCESAR	1,486	533	2,019	40	1,297	1,337	0	60.2	1,526	1,830	3,356
CORPOCHIVOR	963	2,061	3,024	415	2,830	3,245	283	45.5	1,378	5,174	6,552
CORPOGUAJIRA	0	3,832	3,832	0	8,829	8,829	0	30.3	0	12,661	12,661
CORPOGUAVIO	0	3,749	3,749	0	5,209	5,209	0	41.8	0	8,958	8,958
CORPOMOJANA	1,275	17	1,292	718	135	853	0	60.2	1,993	152	2,145
CORPONARIÑO	899	1,476	2,375	929	4,365	5,294	0	31.0	1,828	5,841	7,669
CORPONOR	1,351	2,224	3,575	0	5,394	5,394	67	39.9	1,351	7,685	9,036
CORPORINOQUIA	1,053	2,091	3,145	55	3,967	4,022	0	43.9	1,108	6,058	7,166
CORPOURABA	1,478	555	2,033	798	1,970	2,768	0	42.3	2,276	2,525	4,800
CORTOLIMA	996	2,618	3,614	35	13,503	13,538	729	20.4	1,031	16,850	17,881
CRA	896	2,222	3,118	0	13,088	13,088	689	19.2	896	15,999	16,895
CRC	2,663	3,984	6,647	0	13,256	13,256	0	33.4	2,663	17,240	19,903
CRQ	2,573	1,095	3,668	212	2,966	3,179	0	53.6	2,785	4,061	6,847
CSB	1,300	182	1,482	991	5,108	6,099	0	19.5	2,292	5,289	7,581
CVC	0	23,786	23,786	0	58,717	58,717	0	28.8	0	82,503	82,503
CVS	105	3,736	3,841	0	8,408	8,408	1,123	28.5	105	13,267	13,371
TOTAL	35,660	124,068	159,728	9,547	317,731	327,278	13,862	32.1	45,207	455,661	500,869

TABLE 8.7. Ratio of 2003 to 2002 CAR spending

CAR	OPERATIONS			INVESTMENT			DEBT	Percentage Operations	TOTAL		
	National Contribution	Self-Generated Revenue	Total	National Contribution	Self-Generated Revenue	Total	Self-Generated Revenue		National Contribution	Self-Generated	Total Spending
CAM	1.070	0.865	0.949	0.000	1.087	1.006		0.962	0.796	1.030	0.986
CAR		0.642	0.642		1.130	1.130	0.790	0.725		0.868	0.868
CARDER	1.056	0.905	0.947	0.030	0.846	0.809		1.090	0.814	0.877	0.869
CARDIQUE	1.057	1.810	1.280		0.817	0.817		1.437	1.057	0.870	0.891
CARSUCRE	0.975	0.663	0.881	0.851	0.142	0.375		1.458	0.930	0.284	0.604
CAS	1.031	0.803	0.886		0.795	0.823		1.047	1.167	0.797	0.846
CDA	1.029	1.985	1.072	1.527	0.645	1.376		0.910	1.187	1.082	1.178
CDMB		1.106	1.106		1.481	1.481	3.023	0.766		1.440	1.440
CODECHOCO	0.979	1.238	1.136	0.471	1.137	0.747		1.139	0.749	1.210	0.997
CORALINA	0.988	0.875	0.983	0.615	0.882	0.800		1.132	0.857	0.882	0.868
CORANTIOQUIA	0.338	0.758	0.591		1.126	1.126		0.578	0.338	1.080	1.023
CORMACARENA		0.936	6.793	4.437	5.061	4.626		1.260	9.020	2.407	5.391
CORNARE		2.637	2.637		1.315	1.315	0.968	1.703		1.431	1.431
CORPAMAG	1.068	0.762	0.947	0.683	0.758	0.736		1.138	0.928	0.759	0.833
CORPOAMAZONIA	0.975	1.011	0.993	1.734	1.317	1.357		0.815	1.159	1.239	1.219
CORPOBOYACA	1.025	1.150	1.088		0.836	0.836		1.213	1.025	0.880	0.897
CORPOCALDAS	1.018	1.409	1.146	0.099	1.348	1.337		0.890	0.987	1.354	1.287
CORPOCESAR	1.030	1.015	1.026	0.000	0.792	0.769		1.111	1.003	0.857	0.923
CORPOCHIVOR	1.182	0.565	0.761	0.000	1.113	0.971	1.332	0.869	0.826	0.907	0.890
CORPOGUAJIRA		0.921	0.921		3.146	3.146		0.372		2.473	2.473
CORPOGUAVIO		0.817	0.817		0.955	0.955		0.911		0.897	0.897
CORPOMOJANA	1.001	1.387	1.006	0.925	0.739	0.895		1.046	0.974	0.810	0.962
CORPONARIÑO	1.068	1.231	1.169	0.661	0.476	0.508		1.640	0.861	0.667	0.713
CORPONOR	0.982	0.671	0.789		0.917	0.917	0.000	0.911	0.982	0.838	0.860
CORPORINOQUIA	1.027	1.089	1.068	3.635	1.075	1.110		0.979	1.157	1.080	1.092
CORPOURABA	1.353	0.786	1.198	0.927	1.326	1.211		0.994	1.204	1.208	1.206
CORTOLIMA	1.027	0.865	0.910	1.200	0.837	0.838	0.173	1.092	1.032	0.813	0.825
CRA	1.034	0.634	0.749		0.825	0.825	0.864	0.884	1.034	0.800	0.812
CRC	1.038	1.035	1.036		1.081	1.081		0.972	1.038	1.070	1.066
CRQ	0.978	0.886	0.950	1.486	1.494	1.493		0.790	1.016	1.330	1.202
CSB	1.036	0.768	1.003	1.049	0.037	0.202		2.798	1.042	0.063	0.358
CVC		1.198	1.198		1.827	1.827		0.728		1.645	1.645
CVS	0.993	0.742	0.749		1.491	1.491	0.970	0.611	0.993	1.236	1.234
AVERAGE	1.006	0.891	0.917	0.916	1.278	1.268	0.863	0.795	0.987	1.160	1.145

TABLE 8.8. Regression results: Ratio of 2003 to 2002 CAR spending (2003 data)

	Total Spending	Total Self-Generated	Total National	Self-Gen. Investment	National Investment	Self-Gen. Operations	National Operations
Log GDP	–0.12	–0.085	0.214	–0.126	–0.233	0.02	0.096
	(0.57)	(0.71)	(0.41)	(0.57)	(0.53)	(0.17)	(3.17)***
Log Land Area	0.34	0.194	0.443	0.352	0.584	–0.003	–0.023
	(2.43)**	(2.47)**	(1.59)	(2.44)**	(2.75)**	(0.04)	(1.36)
% Urban	0.016	0.009	0.013	0.017	0.018	–0.004	–0.003
	(1.36)	(1.32)	(0.51)	(1.42)	(0.86)	(0.55)	(2.14)**
Pre-1999 Law	–0.252	–0.018	–0.745	–0.17	–0.764	0.044	0.059
	(0.81)	(0.10)	(1.22)	(0.53)	(1.41)	(0.25)	(1.63)
Poverty	–0.012	–0.008	–0.016	–0.015	–0.023	0.002	0.000
	(2.00)*	(2.32)**	(1.37)	(2.30)**	(2.18)*	(0.59)	(0.04)
2002 Spending	–0.01	–0.003	–0.073	–0.009	–0.089	0.000	–0.019
	(1.14)	(0.66)	(1.75)*	(0.94)	(1.13)	(0.07)	(7.41)***
Constant	1.93	1.482	3.137	1.94	3.493	1.101	1.227
	(2.64)**	(3.61)***	(1.91)*	(2.56)**	(2.45)**	(2.62)**	(12.59)***
Observations	33	33	27	33	19	33	26
R-squared	0.25	0.25	0.3	0.26	0.54	0.06	0.78
F statistic	1.41	1.46	1.42	1.5	2.39	0.25	11.08
Prob > F	0.248	0.231	0.255	0.217	0.094	0.953	0.00

Absolute value of t-statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 8.9. Environmental compensation fund, 1999–2003 (millions of pesos)

	1999		2000		2001		2002		2003	
CAR	Investment	Operations	Investment	Operations	Investment	Operations	Investment	Operations	Investment	Operations
CAM					90		380			
CAR										
CARDER		121	249	234	395		370			
CARDIQUE										
CARSUCRE	55	35	222	178	570	122	474	113	380	63
CAS									150	
CDA	30	91	208	363	530	189	457	172	732	172
CDMB										
CODECHOCO		121		405	579	215	430	76	311	38
CORALINA	37	85	122	181	323	125	484	148	381	157
CORANTIOQUIA										
CORMACARENA	90	31	176	185	442	110	660	48	822	
CORNARE										
CORPAMAG			151	193	389	97	690	100	720	48
CORPOAMAZONIA		121	89	186	398		549		645	
CORPOBOYACA				115						
CORPOCALDAS										
CORPOCESAR			110	143	149		100		400	
CORPOCHIVOR			33	109	230		350			300
CORPOGUAJIRA			44	166						
CORPOGUAVIO										
CORPOMOJANA	7	114	271	160	527	100	475	103	825	127
CORPONARIÑO			91	242	245	34	757		650	
CORPONOR										
CORPORINOQUIA					374					
CORPOURABA		121	124	234	529	44	648	66	900	59
CORTOLIMA										
CRA										
CRC										
CRQ	25	96	294	289	618	20	200		267	
CSB	40	50	87	281	359	180	586	229	640	250
CVC										
CVS										
TOTAL	283	987	2,272	3,663	6,747	1,237	7,608	1,054	7,823	1,213

TABLE 8.10. Regression results: Ratios of environmental compensation fund operations spending

	Ratio of 1999 to 2000 Operations Spending	Ratio of 2001 to 2000 Operations Spending	Ratio of 2002 to 2001 Operations Spending	Ratio of 2003 to 2002 Operations Spending
Log GDP	–0.591	–0.081	–0.003	–0.101
	(1.32)	(1.39)	(0.03)	(1.03)
Log Land Area	0.321	–0.014	–0.071	–0.083
	(1.13)	(0.39)	(1.01)	(1.43)
% Urban	0.031	0.004	0.001	0
	(1.34)	(1.36)	(0.18)	(0.04)
Pre–1999 Law	-0.239	-0.022	-0.007	-0.087
	(0.36)	(0.26)	(0.04)	(0.65)
Poverty	-0.006	0.002	0.003	0.004
	(0.43)	(1.30)	(0.89)	(1.74)*
Log Spending[1]	-0.797	-0.096	-0.246	-0.054
	(1.87)*	(1.68)	(2.10)**	(0.67)
Constant	2.191	0.05	0.445	0.064
	(1.29)	(0.23)	(0.99)	(0.19)
Observations	33	33	33	33
R-squared	0.33	0.48	0.38	0.41
F statistic	0.52	1.04	0.38	1.81
Prob > F	0.761	0.415	0.856	0.146

Absolute value of t-statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

1. Log of spending in the year in the numerator of the dependent variable

TABLE 8.11. Regression results: Ratios of environmental compensation fund investment

	Ratio of 1999 to 2000 Investment	Ratio of 2001 to 2000 Investment	Ratio of 2002 to 2001 Investment	Ratio of 2003 to 2002 Investment
Log GDP	–4.065	0.018	0.145	–0.059
	(2.37)**	(0.04)	(0.52)	(0.28)
Log Land Area	–0.035	–0.135	0.01	0.032
	(0.03)	(0.47)	(0.06)	(0.25)
% Urban	0.146	–0.02	–0.005	0.009
	(1.63)	(0.86)	(0.32)	(0.90)
Pre-1999 Law	–1.531	0.313	–0.086	–0.051
	(0.59)	(0.46)	(0.22)	(0.18)
Poverty	0.041	–0.002	–0.004	0.006
	(0.80)	(0.15)	(0.52)	(1.13)
Log Spending[1]	0.533	–0.845	–0.555	–0.427
	(0.32)	(1.83)*	(1.98)*	(2.43)**
Constant	–5.303	3.746	2.308	0.738
	–0.82	(2.13)**	(2.15)**	–0.99
Observations	33	33	33	33
R-squared	0.31	0.29	0.19	0.4
F statistic	1.68	0.4	0.12	0.57
Prob > F	0.174	0.847	0.986	0.726

Absolute value of t-statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

1. Log of spending in the year in the numerator of the dependent variable

TABLE 9.1. Size and education of CAR staff, 2002

CAR	Employees	Percentage Employees with College or Higher Education	Contractors	Percentage Contractors with College or Higher Education	Employees and Contractors	Contractors as Percentage of Total
CAM	48	66.7	40	100.0	88	45.5
CAR	817	48.5	23	82.6	840	2.7
CARDER	97	70.1	27	100.0	124	21.8
CARDIQUE	31	51.6	163	62.0	194	84.0
CARSUCRE	41	65.9	11	100.0	52	21.2
CAS	40	70.0	116	85.3	156	74.4
CDA	37	73.0	59	28.8	96	61.5
CDMB	217	31.3	301	30.9	518	58.1
CODECHOCO	62	48.4	133	21.1	195	68.2
CORALINA	31	58.1	73	60.3	104	70.2
CORANTIOQUIA	331	50.5	65	50.8	396	16.4
CORMACARENA	37	70.3	21	57.1	58	36.2
CORNARE	156	69.2	57	100.0	213	26.8
CORPAMAG	92	67.4	21	33.3	113	18.6
CORPOAMAZONIA	59	45.8	119	57.1	178	66.9
CORPOBOYACA	31	100.0	30	100.0	61	49.2
CORPOCALDAS	33	100.0	121	100.0	154	78.6
CORPOCESAR	64	100.0	24	100.0	88	27.3
CORPOCHIVOR	54	55.6	72	40.3	126	57.1
CORPOGUAJIRA	99	44.4	25	56.0	124	20.2
CORPOGUAVIO	27	51.9	98	31.6	125	78.4
CORPOMOJANA	35	65.7	7	0.0	42	16.7
CORPONARIÑO	135	41.5	7	28.6	142	4.9
CORPONOR	89	67.4	134	100.0	223	60.1
CORPORINOQUIA	69	60.9	99	69.7	168	58.9
CORPOURABA	78	100.0	19	100.0	97	19.6
CORTOLIMA	87	75.9	40	100.0	127	31.5
CRA	26	100.0	134	87.3	160	83.8
CRC	262	64.1	82	37.8	344	23.8
CRQ	101	51.5	49	95.9	150	32.7
CSB	36	47.2	12	100.0	48	25.0
CVC	246	100.0	8	100.0	254	3.1
CVS	148	70.9	17	100.0	165	10.3
TOTAL	3716	60.7	2207	63.5	5923	37.3
AVERAGE	112.61	66.18	66.88	70.20	179.48	41.02

TABLE 9.2. CAR inhabitants per staff member, 2002		
CAR	**Inhabitants/employee**	**Inhabitants/contractor**
CAM	20,464	24,557
CAR	11,290	401,057
CARDER	10,408	37,391
CARDIQUE	48,923	9,304
CARSUCRE	16,281	60,683
CAS	22,692	7,825
CDA	5,529	3,467
CDMB	5,326	3,840
CODECHOCO	5,351	2,495
CORALINA	2,628	1,116
CORANTIOQUIA	3,556	18,110
CORMACARENA	20,404	35,950
CORNARE	4,154	11,370
CORPAMAG	13,006	56,978
CORPOAMAZONIA	14,724	7,300
CORPOBOYACA	35,285	36,461
CORPOCALDAS	34,671	9,456
CORPOCESAR	15,930	42,479
CORPOCHIVOR	3,556	2,667
CORPOGUAJIRA	4,777	18,918
CORPOGUAVIO	3,517	969
CORPOMOJANA	5,118	25,591
CORPONARIÑO	12,828	247,389
CORPONOR	16,135	10,716
CORPORINOQUIA	11,546	8,048
CORPOURABA	8,147	33,447
CORTOLIMA	14,977	32,575
CRA	89,286	17,324
CRC	5,010	16,007
CRQ	5,972	12,310
CSB	14,410	43,230
CVC	18,134	557,606
CVS	9,112	79,329
AVERAGE	15,550	56,847

TABLE 9.3. Regression results: Determinants of number of CAR staff (2002 data)

	Log Employees	Log Contractors
Log GDP	0.203	–0.511
	(1.05)	(1.37)
Log Land Area	0.041	0.176
	(0.38)	(0.87)
% Urban	–0.001	0.012
	(0.10)	(0.68)
Pre-1999 Law	0.361	–0.065
	(1.62)	(0.15)
Poverty	0.004	–0.007
	(0.96)	(0.84)
Log Operations Spending	0.575	–0.507
	(2.65)**	(1.22)
Log Investment Spending	–0.016	0.637
	(0.08)	(1.63)
Constant	3.263	3.729
	(6.00)***	(3.57)***
Observations	33	33
R-squared	0.66	0.13
F statistic	6.91	0.53
Prob > F	0.000	0.802

Absolute value of t-statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 9.4. Regression results: Determinants of CAR staff education level (2002 data)

	Percentage Employees with High School or Less Education	Percentage Contractors with High School or Less Education
Log GDP	–0.178	–22.933
	(2.86)***	(2.35)**
Log Land Area	0.035	4.174
	(1.02)	(0.79)
% Urban	0.005	0.374
	(1.62)	(0.84)
Pre-1999 Law	–0.006	4.088
	(0.09)	(0.36)
Poverty	0.002	0.266
	(1.20)	(1.30)
Log Operations Spending	–0.057	–0.178
	(0.81)	(0.02)
Log Investment Spending	0.151	7.037
	(2.31)**	(0.69)
Constant	0.019	–90.773
	(0.11)	(3.31)***
Observations	33	33
R-squared	0.34	0.38
F statistic	1.85	2.21
Prob > F	0.121	0.068

Absolute value of t-statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 9.5. Computers available, 2002		
CAR	Computers	Computers per Employee
CAM	60	1.25
CAR	358	0.44
CARDER	78	0.80
CARDIQUE	68	2.19
CARSUCRE	16	0.39
CAS	88	2.20
CDA	19	0.51
CDMB	221	1.02
CODECHOCO	–	–
CORALINA	53	1.71
CORANTIOQUIA	265	0.80
CORMACARENA	34	0.92
CORNARE	95	0.61
CORPAMAG	68	0.74
CORPOAMAZONIA	64	1.08
CORPOBOYACA	42	1.35
CORPOCALDAS	110	3.33
CORPOCESAR	–	–
CORPOCHIVOR	62	1.15
CORPOGUAJIRA	43	0.43
CORPOGUAVIO	80	2.96
CORPOMOJANA	25	0.71
CORPONARIÑO	105	0.78
CORPONOR	114	1.28
CORPORINOQUIA	70	1.01
CORPOURABA	74	0.95
CORTOLIMA	117	1.34
CRA	68	2.62
CRC	147	0.56
CRQ	89	0.88
CSB	17	0.47
CVC	534	2.17
CVS	48	0.32
AVERAGE	104.26	1.19

TABLE 9.6. Regression results: Determinants of technical capacity (2002 data)		
	Computers	Computers per Employee
Log GDP	12.653	–0.203
	(0.51)	(0.72)
Log Land Area	12.315	0.047
	(0.95)	(0.32)
% Urban	0.476	0.003
	(0.45)	(0.26)
Pre-1999 Law	–3.473	–0.178
	(0.13)	(0.56)
Poverty	–0.877	–0.015
	(1.76)*	(2.56)**
Log Operations Spending	64.649	–0.414
	(2.34)**	(1.31)
Log Investment Spending	9.901	0.388
	(0.37)	(1.26)
Constant	45.838	1.864
	(0.71)	(2.53)**
Observations	31	31
R-squared	0.73	0.32
F statistic	8.72	1.56
Prob > F	0.000	0.197
Absolute value of t-statistics in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%		

TABLE 9.7. Systemization of processes, 2001–2002

CAR	Meteorological	Hydrological	Biological	Forest Reserves	Retributive Fees	Compensation Fees	Soils, Character. and uses	Property	Royalties	Licenses and Permits	Oversight Services	Fines	POT	Physical Res. Mgt System	Financial Mgt System	Personnel Mgt System	% processes systematized
CAM	0	0	0	0	1	0	1	1	0	1	0	0	1	1	1	1	**50**
CAR	1	1	0	1	1	1	0	0	0	1	1	0	0	1	1	1	**63**
CARDER	0	1	0	0	1	0	1	1	0	1	0	0	0	0	1	1	**44**
CARDIQUE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**100**
CARSUCRE	0	1	0	1	0	0	1	0	0	0	0	0	1	0	1	1	**38**
CAS																	
CDA	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**100**
CDMB	1	1	1	0	1	0	1	0	1	0	0	1	0	1	1	1	**63**
CODECHOCO	0	0	0	1	1	1	0	1	1	1	0	1	1	1	1	1	**69**
CORALINA	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**100**
CORANTIOQUIA	1	0	0	0	1	0	0	1	0	1	0	0	0	0	1	1	**38**
CORMACARENA	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	**19**
CORNARE	1	1	1	0	1	0	1	1	0	1	0	1	1	1	1	1	**75**
CORPAMAG	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	1	**25**
CORPOAMAZONIA	0	0	0	0	0	0	0	1	0	1	0	0	0	1	1	1	**31**
CORPOBOYACA	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	**94**
CORPOCALDAS	1	1	1	1	1	0	1	1	0	1	0	0	0	1	1	1	**69**
CORPOCESAR																	
CORPOCHIVOR	1	1	0	0	1	0	0	1	0	0	0	0	1	0	0	0	**31**
CORPOGUAJIRA	1	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	**25**
CORPOGUAVIO	1	0	0	0	0	1	1	1	0	1	0	0	0	1	1	1	**50**
CORPOMOJANA	0	0	0	0	0	1	1	0	0	1	0	1	0	0	1	1	**38**
CORPONARIÑO	0	0	0	1	1	1	1	1	0	1	0	0	1	1	1	1	**63**
CORPONOR	0	0	0	0	1	0	0	0	0	1	0	1	0	1	1	1	**38**
CORPORINOQUIA	0	0	0	0	0	0	0	1	0	0	0	0	1	0		0	**13**
CORPOURABA	0	1	0	1	0	1	0	0	0	0	0	0	0	0	1	1	**31**
CORTOLIMA	1	1	0	1	1	0	0	1	0	1	1	0	0	1	1	1	**63**
CRA	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	0	**25**
CRC	1	1	0	0	1	0	0	1	0	0	0	0	0	0	1	1	**38**
CRQ	1	1	1	1	1	1	0	0	0	1	0	1	0	0	0	1	**56**
CSB																	
CVC																	
CVS																	

TABLE 9.8. Hydrological and meteorological stations, 2002

	Gauging	Ordinary Climat.	Principal Climat.	Limni-graphic	Limni-metric	Special Meteoro.	Pluvio-graphic	Pluvio-metric	Others	Total
CAM										
CAR	10	28	31	33	231	2	53	67	11	466
CARDER	0	0	0	1	0	0	0	0	4	5
CARDIQUE	0	4	0	0	0	0	0	0	0	4
CARSUCRE										
CAS										
CDA										
CDMB	0	5	0	4	15	0	3	5	0	32
CODECHOCO										
CORALINA										
CORANTIOQUIA										
CORMACARENA										
CORNARE	0	0	0	0	25	0	0	0	0	25
CORPAMAG	0	0	3	0	0	0	0	0	0	3
CORPOAMAZONIA	0	5	0	0	0	0	0	4	5	14
CORPOBOYACA	0	0	5	1	22	5	1	2	0	36
CORPOCALDAS	0	1	0	1	0	0	0	0	1	3
CORPOCESAR										
CORPOCHIVOR	0	0	4	0	0	0	0	0	0	4
CORPOGUAJIRA	0	0	2	0	0	0	0	0	0	2
CORPOGUAVIO	0	0	0	0	0	6	0	0	0	6
CORPOMOJANA										
CORPONARIÑO	0	0	0	0	0	0	0	0	41	41
CORPONOR										
CORPORINOQUIA										
CORPOURABA										
CORTOLIMA										
CRA										
CRC										
CRQ	0	15	0	11	0	0	3	6	0	35
CSB										
CVC	0	21	0	82	30	0	26	158	12	329
CVS										

TABLE 9.9. Air quality monitoring stations

CAR	Stations
CAR	11
CARDER	6
CARDIQUE	8
CDMB	8
COPOCALDAS	3
CORNARE	5
CORPOBOYACA	3
CORPOCESAR	4
CORPOGUAJIRA	6
CORTOLIMA	13
CRA	4
CRQ	5
CVC	2

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