Successful Environmental Institutions: Lessons From Colombia and Curitiba, Brazil

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Foreword

The Dissemination Note Series of the Latin America and the Caribbean Region's Environment Unit (LATEN) seeks to share the results of our analytical and operational work, both completed or in progress. Through this series, we present the preliminary findings of larger studies in an abbreviated form, as well as describe "best practices" with regard to major environmental issues currently confronting LAC countries.

In most cases, these notes represent "work in progress" and as such have not been subject to either substantial internal review or editing. Therefore the findings, interpretations, and conclusions expressed in these notes are entirely those of the authors and should not be attributed to the World Bank, members of its Board of Executive Directors, or the countries they represent.

Since one of the key objectives of these notes is to stimulate debate, we would encourage readers to contact the authors directly should they have any comments or suggestions as to how the analyses could be improved.

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SUCCESSFUL ENVIRONMENTAL INSTITUTIONS: LESSONS FROM COLOMBIA AND CURITIBA, BRAZIL

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INTRODUCTION

1. Creating effective environmental government institutions (EGIs) has been difficult in Latin America as in other parts of the world. The characteristics of environmental problems and the many linkages they involve give rise to a number of issues that may make or break an infant EGI. Yet, examining the development of Latin American EGIs may reveal important elements necessary for a successful institution. This paper examines broad questions of environmental institution building, focusing on basic elements that help explain an institution’s success and that may be applicable to EGIs in different countries. Moreover, it presents two case studies of regional and local responses to environmental challenges in which these elements are present.

2. The paper is structured in four sections and one annex. The second section presents a brief discussion of the rationale for having an environmental institution within a governing structure: why it is needed; what are the basic elements for its success; and what strategies it can utilize to address environmental problems. The third section presents case studies in Latin America where institutional arrangements have been successful in addressing environmental issues using the basic elements described in the previous section. The case studies draw on Colombia’s experience with natural resource management and on Curitiba’s (the capital of the State of Paraná, Brazil) experience with urban environmental policymaking. Finally, the last section provides conclusions, highlighting examples of environmental policymaking where these elements are clearly used in the experiences presented. To illustrate the diversity of EGIs in Latin America, an annex summarizing the structure and objectives of several EGIs in the region is given at the end of the paper.

1. Ms. Laura Tlaiye and Mr. Dan Biller work in the Latin America and the Caribbean Region of the World Bank. She is an Environmental Specialist at the Environment and Urban Development Division, Country Department I (LAlEU), and he is an Economist at the Environment Unit, Technical Department (LATEN). The authors wish to acknowledge the helpful comments of Dennis Mahar, John Dixon, Juan David Quintero, Malcolm Rowat, Mike Lubrano, Teresa Serra, William Partridge, and the peer reviewers Dan Gross and Sergio Margulis. Erica Buchholz’s assistance in preparing the annex and the background materials on Curitiba, and Peter Brandriss’ assistance in editing are also gratefully acknowledged. Special thanks are due to the governments of Colombia, the State of Paraná, and the Municipality of Curitiba for their assistance in the field.
ENVIRONMENTAL GOVERNMENT INSTITUTIONS IN CONCEPTUAL TERMS

Why is an EGI Needed?

3. Environmental problems are characterized by market failures; that is, markets are unable to efficiently allocate rights and obligations regarding natural resource use and environmental conservation among different agents. This stems from the lack of property rights associated with "environmental goods and services" and the presence of externalities. These characteristics emphasize the distributional nature of environmental issues; that is, either the parties involved in negotiating a particular environment-related problem find an agreement to redistribute net benefits, or a regulator has to intervene to correct an existing market failure. The regulator may also serve as advocate for absent parties as in the case of intergenerational problems, where future generations cannot negotiate current solutions. The regulator is in fact what we are referring to here as an EGI.

4. An EGI therefore is primarily needed to correct market failures and regulate externalities. The EGI does that through the allocation of property rights among recipients and causers of an externality at a given point in time and across time. If these rights are clearly established, enforced, and traded, markets efficiently allocate them among agents. Yet, since this does not often occur, an EGI has an important task regarding curtailing the causes of environmental degradation. Market failures are particularly present in situations where a large number of agents coexist and there is imperfect information.

What are the Basic Elements for a Successful EGI?

5. To effectively achieve the correction of market failures and regulation of externalities, an EGI requires at a minimum certain basic elements in terms of its placement and functions within the government structure. Its placement must enable the EGI to address problems from a cross-sectoral perspective. Its functions must include being part of development planning (and hence influence resource allocation) and being entitled to resources to meet its goal.

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2. Property rights refer primarily to the rights pertaining to the permissible use of resources, goods, and services. Ownership of an asset consists primarily of the rights to use that asset, to change its form and substance, and to transfer all rights through sale. This ownership is not necessarily unregulated, since some restrictions are often imposed by private contract or law (see Pearce, 1984). Externalities occur when actions by one or more agents affect positively or negatively other agents, without the latter being able to incorporate the level of this influence into the decisionmaking process. An externality, by definition, cannot be self-inflicted.
A Cross-Sectoral Institution

6. Environmental problems are cross-sectoral in nature. Since the environment does not recognize administrative boundaries, it is difficult to place the responsibility of addressing environmental problems in a sectoral agency. For example, a river may support a variety of water uses to different economic agents. It may provide fish for urban areas, an activity that traditionally is administered by agriculture or fisheries agencies. Further, a river may provide water for irrigation, which likewise usually falls within agriculture. Yet, a river may also supply water to towns and cities, a typical infrastructure function; and it may serve as an outlet for industrial pollution, which is directly related to industrial policy. If left to a single sectoral agency, property rights for the use of this resource would likely be given to the main constituency of that agency. This outcome may not guarantee equitable distribution of rights, regulation of externalities, and ultimately an optimal use of the resource. A forum is needed where these different objectives are discussed and which takes into account the goals of society at large. Acting as such a forum should be one of the key functions of an EGI.

7. A cross-sectoral approach does not eliminate the need for specific sectoral analysis of environmental problems. Rather, it positions the environmental agenda as an integral part of the overall development planning, in which relevant sectoral analysis of environmental problems also has a place. The diversity of issues related to environmental problems is usually such that it pays to place the environmental agenda in an agency that has an overview of the economy. In such an agency, complementarities among sectors are more readily identified, and tradeoffs are dealt with earlier in the development process. The probability of addressing one aspect of a certain environmental problem while worsening another aspect of the same problem is greatly diminished, and so is the likelihood of creating a new environmental problem from an apparent solution of another environmental problem.

8. In this context, it is also important to clarify institutional responsibilities, for several government agencies at different levels are likely to get involved in solving most environmental problems. In practice, this entails the reduction of opportunities for conflict among agencies by ensuring that regulatory, enforcement, and monitoring capabilities are not placed in agencies with conflicting objectives and incentives. Further, the functions and hierarchical status of each agency should be clearly defined to ensure smooth relationships among the relevant agencies.³

9. Stemming from the cross-sectoral nature of environmental issues lies the argument that a multidisciplinary team is needed to optimally address these issues. This requires a diverse staff that is able to respond to the various questions related to projects and planning. Headed by competent managers, this multidisciplinary team would be able

³. For additional discussion on this topic, see Margulis (forthcoming).
to confront the different facets of environmental concerns, translating them into action. By involving affected parties, the team would also be able to test the acceptance and probable consequences of these actions prior to implementing them, and to build consensus regarding possible tradeoffs.

Planning

10. Markets are usually unable to capture environmental costs and benefits without some level of regulation. This means that in most cases it cannot be expected that private agents would by themselves agree on solutions to environmental problems; therefore, a well designed regulatory framework is a sine qua non condition for environmental improvement. This regulatory framework should be flexible to allow for exceptions. In addition, since budgets to address environmental problems are usually modest in Latin American governments, combinations of market-based incentives (MBIs) and command and control measures (CACs) should be explored. This would minimize the costs of implementing a regulatory framework without jeopardizing the objective of improving environmental conditions.

11. Apart from devising market solutions to environmental problems and designing and implementing a regulatory framework, appropriate planning would also require a well-functioning information system. While the extensive use of market-based incentives may indeed decrease enforcement costs, both market-based incentives and command and control measures are equally dependent on effective monitoring and analysis. Without such an information base, it is unlikely that this policy will succeed in equating the tradeoffs between environmental conservation and economic growth.

12. Beyond the context of the environmental regulatory framework, integrating an EGI into the overall development planning process may enhance opportunities to extract additional (environmental) benefits from public investments and programs. The Bank’s environmental assessment practice, which is built into the early planning stage of projects, has shown that small design changes can often increase the beneficial impacts of development projects, and avoid or minimize environmental risks.

4. There are exceptions, however, that should be duly exploited. For example, when preferences are strong enough to change the behavior of a polluting agent (e.g., when the demand for a good produced by a polluting agent is inversely related to the pollution), there is little need for the intervention of a regulator. These exceptions are likely to occur when the polluting agent depends directly on the constituency interested in promoting environmental conservation. Moreover, they may occur when the transaction costs of reaching the social optimum are negligible, and agents do not engage in strategic behavior, as explained by the Coase Theorem (see Coase, October 1960).

5. For a thorough review of market-based incentives in developing countries, see Eskeland and Jimenez (July 1992). For a discussion on combining market-based incentives with command and control measures in Latin America, see The World Bank (1992.b).
Resources

13. An EGI requires sufficient resources to adequately perform its functions. This is not different from any other government institution. Yet, if an EGI is to remain an effective regulator, it cannot be viewed either by polluters or by "pollutees" as defending a certain group or sector of society. Once property rights are defined and established, the EGI's function becomes part of the enforcement effort through its environmental policy. Different than a line ministry, for example, whose function may be to promote a certain sector of the economy, an EGI has as one of its key goals to ensure that distributive issues regarding environmental degradation are addressed. If it engages in defending a particular group, the EGI becomes similar to a line ministry and the environment is treated as a sector. In that case, while some aspects of the environment may improve, others may actually worsen.

14. This need for a certain degree of impartiality may restrict the availability of direct external EGI funding. However, if instruments like MBIs are used, an EGI may secure an alternate source of funding and decrease its budgetary dependency.

What Strategies are Available to an EGI?

15. An EGI has two basic strategies at its disposal: correction and prevention. Though not exclusive, the corrective strategy seems to command environmental policymaking in most countries. This is due in part to the structure, placement, and mandate of existing EGIs, which preclude environmental policy from influencing the early stages of decisionmaking. This section explores these basic strategies, and suggests that both can be used by the conceptual EGI described in the preceding section.

Corrective Strategy

16. A corrective approach to environmental problems has been undertaken by most countries, particularly industrialized nations. Activities such as enforcing compliance with regulations and cleaning up have received more attention than environmental planning. This may be partially explained by the sectoral view that has commanded policy measures related to environmental problems. Since throughout the different economic sectors environmental problems have traditionally been dealt with by sector specialists, it is reasonable to expect that governments would view environment as a sector in itself. This sectoral emphasis may also help to explain the tendency to promote CACs as opposed to MBIs. MBIs are often considered part of the macroeconomic strategy because of their relation to fiscal and financial measures.

17. The corrective approach tends to be "ex-post" in nature. In other words, if environmental degradation occurs and is detected, a polluter would be fined or punished according to the law. The idea is to set a fine or punishment high enough to discourage
future polluters. In fact, a corrective approach in the first round implies a preventive approach in subsequent rounds. Oil spills in the USA provide an example of corrective approach. In these cases, it is not uncommon for polluters to pay high out-of-court settlements to the injured parties. While the perceived size of the settlement may discourage prospective polluters from polluting, settling them out of court mitigates this corrective approach in at least two ways. First, it avoids possible higher court-imposed penalties. Second, although there are estimates on sizes of settlements, the actual values are usually kept secret. This way precedents would not be officially established, and future settlements would be less correlated to previous ones.

18. To attain environmental improvement, the corrective approach has to send clear signals to polluting agents that laws and regulations are being enforced, i.e., that polluters face a high probability of being detected and fined. Furthermore, fines have to be set at a level where the probable costs of being caught exceed the costs of pollution abatement. While industrialized countries have the financial capacity to build such enforcement credibility and can rely on their judicial systems for conflict resolution, developing countries lack such resource and institutional bases. Despite government modernization efforts, Latin America still confronts difficulties similar to those faced by other developing regions.

Preventive Strategy

19. Incorporating environmental considerations and costs early in a country’s macro planning enables the establishment of development priorities that internalize environment-related tradeoffs. A preventive strategy thus diminishes cleanup expenditures and regulation enforcement costs at a later stage. This integrated approach also has the advantage of allowing active participation of stakeholders. Its transparency is likely to diminish possible challenges to regulations, since participants are aware at an early stage of the different characteristics of the regulatory framework. In addition, since the level of uncertainty regarding regulations greatly diminishes, cheating, free riding, and possible markups are likely to decrease as well. At the project level, a successful preventive strategy would attempt to address environmental concerns at the design stage, both to mitigate impacts and to exploit opportunities for environmental improvement. At the policy level, a similar approach would be feasible.

20. Finally, it should be noted that the focus on a preventive strategy does not eliminate the need for a corrective approach. Penalizing wrongdoers is still necessary, and the need for enforcement and cleanup remains. Yet the corrective approach would become a backup to prevention rather than the central focus of an environmental policy. Emphasis would be given to early deterrence and detection rather than policing.

6. It should be noted that due to the relatively small number of firms in the industry, it is probable that these firms are recurrent polluters.
21. Almost all countries in Latin America have established some form of environmental institution at the central government level. Earlier examples included second-tier units within the ministry of agriculture while more recent institutions are placed higher in the hierarchy and are charged with a broader mandate. Annex 1 presents a snapshot of environmental institutions in Latin America. A noticeable trend in the continually evolving form of these institutions is the establishment of national coordinating bodies. These entities are usually chaired by the central government and are intended to bring together the interests and concerns of various institutions engaged in environmental management, including those at regional and local levels. In many cases, regional and local environmental management predates national experience and offers a fertile ground to draw lessons.

22. The case studies presented in this paper illustrate institutional arrangements set out to address environmental objectives as part of a broader development mandate. The main goal is to show that certain institutional attributes, closely resembling the basic elements of an EGI described earlier, contribute to successfully meeting their intended objectives. These case studies are illustrative, designed to show the potential usefulness of the conceptual EGI. They are far from representing a thorough hypothesis testing.

23. While environmental degradation is ultimately the result of aggregated decisions and choices by various agents, each choice is a response to incentives and other forms of guidance from various sources, including the market and the government. In the case studies, the institution’s performance is judged either by its ability to create (a) measurable changes in the incentives, and thus in the decisionmaking process of relevant parties, or (b) physical improvements in the targeted problem (e.g., stopping the rate of environmental deterioration).

24. The first case study describes Colombia’s regional development corporations (institutions in charge of watershed management in well-defined areas), and evaluates their performance in addressing water quality issues. This case study shows that these institutions are effective in achieving environmental objectives in part because their work is integrated into the overall development planning process, and also because they have influence over the actual execution of plans.

25. The second case study describes the characteristics and incentives of city institutions in Curitiba, Brazil. These institutions permitted the implementation of an urban plan that favored mass transportation (against roads for private cars and other alternatives) and managed city growth by gradually introducing land use control. The result is a city with less congestion and air pollution than most cities of its size in Latin America.
Environmental Management by Regional Development Corporations in Colombia

26. Colombia has a tradition of concern and attention to natural resource management, and was one of the first countries in Latin America to enact laws for environmental protection. Dating back to the formation of the Republic, this tradition generates human and institutional capital, enriched by the past 20 years of experience in addressing environmental challenges. This case study traces the evolution and experience of regional institutions, whose primary mandate is overall development coupled with environmental management.

27. The discussion is structured in three sections. The first section provides a historical perspective of the establishment of regional development corporations in Colombia and their relation to environmental institutions in the central government. The second section describes the oldest regional development corporation Corporación Autónoma del Valle del Cauca (CVC), including discussion of its mandate, planning process, governance structure, resources, and approach to watershed protection and water quality management. CVC's track record in these areas is considered best practice in Colombia. Finally, the third section presents the evolution of Corporación Autónoma Regional Rionegro-Nare, emphasizing its cross-sectoral, participatory planning approach, which successfully influences development plans and budget allocation for environmental goals at the local government level.

28. It should be noted that this case study does not reflect the changes introduced by a recent law approved by the Colombian Congress in December 1993 (Law 99). The law introduces sweeping changes in the institutional framework for environmental management, but is still in a transitional period. This discussion is a retrospective description of these corporations and their performance before Law 99.7

Environmental Management and Regional Development Corporations

29. Beginning in the 1950s, Colombia established regional development corporations in the spirit of fostering regional development while conserving natural resources, particularly water resources. On closer examination, however, not all corporations had the same mandates and attributes. In some cases, these institutions were established as a means to control and optimize the use of water resources; others to address regional concerns about environmental and social impacts associated with large development projects of national interest. Specific objectives such as remedying the effects of a

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7. The main changes introduced by the law affecting the regional development corporations are: a governance structure based on elected officials and on a board of directors that includes local and NGO representation; a reduced scope of mandate; a separation of productive/service activities from regulatory functions (with the associated separation of revenue sources); and the corporations are now accountable to a new environment ministry.
natural disaster or addressing severe soil erosion in a region were also responsible for the creation of yet another group of corporations.

30. At first the corporations were linked to the Ministry of Agriculture, because their mission was equated with rural development. However, as time passed the breadth of their mission expanded significantly, ranging from electricity generation to irrigation and infrastructure development. In addition to transfers from the central government, most corporations were entitled to some form of earmarked revenues directly or indirectly related to the exploitation of renewable or nonrenewable resources in their area of jurisdiction. These ranged from a share of gross electricity revenues to property surtaxes, water use fees, and mineral royalties. Their expanded mandate and partial financial autonomy contributed to a decision in the 1970s to place these institutions under the tutelage of the National Planning Department (DNP).

31. In 1976 DNP created a special unit (Unidad Especial de Política Ambiental y Corporaciones Autónomas Regionales) responsible for coordinating the corporations’ activities and formulating a national environmental policy. Additionally, at around the same time the central government established INDERENA (Instituto Nacional de los Recursos Naturales Renovables y del Ambiente), a normative environmental agency within the Ministry of Agriculture. By the late 1970s, INDERENA had developed a comprehensive environmental legal framework and delegated its application in certain regions of the country to the regional development corporations.

32. As of May 1994 there were 18 regional development corporations in Colombia with jurisdiction over 25 percent of the country. The remaining territory was under the jurisdiction of INDERENA. Among these corporations, the Corporación Autónoma del Valle del Cauca and the Corporación Autónoma Regional del Rionegro-Nare are recognized as responsible for the most successful environmental management experiences in Colombia.

Corporación Autónoma del Valle del Cauca

33. The first regional development corporation in Colombia, Corporación Autónoma del Valle del Cauca (CVC), was established in 1954 with the "mission of transforming the Upper Cauca Valley and its surrounding region ... through better and more intensive use of natural resources" (Anderson and Posada, 1964). CVC's primary mandate was the planning and execution of development projects (in energy, flood control, irrigation, rural technical assistance, roads, etc.) through integrated management of the region's natural resources.

8. Law 99 abolishes INDERENA; its functions (with some modifications) are transferred to the new environment ministry. Additional corporations to cover the entire territory are also created. The information presented in the text predates the above law.
34. **The Cauca Valley in the Pre-CVC Phase.** The Cauca Valley in the 1930s and 1940s was one of the most fertile valleys of Colombia, with an area of approximately 400,000 hectares of flat land nursed by the Cauca River. Located in the west-central region of Colombia, the valley was also rich in mineral resources and suitable for agriculture and cattle raising; however, its large development potential was constrained by frequent flooding of rivers, lack of infrastructure and energy, and limited agricultural know-how.

35. In 1936 the Cauca Valley region was plagued by an extremely hot summer, which caused a severe drought in several parts. This prompted experts and politicians to look for ways of tapping the region's abundant water resources. Concrete plans to address these needs, such as dams, protection of watersheds through reforestation, and flood control projects, began to be designed. A dialogue between those in favor of limited local projects and those in favor of more geographically extensive and ambitious projects started in the late 1930s and continued into the 1940s and 1950s. Gradually, as the problems were better understood and their interdependence realized, the scope for cross-sectoral planning based on multipurpose projects integrating and developing all the resources of the region was acknowledged.

36. **CVC's Mandate.** With the advice of David E. Lilienthal (former head of the Tennessee Valley Authority), the central government and the departments sharing the Upper Cauca founded CVC in 1954. The corporation was created as a pilot to test the potential usefulness of this type of cross-sectoral planning and development agency.

37. CVC's original mandate ranged from electricity generation to flood prevention and water quality management. In 1987, Decree 77 reduced the scope of its mandate by transferring construction and operation of roads, telecommunications, and sewerage infrastructure projects to local jurisdictions (municipios) and public utilities. CVC retained the three main mandates and attributes that formed the spirit of its bylaws:

- an autonomous and decentralized entity able to directly influence the region's social and economic development;
- improve the electrical infrastructure by engaging in hydroelectric projects;
- manage and administer the Cauca River and the watershed's natural resources utilizing an integrative and cross-sectoral approach.

38. **Governance Structure.** Until 1993, CVC's Director was appointed by the country's president. The Director reported to the corporation's board of directors, which comprised eight members: six from the public sector (including representatives of the federal, state and local governments), and two representatives of the private sector.

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9. The Tennessee Valley Authority was created in 1933 to manage multi-purpose development and regional growth in the Tennessee River Basin and still functions as one of the few federal-state river basin management entities in the United States.
As a government agency, CVC reported directly to the planning ministry for approval of its budget and for external financing support of investment projects.

39. **Internal Management.** During its initial stages, CVC had a rudimentary organizational framework, comprised of study groups. These study groups developed an integrated plan and a number of specific projects. Since its inception, CVC was characterized by a business-like, cost-conscious and results-oriented management style. Its recruitment was based on technical competence, and its compensation and reward systems resulted in a very low turnover rate compared to other public organizations. In addition, its personnel were unaffected by changes in the political system.

40. As shown in Figure 1, CVC has four layers of management with five technical divisions reporting to the General Manager. The Natural Resource Management Division and the Technical Division work jointly to ensure that environmental considerations are part of every major decision regarding investments and operating practices. An example of the integration of environmental analysis in CVC’s development planning process is the involvement of the Natural Resources Unit in the analysis of the energy expansion plan. Environmental constraints and complementarities are identified early on, at the time when alternatives for future provision of electricity in the region are identified.

41. **CVC’s Resources.** CVC is an entity created by law with legal personality and administrative autonomy, and endowed with its own sources of revenue supplemented by resources transferred from the central government. CVC is subject to audit by the Contraloría General de la República with respect to fiscal matters. The National Council of Economic Policy and Planning is responsible for approving the corporation’s plans and programs, and any request for obtaining domestic or international loans.

42. On average, about 85 percent of CVC’s operating revenues come from electricity sales. The remaining sources, in approximate order of importance, are a property surtax, fees for services rendered, concession fees (water and forests), valuation fees (in account of infrastructure works), and pollution fees (*tasas retributivas*). In addition, transfers from the central government, international loans, and technical cooperation supplement the corporation’s investment budget.

43. Regarding its attributes, CVC has the prerogative of improving rights-of-way and carrying out property expropriation under certain conditions. CVC also receives appropriations, grants and transfers from the national government (e.g., shares of power companies). In addition, the CVC has authority over the allocation of water use rights (both surface and groundwater) in the Upper Cauca.

44. The institution has approximately 2,400 employees, of which 565 work in the Natural Resources Division and 338 in the Technical Division.
FIGURE 1. CVC'S ORGANIZATION
Examples of Effective Environmental Management

Example 1—Preventing Watershed Degradation: User Associations

45. Faced with a daunting mission, CVC's planning approach was simple and flexible. It first made an inventory of available resources and most urgent needs, so as to arrive at decisions on priority programs and to meet these needs on an integrated, cross-sectoral basis. Principal obstacles preventing agricultural development were: periodic flooding of the rivers; lack of irrigation facilities; lack of agricultural know-how; low agricultural income and productivity; inadequate nutrition and capacity of farming population; scarcity of electricity for industry; and inadequate transport infrastructure.

46. The next stage was preparation of studies to determine projects and their priority ranking subject to the available and potential financial resources. Limited resources made CVC start with only four programs: land reclamation (drainage and irrigation) in two pilot zones; energy supply for the region; improvement of living conditions of the farming population through technology dissemination; and improvement of community relations.

47. If a certain project encountered funding difficulties or opposition from landowners, the central government or politicians, another project would be carried out during the period needed to clear obstacles. In this way, CVC managed to earn the public's support, since it was clear that there was a benefit attached to its presence.

48. CVC pioneered watershed management in Colombia by initiating natural resource management programs for selected Upper Cauca tributaries in 1969. Its initial focus was to maintain the biophysical conditions of these areas as reflected in its technical diagnoses and management plans. However, its approach evolved over time to address in a more integral manner the biophysical, economic and social problems of these watersheds, providing the infrastructure and operational means necessary to administer them.

49. In the early 1980s, CVC launched its Programa de Ordenación y Desarrollo Integrado de Cuencas Hidrográficas, covering nonagricultural territory of about 800,000 hectares. Microwatershed development plans have been prepared incorporating the following elements: (a) development of a microwatershed development plan in close consultation with resident communities; (b) community-managed watershed use schemes supported with social programs to improve living conditions (e.g., farmers' family training, better production techniques, etc.); and (c) control and surveillance of natural resource use. The planning exercise has lead to detailed subregional maps which are used for identifying ecologically sustainable use patterns. In some local jurisdictions these plans have been adopted for land use zoning purposes.

50. An interesting scheme being used by CVC to encourage the adoption of these sustainable land use patterns are Watershed User Associations. Fourteen such associations bring together water users located in the lowlands (mostly farmers and cattle
ranchers) and communities living in the highlands (mostly subsistence farmers including indigenous reserves). The production pattern of the latter group tends to reduce forest cover and decrease soil stability, thus contributing to the deterioration of water resources used for agriculture. CVC has acted as a catalyst between these two groups, establishing a scheme whereby subsistence farmers are compensated for protecting forest cover in the watershed. Such compensation required pooling of resources from all downstream users in the watershed. CVC fostered such cooperation among users, and helped establish a fund made of contributions proportional to water usage. The fund is used to finance the compensation package and a forest and soil management program for the area.

Example 2—Water Quality Management at CVC

51. The Cauca watershed has contributed significantly to economic development of the region under CVC’s jurisdiction (which excludes the city of Cali). Surface and groundwater sources have been supporting human consumption, agricultural, industrial, and ecological uses. However, with the increase of economic activities, CVC determined that water quality could become a limiting factor in certain stretches of the Upper Cauca. CVC thus developed an approach to water quality management that can be conceptualized in three stages: (a) study the problem to determine its causes and effects; (b) establish medium- and long-term goals to address the problem; and (c) develop a program to implement an integrated solution.

52. The first stage began in the early 1960s, when CVC identified an intermediate stretch of the river (from Vijes to Mediacanao) that suffered from low water flows during the summer and progressively lower concentrations of dissolved oxygen. Water quality for human consumption was deteriorating rapidly, and large investments in pretreatment or groundwater extraction were foreseen if pollution trends continued.

53. The second stage took place in 1968, when CVC set a medium-term goal of achieving an annual average dissolved oxygen concentration of 0.5 mg/L by 1995 at the critical point of the above-mentioned stretch (at a town called Juanchito—downstream from Cali) and a long-term goal (20 years later) of maintaining or improving that level of water quality. Interim targets of 5 years each were also established. These targets were established utilizing simulations of the river’s behavior with increasing pollutant loads, considering its natural capacity to assimilate such pollution. These goals were passed as a regional regulation in November 1976 (Acuerdo 014). This instrument stipulated the desired concentration of dissolved oxygen for different sections of the stretch, and mandated pollutant removal from public and private sources.

54. The third and last stage corresponds to the implementation of the proposed solutions. Based on the legal requirements mentioned earlier, CVC could have established a set of effluent standards for industrial and municipal wastewater and focused its attention on enforcement and monitoring. Instead, the institution took a proactive role and worked closely with industry to develop an industrial pollution control
program consisting of specific pollution control measures for each industry sector present in each section of the stretch.

55. Another component of this implementation stage is CVC's ability to directly increase pollutant dilution by allocating water discharges from the hydroelectric dam of Salvajina, just upstream from the city of Cali. In addition to providing water resources for electricity generation and infrastructure for flood prevention, the dam is operated by CVC to release water at rates that guarantee a minimum flow rate of 130 m$^3$/sec (daily average) at the town of Juanchito, thus increasing the dilution of waste loads. Before Salvajina, flow rates dropped to 47 m$^3$/sec during the dry season and the river was virtually anaerobic (CVC 1993).

56. CVC's water quality program predates national regulations by almost 10 years, and its implementation approach is vastly different from that implied in the national code. Decree 1594 approved in 1984 establishes national standards concerning water quality and provides norms for wastewater discharge, including sewage and industrial wastewater, taking into account the quality of receiving waters. In addition to dissolved oxygen, the decree enumerates the priority substances of concern from a health standpoint (e.g., lead, mercury, PCBs, pesticides).

57. The decree requires water users to register with local authorities and to submit plans for coming into compliance with its water discharge provisions within 4.5 years. In contrast, CVC negotiated different timetables for compliance (4 years for preliminary treatment, 4 years for primary, and 5 years for secondary), and its operating style is based more on negotiation and consensus building than on enforcement and control. In addition, due to the high costs involved in meeting the national standards in terms of acidity, turbidity, and reduction of priority substances, the program has focused on solids and odor removal with an overall goal of increasing dissolved oxygen concentrations in the ambient waters of the Cauca River.

58. In 1981 the pollution control program was published, and by 1985 over 100 industries had invested the necessary funds for primary treatment. Secondary treatment was installed in 1990, and by 1993 the concentration of dissolved oxygen at the critical point had increased from zero to 0.3 mg/lt. This improvement is directly attributable to significant reductions in industrial organic pollutant discharges; however, largely due to lack of control over organic loads from municipal sewage, the 1995 goal (0.5 mg/lt) has not yet been achieved.

59. A key to the success of the industrial pollution program is that CVC was perceived by the private sector as credibly committed to promoting and enforcing the program. The corporation's resources—the quality and professionalism of its human resources—have been instrumental in achieving this success.

10. New industry is required to start up with secondary treatment.
resources, and the type of instruments used by CVC, such as technical advise and pollution fees—worked to provide sufficient incentives for enterprises to adopt pollution control measures.

60. As stated earlier, the main pending hurdle to meeting the program's goals has been the somewhat slower compliance of Cali (which is outside the jurisdiction of CVC and is the largest source of pollution). Even though CVC reached agreement with the local sewerage company (EMCALI) on a program of pollution reduction for both industrial and municipal discharges, EMCALI has only recently launched a series of initiatives (water treatment plant, small-scale anaerobic systems, and preliminary treatment of industrial discharges). With these investments in place, water quality is expected to meet the desired targets.

61. CVC served as an initial model for other regional institutions created in the 1950s (notably the Corporación Autónoma de Desarrollo de Cundinamarca—CAR). Since then, however, a number of institutions emerged with different and sometimes narrower objectives and attributions. The next section describes one of these newer entities.

**Corporación Autónoma Regional Rionegro-Nare**

62. **Background.** The jurisdiction of the Corporación Autónoma Regional Rionegro-Nare (CORNARE) is located within the northwestern department of Antioquia and encompasses 26 municipios, neighboring but not including the city of Medellín. The region includes a system of watersheds (notably the Magdalena, Medellín, Negro, Nus, and Nare rivers) with four major hydroelectric developments supplying approximately 30 percent of the nation's electricity. These and other large infrastructure projects created local socioeconomic dislocations leading to CORNARE's creation in 1983 as a means of harmonizing local concerns and projects of national significance.

63. **Resources and Mandate.** Based on the local desire to capture part of the income extracted from the region's natural resources, CORNARE is entitled to 4 percent of gross electricity revenues. These revenues are allocated in equal shares to natural resource management and rural electrification. CORNARE's overall mandate is to promote and guide regional development through sustainable use of its natural resources.

64. **Planning Process.** The corporation began operating in 1985. It engaged in a three-year regional planning exercise, which served as the basis for regional natural resource management policies and programs. To lay the foundation of its planning process, CORNARE conducted studies to establish the biophysical, socioeconomic, and

11. The use of pollution fees to financially support the administration of the pollution control program is also noteworthy, since CVC is probably the first institution in Latin America to use such an instrument. Although effective in raising some revenues for the institution since 1979, these fees are not the main incentive driving industry compliance with the pollution control program.
cultural characteristics of the region and its constraints for future growth. The
sociocultural emphasis of the studies helped assess the degree and nature of the
community’s sense of ownership for the region’s natural resources and to identify
determinants of power relationships. This knowledge assisted the corporation in its
future dealings with the local governments.

65. The completion of the study phase lead to a synthesis of the region’s development
objectives, including its natural resources management priorities, articulated at the level
of eight subregions. The main result of the planning process was a Protocol for Regional
Development outlining the region’s vision of the main development programs and
policies to be implemented by CORNARE and by local governments.

66. In practice, this planning process shapes the way in which CORNARE currently
works. CORNARE’s planning approach is highly participatory and reaches local
governments and communities. In fact, a unique feature of this corporation with respect
to all other corporations up to mid-1994 is the composition of its board of directors,
which includes representatives from local governments.

67. From Planning to Implementation. The final and most important stage of
planning is to make provisions for implementation. In addition to CORNARE’s
allocation of its own resources, the adoption of the Protocol’s projects and policies in
municipal budgets is evidence of the success of the planning exercise. Resources
budgeted by local jurisdictions for environmental programs are supplemented by
CORNARE, enabling it to participate during implementation. For example, a project
may entail purchase and reforestation of a plot in the highlands of a microwatershed.
CORNARE may purchase the land while the municipio establishes boundaries and
reforestation the plot. An environmental technician is hired jointly by CORNARE and the
municipio (50-50 share) to act as liaison and coordinator of the project. CORNARE also
provides technical assistance to the municipio in the form of improved local
administration systems and project preparation capacity building.

Curitiba—Linking Urban Planning and Resource Allocation
for Environmental Quality

A Brief Review of Environmental Policymaking in Paraná

68. Paraná, a southern state in Brazil, is in the forefront of environmental and natural
resource management in the country. Its economy, which steadily outperforms the
national economy, is based primarily on agriculture and natural resource exploitation.¹²

¹². Over 30 percent of the state’s GDP comes from agriculture, cattle raising, renewable and exhaustible
resources exploitation and related industries (State of Parana, 1993).
Realizing that these activities are essential to guarantee a steady source of income for the state, planners attach significant importance to closely monitoring the use of these riches.

69. This preoccupation is reflected in a number of actions and efforts undertaken by the state and some local jurisdictions. The government of Paraná has a number of initiatives ranging from protecting the remains of the Atlantic rainforest to combating erosion on areas overexploited by agriculture. It often seeks collaboration with nongovernmental organizations (NGOs) and local communities, and participates in a variety of projects to improve environmental conditions. Its efforts, however, are generally directed to natural resource management, while urban environmental management often falls under local jurisdictions.

70. Yet, at least one example can be found where the role of the state government directly impacts decisionmaking by the different local administrations on environmental issues. In a new initiative—Projeto Agua Limpa\textsuperscript{13}—the state government seeks to address externalities related to water supply by influencing the allocation of tax revenues. In the past, local districts located in headwater areas had no incentive to conserve and protect the resource. In fact, if preservation was required by law, they viewed the existence of this resource as a nuisance that stopped development. Due to their geographical location, among other things, these local jurisdictions were often unable to reap the benefits of economic growth, thus forfeiting the tax revenues that would come with it. A vicious cycle developed. Local governments could not stimulate the establishment of companies in their jurisdiction for lack of economic incentives and their perceived water protection functions, which resulted in a depressed economy unable to generate tax revenues to improve economic conditions.\textsuperscript{14} While richer districts were enjoying the benefits of clean water, no compensation was provided to poorer "protective" districts—a regressive way of distributing benefits.

71. Understanding that this situation was unsustainable, the state government decided to redistribute the revenues of the ICMS in a slightly different fashion. As required by law, the government continues its revenue distribution based on economic dynamism, but now it includes a provision to compensate the local districts that protect headwaters. Since it has a certain degree of flexibility in this revenue allocation, the state adopted a redistribution formula that takes into account water availability and quality. In addition,

\textsuperscript{13} See Governo do Parana (February 1994) and Do Carmo (November 1993).

\textsuperscript{14} A main source of government revenue in Brazil is the "Imposto de Circulação de Mercadorias e Serviços" (ICMS), a value-added tax on goods and services. These funds are shared between the state and local district according to a formula that takes into account the value of outflow and inflow of goods and the value of services rendered within the municipality. In addition, each state is also given complete discretion in the allocation of part of these funds. Many states often allocate this discretionary part on the basis of population. Yet, given that the nondiscretionary part of the formula is based on economic activity, poorer districts are likely to produce less goods and services thereby generating less fiscal revenue (see Shah, 1991).
it provides technical support to interested districts, and serves as a catalyst for private sector investment in the conservation of these natural areas. These initiatives are part of the Agua Limpa project, and have the advantage of compensating districts for water protection while guaranteeing a reliable source of the resource to larger urban areas.

Urban Environmental Policymaking: The Case of Curitiba

72. Examples of natural resource management are discussed in detail in the previous case study. We now focus on the urban environment, and present an analysis of Curitiba's environmental management. Curitiba deems itself "Brazil's ecological capital," and is recognized as one of the most agreeable, clean, and energy efficient cities in the country. This reputation is largely the result of a public policy orientation towards increasing quality of life by improving the quality of the urban environment. This case study reviews Curitiba's success within the context of the composition and relationship between city institutions, particularly those responsible for planning and resource allocation.

73. Curitiba, a city of 1.6 million inhabitants, is the capital of Paraná. Like other urban centers in the past four decades, Curitiba suffered the effects of rural migration from within Paraná and from other states in Brazil, albeit on a smaller scale. Concern for maintaining and improving quality of life prevented the significant deterioration of the urban environment that is often caused by rapid growth.

74. Curitiba's approach to improving quality of life is all-encompassing, and involves providing good urban services such as housing, transportation, employment, education, and leisure opportunities. With respect to services that directly affect environmental quality, Curitiba has obtained remarkable results in public transportation, solid waste collection, flood prevention, headwaters protection, and parks and recreational areas.

75. Located in a relatively affluent region of Brazil, Curitiba had the country's highest ratio of automobiles per capita in 1971. City planners foresaw that congestion and air pollution would worsen, unless they reversed existing transportation policy that favored the use of private automobiles. They developed an innovative mass transportation system based on buses with exclusive express lanes and special passenger stations. Currently, the system is used daily by about 75 percent of all commuters.

76. Regarding waste collection, the city's education system and mass communication programs encourage its citizens (primarily children) to recover and separate reusable trash before it is collected by private contractors. The reduced volume of waste extends the useful life of the city's landfill, creates environmental awareness, and generates some revenues from the sale of used bottles, cans, etc.

77. Curitiba is the birthplace of the Iguacu River, which flows into the Paraná River at the border between Brazil, Paraguay, and Argentina. The Iguacu's northern section is the site of numerous springs that are currently vital for Curitiba's water supply. Many
smaller tributaries of the Iguacu also cut through Curitiba. When the city was small, the rise of these rivers during the rainy season was uneventful because a wide floodplain existed to capture the floods. Starting in the 1950s, the city’s horizontal expansion encroached on this floodplain and caused severe flooding problems.

78. Engineering solutions to this problem were unsuccessful because channelling the rivers simply transferred the floods to other areas. City authorities realized that it was necessary to recover the floodplain. A concerted effort to expropriate areas along their courses and build small dams led to the creation of large parks and lakes that today are Curitiba’s main recreational sites. Concurrently, new land use regulations regarding the division of land into plots for housing development prohibits the construction of streets and buildings in strips subject to flooding.

79. Another park (the Passauna Park) was also created to protect a river and its system of springs that supply one-third of Curitiba’s water. The area was declared an "environmental protection area" under legislation that grants tax incentives for preservation of forest cover. Further, the law allows only up to 30 percent of the area to be used for construction, and the choice of sites and the building parameters are subject to district approval. Similarly, new housing developments elsewhere (i.e., in non-drainage areas) must dedicate 35 percent of the land area to the public domain for environmental purposes.

80. The overall result is a city with one of the highest ratios of green areas per capita (50 square meters per inhabitant) among western cities, providing its citizens ample recreational and cultural sites, more than 140 km of bicycle paths, neighborhood parks, and in-city forest reserves.

81. In the 1940s, Curitiba was poised to become a large metropolis. Parana’s coffee-generated wealth provided the economic foundation for faster growth. In anticipation of cheap fuels and a boom in Brazil’s automobile market, the first urban master plan, developed in 1942, prepared the city for extensive automobile use.

82. Curitiba’s position as the state’s capital and center of services, and its geographical location (on the main road to the state’s principal port of Paranagua) fueled its growth from 140,000 inhabitants in 1940 to 180,000 in 1950, and then doubled its population to 360,000 by the 1960s. The 1942 master plan called for the construction of large overpasses and roads to accommodate the increased volume of vehicles associated with this growth. At that time, a new generation of city leaders and state officials began to question the traditional model of development. They were concerned about the extent of investments required and the longer-term effects on urban quality of life.

83. In 1964, the administration of Curitiba commissioned a consortium of Brazilian consulting firms to produce a new master plan which later became the Curitiba Master
Plan. This plan included the ideas for segregated bus lanes, pedestrian streets, gradual development of land use legislation, several waste management programs and integrated surface transport networks. The Curitiba Research and Planning Institute (IPPUC) was then created in 1965 to pursue implementation of the plan.

84. In the meantime, the mechanization of agriculture and the uprooting of coffee in northwestern Parana accelerated migration to Curitiba. In addition, the 1960s witnessed the industrialization of Curitiba as a result of the government's effort to decentralize heavy industry from Sao Paulo. By the 1970s the urban growth rate of Curitiba and its metropolitan region was almost 7 percent—the highest in the country.

85. Mr. Jonas Rabinovitch—IPPUC's past chief of staff, and later Curitiba's director of international relations—points to two very distinctive phases of the planning process: (a) the preimplementation phase (1965-1970) characterized by the traditional master plan methodology and less emphasis on implementation, and (b) the implementation phase (1971-present) characterized by the political will and the commitment of the public administration to "get things done." Rabinovitch believes that it was this slow moving, well thought out "interaction between theory and practice" that has produced Curitiba's success in development. This interaction was made possible by the composition and internal workings of city institutions.15

86. Figure 2 shows the inception of IPPUC within the city government organization. In contrast with other forms of city organizations where the planning agency is placed at the level of executing agencies (i.e., "secretariáis," which in the case of Curitiba are placed at a fourth level of hierarchy from the mayor's office), IPPUC is placed directly under the mayor's office.

87. IPPUC's main functions are to conduct research on urban planning, collect and maintain city statistics, research urban law, and develop instruments for implementation and monitoring of the Curitiba Master Plan. IPPUC develops the broad guidelines and policies, which are then transformed into action by the secretarias. Yet, IPPUC is not detached from the translation of its guidelines into specific actions and project initiatives. As shown in Figure 3, the institute has implementation and supervision units, which monitor the development and execution of projects. Most importantly, IPPUC has the authority to review the allocation of resources to implement these projects. Finally, IPPUC has an ex-post evaluation responsibility.

88. An illustration of the role of IPPUC in incorporating natural resource objectives into planning and implementation was the adoption of land use policies in conjunction with the mass transportation and road plan. These land use policies facilitated the preservation of green areas necessary for flood prevention and springs protection mentioned in the previous section.

Figure 2. Municipality of Curitiba—Executive Branch Structure

LEGENDAS

IPPUC - INSTITUTO DE PESQUISA E PLANEJAMENTO URBANO DE CURITIBA
IMAP - INSTITUTO MUNICIPAL DE ADMINISTRACAO PUBLICA
IPMC - INSTITUTO DE PREVIDENCIA E ASSISTENCIA DO SERVIDORES DO MUNICIPIO DE CURITIBA
FCC - FUNDACAO CULTURAL DE CURITIBA
FAS - FUNDACAO DE ACAO SOCIAL
URBS - URBANIZACAO DE CURITIBA S.A.
CIC - COMPANHIA DE DESENVOLVIMENTO DE CURITIBA
COHAB-CT - COMPANHIA DE HABITACAO POPULAR DE CURITIBA

CHEFE DO PODER EXECUTIVO

AUXILIAR

AUTARQUIA

IPPUC
IMAP
IPMC

FCC
FAS

URBS
CIC
COHAB

SECRETARIA DO GOVERNO MUNICIPAL
PROCURADORIA GERAL DO MUNICIPIO
SECRETARIA MUNICIPAL DE COMUNIC. SOCIAL

SECRETARIA MUNIC. DE RECURSOS HUMANOS
SECRETARIA MUNIC. DE FINANÇAS
SECRETARIA MUNICIPAL DA CRIANÇA
SECRETARIA MUNICIPAL DA SAUDE
SECRETARIA MUNICIPAL DE OBRAS PUBLÍCAS
SECRETARIA MUNICIPAL DA EDUCAÇÃO
SECRETARIA MUNICIPAL DO URBANISMO
SECRETARIA MUNICIPAL DA INDÚSTRIA, COMÉRCIO E TURISMO
SECRETARIA MUNICIPAL DO MEIO AMBIENTE
SECRETARIA MUNICIPAL DO SANEAMENTO
SECRETARIA MUNICIPAL DO ABASTECIMENTO
SECRETARIA MUNICIPAL DE ADMINISTRACAO
FIGURE 3. IPPUC’S STRUCTURE

CARGO | SÍMBOLO
--- | ---
PRESIDENTE | S. 1
SUPERVISOR | S. 2
ASSESSOR ESPECIAL | S. 2
ASSESSOR TECNICO | C. 3
CHÉF DE GABINETE | C. 4
SECRETARIA EXECUTIVA | C. 4
COORDENADOR | FG. 5
GERENTE | FG. 6
CHÉF DE SETOR | FG. 4
ENCARREGADO DE SERVIÇO | FG. 2

SECRETARIA EXECUTIVA

GABINETE DA PRESIDÊNCIA

CONSELHO DELIBERATIVO

ASSessorias

SECRETARIA EXECUTIVA

SUPERVISÃO DE INFORMÁTICA

SUPERVISÃO DE INFORMAÇÕES

SUPERVISÃO DE PLANEJAMENTO

SUPERVISÃO DE IMPLANTAÇÃO

SUPERVISÃO ADMINISTRATIVA E FINANCEIRA

DECRETO NÔ 487 DE 22.08.94

FIGURE 3. IPPUC’S STRUCTURE
89. The transportation system is built around five roads that radiate more than 10 kilometers from the city’s center like the spokes of a wheel. These main roads have exclusive lanes for buses, are connected to each other by 185 kilometers of suburban interdistrict lines, and are augmented by 300 kilometers of "feeder" routes (Rabinovitch 1993). As the main roads and the feeder routes became primary axes of development in the city, IPPUC developed instruments for preserving green areas along these routes. These instruments were implemented by the secretarias, and took the form of tax incentives and expropriation laws in the case of ecologically fragile areas. These areas were then transferred to Curitiba’s Environment Secretariat, which is responsible for their reconditioning and maintenance.

90. Another example of the contribution of an integrative planning approach in solving city problems was the development of single programs that address multiple objectives. Faced with the difficulty of collecting waste in marginal neighborhoods with limited access, city planners devised a program to improve the trash collection service while providing a source of income to these poor communities.

91. The city pays local residents to gather waste in plastic bags. Initially they were paid in bus tokens, but are now paid with bags of food. Curitiba is located in an area surrounded by agricultural activities and these bags of food constitute surplus production that is sold to City Hall at below market prices. The plastic garbage bags are distributed to the population by neighborhood associations, which are paid a fee by the city government equivalent to 10 percent of the value of a bus token per bag. The price per kilogram that the city is paying for garbage collection by residents is equivalent to that paid to a private company, yet the residents reap greater gains.

92. Another program that addresses socioeconomic and waste management objectives is the "Trash that isn't Trash" program. With a strong publicity campaign, planners convince residents to separate their trash into organic and inorganic waste. The recyclable waste is collected by a private contractor once a week, and taken to a processing center owned by the city. The facility employs homeless people and recovering alcoholics to sort the trash into different types of materials. The trash-purchase scheme and the "Trash that isn't Trash" program are linked; the proceeds from sale of the recycled materials go to finance the purchase of food given in exchange for trash.

The Role of Leadership and Continuity

93. Much of Curitiba’s environmental management success is attributed to Mayor Jaime Lerner, who provided the political backing for many of the innovative programs mentioned above. However, the role of IPPUC has been very important in providing continuity.
Lerner, an architect, began his work with Curitiba city planning as president of IPPUC in 1968-69. He continued to support IPPUC after being elected to his first term as mayor in 1971. In addition, he made the explicit political decision to initiate the first stages of implementation of the Curitiba Master Plan. This period established IPPUC’s role of strategic coordination and guidance within the city’s administration, and developed an approach to urban management based on the constant interplay between planning and implementation activities.

Though Lerner’s three terms as mayor were nonconsecutive, work by administrations with different priorities did not reverse the policies and directives of the master plan. IPPUC was largely responsible for maintaining this continuity despite the fact that its president serves as an appointee of the mayor in office. IPPUC’s objectivity, technical excellence, and public image of service contribute to the institution’s enduring influence. The success of its planning function is also due to its ability to affect resource allocation.

CONCLUSION

Several elements influence the formulation of a successful environmental policy and consequently an effective Environmental Government Institution. It is virtually impossible to isolate them, for local conditions and particularities such as management styles and staff morale may play a major role in the success of any organization. The purpose of this paper, however, is to identify some basic elements that may assist policymakers in designing and shaping the objectives of an EGI. In addition, it seeks to present cases in which these elements are clearly displayed. Instead of providing a final answer to the question of how to build a successful EGI, the paper intends to stimulate debate on the topic. Nonetheless, it is clear that further research in this topic is needed. The complexities and dynamics related to the construction and functioning of an EGI make this an evolving process. The need for further study is particularly evident when attempting to introduce the findings of this work into a country-specific context.

This paper presents a conceptual framework which identifies three key elements that should dominate environmental policymaking in developing countries. First, policymakers should recognize that environmental problems are cross-sectoral in nature. Translating this recognition into action means, that at a minimum, an EGI has to be capable of influencing the different sectors of the economy, be staffed with a multi-disciplinary team, and take part in overall development planning.

This leads to the second element. Environmental planning plays a major role in any cost-efficient and successful environmental policy. It centers on prevention rather than correction and cleaning up. It takes into account complementarities and tradeoffs at an early stage. It builds a regulatory framework that is flexible, and benefits from cost-saving approaches such as market-based incentives and stakeholder participation. It
facilitates active public participation in the overall development planning, and fosters understanding of objectives and regulations. Finally, the third element is the EGI’s capacity to earn resources to fulfill its mandate and to influence resource allocation. This is crucial in the linkage between planning and implementation.

99. The three basic elements are present in the institutions studied in this paper. For example, regarding natural resource management in Colombia, the use of the Salvajina dam offers a clear illustration of cross-sectoral complementarities. This multipurpose project generates electricity, prevents floods, and assists in the dilution of waste loads. On the urban side, Curitiba’s Passauna Park fulfills functions such as flood prevention, watershed protection, and provision of amenities. As the case studies indicate, part of the success of the three institutions analyzed here can be explained by the fact that all of them are able to take advantage of the cross-sectoral nature of environmental issues.

100. This success does not occur overnight. In fact, as illustrated by the analysis, all three institutions engage in detailed studies and planning prior to designing solutions. CVC and CORNARE, for example, involve communities early on in the planning stage (e.g., on CVC’s Programa de Ordenación y Desarrollo Integrado de Cuencas Hidrográficas and on the composition of CORNARE’s Board of Directors). Curitiba guarantees a certain degree of continuity through IPPUC, and involves the community at least in the implementation stage. All three case studies indicate that the responsible institutions have a medium-term vision of economic growth subject to environmental constraints. Rather than short-run trouble shooting, they seem to be interested in slowing environmental degradation over time.

101. Finally, as the case studies indicate, a common characteristic among the different institutions is that all of them manage to gain sufficient resources to perform their functions, and that they effectively influence resource allocation. In the Colombian case, financial resources mainly come from a direct benefit to the household—the sale of electricity, various service charges, and different taxes and fees. In the case of Curitiba, it is harder to isolate a particular EGI, since the environmental agenda is intertwined at all levels of government. Nonetheless, revenue sources include taxes, service charges, and the sale of recyclable materials, among others.

102. Regarding resource allocation, CORNARE and CVC influence the environmental programs of local governments, for they cofinance such activities. In the case of Curitiba, environmental planning is reflected in project implementation due to IPPUC’s ability to influence resource allocation to the executing units.

103. Concern with the environment has traditionally been dominated by the developed countries. These countries are now starting to realize that a hastily designed environmental policy based on corrective strategies may not be cost effective. Recent estimates
provide staggering figures for the costs of different aspects of environmental policies.\textsuperscript{16} This paper proposes an alternative route taken by some institutions in Latin America that may help policymakers address environmental issues in a more cost-effective manner.

\begin{footnote}
For example, Cropper et. al. (1992) estimates US$35 million per applicator cancer case avoided due to U.S. pesticide regulation. Citing other studies, Bartlett (1994) gives values for different aspects connected to environmental regulations. For instance, he indicates that without the loss of productivity associated with environmental regulations between 1972 and 1991, real output in the U.S. would have been more than US$700 billion higher.
\end{footnote}
ARGENTINA:

A decree in November 1991 created the National Secretary of Natural Resources (SRNAH), a cabinet level position reporting to the president. It also placed three secretaries below (SRNAH): Subsecretary of Natural Resources, Subsecretary of Human Resources, and Subsecretary of National and International Relations. Coordination of different levels of government takes place through the Federal Council for the Environment (COFEMA). SRNAH has control over The National Presidential Commission on the Environment, National Park Administration, Direction and Natural Resources, Cattle and Fishing Industries, and the National Institute of Science and Hydrological Technology. The major functions of SRNAH have been park administration and water management.

BOLIVIA:

In December 1990, the National Environmental Fund (FONAMA) was established under the Office of the President to coordinate and administer national and external financial assistance for the environment. In January 1991, the Government established a National Environmental Secretariat (SENAMA) under the Office of the President. SENAMA is attached directly to the presidency, and its secretary is a member of the National Economic Council. The secretariat is responsible for formulating, monitoring, and coordinating implementation of environmental policies, but it has no implementation role. The implementing agencies are the sectoral ministries, subnational departments, regional development corporations, and other entities such as NGOs and municipalities. In 1992 an environmental law was passed that focuses on the need for environmental impact assessments of investments and for creating the National System of Protected Areas.

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1. The information provided in this annex was assembled during the summer of 1994 based on available Bank reports. Some of the country summaries may be outdated as these institutions are evolving at a rapid pace.
BRAZIL:

In February 1989, Brazil created a single national environmental agency, the Brazilian Institute for Environment and Renewable Natural Resources (IBAMA). This agency was placed under the Ministry of the Interior, and divides its responsibilities among five directorates. It also acts as the secretariat of the National and Environmental Council (CONAMA). The main functions of IBAMA and its agencies are to assist the president in shaping environmental policy, regulate and evaluate this policy, create state agencies to execute programs, and control activities that could degrade environmental quality. One of the major environmental programs that the government has focused on is the National System of Conservation Units to protect biological resources.

CHILE:

A 1991 decree created Chile’s National Environmental Commission (CONAMA) an environmental agency attached to the Ministry of National Resources. CONAMA consists of: (a) the Committee of Ministers (chaired by the Minister of Natural Resources); (b) the Operational Committee, composed of all ministers with environmental competencies; (c) the Technical and Administrative Secretariat headed by an executive director appointed by the president of Chile; and (d) the regional and provincial environmental commissions chaired by local government authorities and comprised of the directors of the Ministerial Regional Secretariat and representatives of community and social organizations. The two most pressing natural resource issues that CONAMA has been addressing are forest conservation and pollution affecting fisheries.

COSTA RICA:

The Ministry of Natural Resources, Energy, and Mines (MIRENEM) was designed in 1986, but was not formally approved by the Congress until 1990. There is no general environmental law, but the legislative assembly has a draft environmental code before it now.

ECUADOR:

Ecuador has a comprehensive environmental law regulating environmental pollution, but norms regarding other natural resources are sectoral. At the national level, the Interinstitutional Committee for the Protection of the Environment (CAAM) is responsible for environmental policy formulation and coordination, while other agencies have control over operational aspects of environmental protection. The Office of the Environment within the Ministry of Energy and Mines has the authority to monitor the environmental impacts of oil exploration, power generation and mining. The Natural
Resources Subsecretariat of the Agriculture Ministry deals with forestry issues and management of conservation units.

EL SALVADOR:

In June 1991 CONAMA, an interministerial coordinating committee that formulates environmental policy, was formed with the Secretaría de Medio Ambiente (SEMA) as its Executive Secretariat. CONAMA was headed by the minister of agriculture and reported directly to the president. SEMA began to tackle the problems of solid waste disposal, air and water pollution, and deforestation, but it does not participate in the national planning and development process. A new proposal to place SEMA within the Ministry of Planning and to restructure the role and composition of CONAMA is pending approval.

GUATEMALA:

The Law of Protection and Improvement of the Environment, enacted in November 1991, creates the National Commission for Protection and Improvement of the environment under the control of an executive agency. The commission is directly dependent on the president, and consists of a coordinator appointed by the president, and a technical advisory council which consists of representatives from several ministries and NGOs. The commission’s function is to help coordinate all national government actions for the protection and improvement of the environment. One of the commission’s main tasks is to coordinate and give advice in all activities of the National Council of Urban and Rural Development.

MEXICO:

In May 1992, the Secretaría de Desarrollo Social (SEDESOL) was created with federal environmental protection as one of its main responsibilities. SEDESOL reports to the president, and is broken into two subagencies: the National Institute of Ecology (INE) and the Federal Guard for the Protection of the Environment (PROFEPA). INE is in charge of formulating policy and setting national standards and norms, while PROFEPA is in charge of enforcing the mostly control-and-command legislation. In general, SEDESOL is responsible for setting fuel quality and vehicle emissions standards and the operation of air quality monitoring systems. Responsibility for national parks, reducing water pollution, and preservation of maritime species are controlled by separate individual ministries.
Policy implementation and management of the environment are addressed in the 1976 Organic Law on Central Administration, which created the Ministry of Environment and Renewable Natural Resources (MARNR). MARNR, with headquarters in Caracas and delegations in each state, is responsible for the enforcement of environmental standards and the preparation of most environmental and land-use plans at the national and regional levels. MARNR is also responsible for management of much of the publicly owned natural resources, including inland waters, forests and protected areas. Under a 1991 decree MARNR became responsible for environmental screening of virtually all new development projects. There are three autonomous services that are in charge of protecting wildlife, national parks, and the undeveloped Amazon region.
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