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Report on: Environmental Regulation and Supervision of Infrastructure Investments

Office of Evaluation and Oversight

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Table of Contents

List **of** Annexes

List of Acronyms

ASTEF	Engineer Paulo de Frontein Technical and Scientific Association
AUMEF	Metropolitan Planning Agency
CAGECE	State Water and Sewerage Company
CODEFF	National Committee for the Protection of Fauna and Flora
CONAF	National Forest Service
CONAMA	National Environmental Commission
COPEL	Parani Energy Company
COREMA	Regional Environmental Commission
DAER	State Roads Department
DEOPE	Department of Operations
DERT	Highway and Transportation Department
DNCB	National Directorate for Bio-diversity Conservation
DNER	National Roads Department
DV	Department of Roads
EIA	Environmental Impact Assessment
ELETROBRÁS	Brazil's Central Electric Authority
EMATER	Parani Company of Technical Assistance and Rural Extension
ENDESA	National Electric Company
EVO	Evaluation Office
FETAPE	Federation of Agricultural Workers
FINAME	Special Agency for Financing to Industry
GRAMA	Deliberative and Action Group for the Environment
IAP	Environmental Institute of Paraná
IBAMA	Brazilian Environmental Institute
IDB	Inter-American Development Bank
INCRA	National Institute for Colonization and Agrarian Reform
ITCF	Institute of Land, Mapping and Forests
MDSMA	Ministry of Sustainable Development and the Environment
MOP	Ministry of Public Works
MW	Megawatts
NGO	Non-Governmental Organization
NUPELIA	Research Nucleus for Limnology, Ichthyology and Aquiculture
PRODEST	Program for the Development of the Transport Sector
PROMECA	Highway Improvement Program
RENACE **(RED)**	National Network for Ecological Action
RIMA	Environmental Impact Report
SEIA	System of Environmental Impact Assessment
SEAIN	Secretariat for International Affairs
SNC	National Road Service
SOEC	Civil Works Superintendency of the State of Ceari
SUDEPE	Superintendency for the Fishery Development
SUREHMA	Superintendency of Water Resources and the Environment
SUTERCE	Superintendency of Inter-municipal Transport & Passenger Terminals (Ceari)
TOR	Terms of Reference

Executive Summary

A. Context of this Report

1. Background. The Inter-American Development Bank has clearly established the conservation of natural resources and environmental management as key strategic areas of concern within the programming of its investment activities. Regarding the former, in *1997* the Board of Directors considered the summary evaluation report entitled: "Bank-Supported Renewable Natural Resource Management Efforts in Watersheds". This final report was based on four individual Project Performance Reviews of projects implemented in Ecuador, Honduras, and Colombia.[1] Parallel to this series, the Evaluation Office produced a Working Paper of good practices analyzing non-Bank operations.[2] As a sequel to this evaluation of projects relating to the conservation of natural resources, the Office then turned its attention to other issues of environmental management. Together, these assessments, apart from the good practices working paper, cover nine projects in *six* different countries within the three Regions of the Bank. To this end, the Bank has been cooperating with the member countries of LAC in this critical dimension primarily by strengthening the technical and institutional capabilities of national, state and local governments and their effective participation in the project cycle.

2. Environmental Management Guidelines. Increasingly, institutions within most member countries are devising legal frameworks and appropriate instruments to comply with conditions attached to Bank-financed Projects designed to mitigate potential damages, enhance Project effectiveness, and safeguard decent living conditions in affected areas. To further enhance the Bank's ability to support its borrowing member countries in their efforts to improve environmental and natural resource management, the Bank is currently engaged in the process of formulating Environmental Management Guidelines. These Guidelines will encompass several areas: economic knowledge as the basis for planning; the integration of environmental management with economic development; and the cost-effectiveness of environmental policies. In addition to these instruments, this SDSENV product will focus on environmental regulation and supervision functions taking into consideration the findings of this synthesis evaluation report.

B. Evaluation Mandate

3. Replenishment Directives. The Seventh and Eighth Replenishments provide the most recent strategic guidance regarding the environment. The Seventh Replenishment brought environmental management and conservation of natural resources to the forefront of the Bank's lending activities.[3]

"The Bank should respond to this concern in a positive fashion by dedicating greater staff attention and financial resources to solving the problems of environmental management within a developmental framework. The Bank's ability to cooperate with the regional member countries in this critical dimension depends primarily on the strengthening of the technical and institutional capabilities of national governments and their effective participation in the project cycle. Thus, institutional strengthening of the environmental management function in the public sector should be promoted and supported both throughout the loan and technical cooperation activities." (Seventh Replenishment, May, *1989*, p. 14)

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1 Ecuador: Management and Conservation of the Rio Paute Watershed (1995); Ecuador: The Daule-Peripa Multi-Purpose Project – Performance Overview and Effectiveness of Environmental Management (1995); Honduras: Comayagua Forestry Development Program (1995); Colombia: Integrated Rural Development Program, Micro-Watershed Management Component (1996).

2 Working Paper 1/97: The Business of Respectful Exploitation – Good Practices in the Management of Natural Resources in Watersheds.

3 Inter-American Development Bank, 1989. Proposal for the Seventh General Increase in the Resources of the Inter-American Development Bank. Report to the Board of Governors, AB-I378, May, 1989, Washington, D.C.. 39 pp. plus annexes. See p. 14, paragraphs 3.33 - 3.36.

The Eighth Replenishment reiterates the fundamental importance of the environment as a key area of Bank activity, including management of natural resources and mitigation measures to reduce potential negative effects from projects.[4] This evaluation also responds to EVO activity (99107) as set forth in the Work Plan Profile approved by the Bank's Board of Directors.

4. **Purpose.** This evaluation report is inserted within the overall context of these Environmental Management Guideline activities being conducted by the Bank's, Environment Division of the Sustainable Development Department (SDSEW). The assessment of five infrastructure Projects, public and private, contributes directly to lessons learned from past experiences and to recommendations as they apply to the **management functions of regulating the use of the environment and implementing policies, monitoring, enforcing, and to their effectiveness and sustainability.** In addition, this EVO report examines the usefulness and adequacy of Bank guidelines and compliance oversight functions. As a result, analysis and evaluation of environmental management impacts, conformity with loan contract stipulations, effectiveness of enforcement instruments, serve to highlight areas for strengthening country capacity to successfully implement Bank-supported investments.

C. Methodological Approach

5. **Infrastructure Projects.** This thematic evaluation focuses on those investments that are most likely to cause environmental concerns, namely, infrastructure projects. Of particular interest are those projects whose conception, design, or execution were influenced by the mandates of the Seventh and Eighth Replenishments. As indicated in Table 1.1, the sample projects for ex-post evaluation do not fall neatly within this chronology. Projects were completed in 1992, 1995, 1996 (2), and 1999, respectively. The Board approved two of them in the 1980s (1986 and 1989), prior to the introduction of many environmental safeguards both in the Bank and in country governments (see Box 1, Chapter 1). Evaluation missions took place in 1997-98 with follow-up consultations and impacts assessment in 1999. Overtime both the Bank and borrowing countries have issued procedures for classifying and assessing environmental impacts and have developed operations specifically designed to resolve environmental problems in the Region. Accompanying tables attempt to highlight major legal and institutional changes that have occurred in the countries in question (Bolivia, Chile, Brazil). The projects proposed for ex-post evaluation should reflect some of these changes, if not in their design, at least in their implementation and supervision.

6. **Project Selection.** Following consultations with the Regional Operations Department and SDSENV in 1996, five operations in two sectors - three highway and two hydroelectric Projects were selected for evaluation of their environmental management components. In addition to publicly sponsored projects, this evaluation also included a sample of private infrastructure investments. In these two sectors, without taking into account projects currently in execution, the pipeline of future investments includes at least 20 projects in transportation and four in energy that contain environmental management components. Total project costs in these sectors amount to over US5.5 billion dollars. Despite the volume of this commitment, the inclusion of a greater number of sample cases, encompassing other infrastructure sectors, would, in all likelihood, produce only marginal returns of new knowledge relative to the allocation of evaluation staff resources. The Evaluation Office prepared PPRs for the following operations:

a. Patacamaya-Tambo Quemado Road Project (Loan 840/SF-BO).
b. Arica-Tambo Quemado Road Project (Loan 613/OC-CH).
c. Road Rehabilitation Program for the State of Ceari (Loans 587/OC-BR, 833/SF-BR).
d. Pehuenche Hydroelectric and Transmission System Project (Loan 218/IC-CH).
e. Segredo Hydroelectric Project (Loan 593/OC-BR).

D. Evaluation Focus - Key Criteria

7. **Environmental and Social Impacts.** The individual Project Performance Reviews (PPR) for each Bank operation contain detailed analyses of the **short- and long-term environmental implications** and **impacts** of

[4] Inter-American Development Bank, 1993. Eighth General Increase in the Resources of the Bank, AB-1683.

Projects, as well as **lessons learned** and **specific recommendations.** For brevity, this synthesis report cannot elaborate on the richness of these findings. From an environmental perspective, for example, proper road maintenance in Ceari can mitigate the effectsof erosion, local landslides, sedimentation and run-off into agricultural fields, water contamination, and destruction of vegetation and wildlife habitats. The environmental components of the Bolivian and Chilean road Projects included safeguards for national parks, wetlands, rare parrots, pre-Colombian burial towers, colonial churches, historic sites, and the highest natural forest in the world. The PPRs also provide **assessments of social and cultural impacts** as well as **civil society participation,** such as indigenous groups in northern Chile and the **resettlement** of families from the Segredo hydro-power site in southern Brazil. These reports also evaluate **land and water rights conflicts** at Pehuenche in Chile and the **economic development impacts** on municipal governments affected by the COPEL installation on the Iguaçu River. **This** synthesis report, therefore, **focuses primarily on institutional aspects of environmental management listed below.**

8. **Regulating the Use of the Environment - Legal Instruments and Institutional Framework.** Activities for institutional strengthening tend to focus on certain domains in which performance success is typically measured (see Chapter 1). Within the perspective of this evaluation, the efficiency of environmental management is predicated on the existence and quality of legislation, organizational structure, technical norms, training, equipment, information exchange, and decentralizing capacities to monitor and to respond expeditiously to "environmental situations".

9. **Effectiveness - Executing Agency Capacity to Implement Policies, Monitoring and Enforcement.** The Project Performance Reviews in this evaluation cycle attempt to identify and analyze what mechanisms have proven successful and which have fallen short of achieving desirable environmental management competence. Results are assessed in light **of** agency performance in protecting natural features in the Project areas, mitigating possible negative impacts of civil works and, where relevant, how the agency managed further effects on local communities, resettled families, and cultural, historical and archeological sites.

10. **Sustainability - Project Effects on Institutional Capacity. This** evaluation report also examines environmental management components and institutional development processes **within** the executing agencies and the **Bank during** consecutive time frames - before the Project, in its early stages, and during implementation. In addition to benchmark operations taking place during the Project cycle, a review of post-Project developments also provided the opportunity for assessing further capacity building efforts that extend beyond the actual Project implementation phase. These measures help to compare and evaluate pre-1990 organizational changes and to determine the catalytic effect that Projects can have in strengthening institutions for improved environmental management.

E. Major Findings and Lessons Learned

11. **Bolivia - Highway Construction Project (Patacamaya-Tambo Quemado). This** Bank-supported road Project was the first ever in Bolivia to incorporate specific environmental components in its design and execution. In the process, the design and implementation of this Project were instrumental in promoting the institutional strengthening of the National Road Service (SNC) to safeguard the environment affected by road construction projects in the future. In addition to the environmental protection components, perhaps for the first **time** in the Bank's experience, a large-scale physical infiastructure Project included components for cultural, artistic and historical preservation. The Project helped to restore colonial churches and archeological burial sites, treasures vulnerable both to road construction and to the effects of increased access and traffic in this region of the ***altiplano.*** This Project also supported the establishment of an Environmental Unit **within** the National Road Service that currently develops studies and participates in the approval procedure for road projects.

12. Chile - Highway Construction Project (Arica-Tambo Quemado). According to the Environmental Unit of the Department of Roads (DV), established in 1990-1991 as a Bank requirement, this is the first road project in Chile to specifically include environmental components. For this reason, Bank loan contract stipulations for this particular Project arguably provoked greater than usual public and private scrutiny, and more hands-on environmental management activities than the average construction project carried out by the Department of Roads. At the national level, CONAMA (Comisión Nacional del Medio Ambiente) has made significant progress toward the decentralization of environmental responsibilities. **This** process, however, is far from complete.

- The DV Environmental Unit operates in a relatively reactive mode, responding to requests for assistance when problems arise. The Unit is unable to anticipate and track all but one percent (1%) of DV projects and does not provide substantive input into environmental impact analysis, most of which is sub-contracted to private consultants by the central unit of the Ministry of Public Works. In short, the Unit has neither the stature nor the resources to transform its small team into the state-of-the-art environmental unit envisioned in the institutional strengthening study.

- With regard to environmental management, Bank staff provided valuable orientation and feedback for the analysis of DV's institutional capacity and guidelines for environmental impact studies. Staff also successfully contributed to the mitigation and monitoring agreements established between the Department of Roads and the National Forest Service (CONAF) responsible for managing the Lauca National Park.

13. Brazil - Road Rehabilitation Program (Ceari Phase **I).** Bank guidelines and staff efforts proved instrumental in effectively supporting the process which took the Roads Department (DERT) from timid, incipient steps to an advanced stage of consolidated policies and transparent procedures for environmental management. Building on earlier initiatives by the State of Ceará, the Road Program itself served as a catalyst not only for further road improvement operations but also for institutional changes within DERT that are conducive to adherence to environmental guidelines. Much of the success of this Program is attributable to the attentive supervision by Bank staff to provide support and to resolve implementation challenges.

14. Chile - Pehuenche Hydroelectric and Associated Transmission Project. Bank involvement in this pre-1990 Project resulted in the inclusion of a limited number of environmental studies, partly from the urging of agencies responsible for natural resources. These studies, however, were carried out before construction and, in no way, were designed to determine and measure post-Project impacts. These studies contain quality basic science data relevant to river basin conditions prior to investments. The Bank did not insist, however, that these studies be used as baseline referents for Project monitoring during implementation and operational phases.

- The executing agency (even without its **own** environmental unit) complied with the contract stipulations to carry out environmental studies focusing on parrots, fish, vegetation, and reforestation in the Project area. Nevertheless, ENDESA (National Electric Company) and Pehuenche S.A. played passive roles in identifying environmental ramifications of Project implementation. As issues were raised by the Bank and CONAF, the companies responded to these modest and limited requests for studies (none of which would have altered pre-determined construction designs and actual construction already underway).

- This Project resulted in the sacrifice and/or serious compromise of natural resources (hydrological systems) in the Maule and Melado region. There is no apparent indication that Bank supervision took effective advantage of this Project opportunity to promote broad discussion of engineering design alternatives or other issues of interest to key affected parties. Rather than the outcome of decisions based on a conscious watershed management strategy, these effects emerged fiom Bank concurrence with key components contained in original Project and Loan documentation and in insufficient supervision of the "Project Evaluation Methodology" submitted by Pehuenche S.A. itself.

15. Brazil - Segredo Hydroelectric Project, State of Parani. COPEL was the first hydroelectric company in all Brazil to carry out, on its own, environmental plans and programs to preserve the natural surroundings and improve living conditions of families in a region affected by the construction and operation of a power plant. When COPEL began the Segredo Hydroelectric Project in 1980, prior to Bank financing, the company acted in compliance with the environmental legislation in force at the time. When new legislation was enacted in 1986, therefore, the company had no legal obligation to subject itself to these requirements. COPEL, nevertheless, freely took the initiative to comply with these new standards. This hydroelectric power plant Project forms part of a series of dams that interrupt river flow on the Iguaçu River. As such, it created major impacts on the human and natural environment. Nevertheless, within the limitations of this overarching circumstance, COPEL is taking appropriate and effective measures to protect local and regional ecosystems.

F. Recommendations

I. *For infrastructure projects, depending on each country's institutional capacity and policy framework, the Bank should continue to exert persistent influence to shape and to make operational those mechanisms designed to achieve environmental regulation of Projects. Therefore, the Bank should also provide rigorous supervision and the corresponding financial support required to meet satisfactory environmental standards.*

Commentary. For example, within the National Road Service (Bolivia) and the Department of Roads (Ceará, Brazil), Bank involvement and supervision were instrumental in establishing the benchmarks to both minimize negative impacts of investments and support enhancement of natural features. Within these agencies there now exists a culture of environmental concern, in large part, according to this observer, because Bolivia and the State of Ceará now possess specific laws that require environmental safeguards for road projects.

II. *With respect to infrastructure investments having direct impact on historical and archeological sites, the Bank should continue to foster, where appropriate, the inclusion of Project components to preserve these areas. Such sub-components, to be negotiated with borrowers and subject to cost-benefit analysis, could help both to mitigate possible undesirable effects of projects as well as to generate further benefits to affected populations.*

Commentary. Stand-alone operations for environmental management are a part of the Bank's approach to capacity building for protection of natural resources and environmental enhancement. Contract requirements and support for institutional strengthening within the context of infrastructure Projects also help to serve similar objectives. In addition to these efforts, Project experience demonstrates that even greater benefits can accrue, at modest cost, by encompassing activities of interest to the local community. For example, for much less than 1% of total Project cost, a cluster of non-road operations, including Sajama National Park, can provide additional incentives for the regulation and supervision not only of civil works but also the natural and built environment nearby. The inclusion of such activities can also promote a wider and deeper sentiment of public ownership and responsibility, thereby enhancing the sustainability of investments. Where advisable, future infrastructure proposals could seek to capitalize on similar opportunities.

III. *The introduction and strengthening of environmental management instruments (regulation and supervision measures, in particular) are part of a continuing process. The Bank should ensure resources (human and financial) to perfect and adopt compatible approaches and methodologies for the evaluation of such efforts, together with appropriate data, indicators, and benchmarks that trace both Bank and borrower performance.*

Commentary. As an executing agency takes measures to establish its own systems of environmental regulation and supervision of infrastructure investments, congruent with the Bank's own management strategy and guidelines, there arises the need to facilitate the evaluability of the performance and effectiveness of these mechanisms. This entire evaluation work program, furthermore, has demonstrated to the executing agencies of these Projects both the importance the Bank attaches to follow-up and its continual monitoring of capacity building activities in progress with a view to future Projects in the pipeline.

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Background

A. Objective of This Report

1.1 **Key Concerns.** The Inter-American Development Bank has clearly established environmental management and the conservation of natural resources as key strategic areas within its investment programming. The Environmental Management Policy of the Bank (OP-713) dates fiom 1979.[5] Since 1990 the Bank has formally included general and specific measures in all operations that have the potential for negative environmental impacts. The Bank has also developed several projects designed to bring about positive environmental effects. In addition, the Bank is engaged in efforts to strengthen the environmental legal and regulatory framework at the national level in many countries. Even for Projects started prior to 1990, the Bank has included natural resource management components in hydroelectric, irrigation and agricultural development and forestry Projects.

1.2 **Replenishment Directives.** The Seventh and Eighth Replenishments provide the most recent strategic guidance regarding the environment. The Seventh Replenishment brought environmental management and conservation of natural resources to the forefront of the Bank's lending activities.[6]

> 'The Bank should respond to this concern in a positive fashion by dedicating greater staff attention and financial resources to solving the problems of **environmental management** within a development framework. The Bank's ability to cooperate with the regional member countries m this critical dimension depends primarily on the strengthening of the **technical and institutional capabilities of national governments and their effective participation in the project cycle. Thus,** institutional strengthening of the environmental management function in the public sector should be promoted and supported both throughout the loan and technical cooperation activities." (May, 1989, p. 14)

The Eighth Replenishment reiterates the fundamental importance of the environment as a key area of Bank activity, includin management of natural resources and mitigation measures to reduce potential negative effects fiom Projects? This evaluation also responds to EVO activity (99/07) as set forth in the Work Plan Profile approved by the Bank's Board of Directors.

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5 A detailed account of the evolution of the IDB environmental policy is presented in GN-1724, Summary Report on Environmental Planning and Management for Water Impoundment Projects. Office of the Controller, Operations Evaluation Office, December, 1990.

6 Inter-American Development Bank, 1989. Proposal for the Seventh General Increase in the Resources of the Inter-American Development Bank. Report to the Board of Governors, AB-1378, May, 1989. Washington, D.C., 39 pp. Plu annexes. Seep. 14, paragraphs 3.33-3.36.

7 Inter-American Development Bank, 1993. Eighth General Increase in the Resources of the Bank, AB-I683.

B. Environmental Management Functions

1.3 Bank Strategy. Consonant with these mandates, Bank staff has prepared or is preparing its own guidelines, and constantly adjusting its Project design practices to achieve these ends. Increasingly, institutions within Country are also devising legal frameworks and appropriate instruments to comply with conditions attached to Bank-financed Projects and to mitigate potential damages, enhance Project effectiveness, and safeguard decent living conditions in affected areas. In addition, the central aim of SDS/ENV's business plan for the year 1999-2000 is to further enhance the Bank's ability to support its borrowing member countries in their efforts to improve environmental and natural resources management. The Bank's strategy for strengthening Environmental Management in the region will likely address functions such as the following:

- understanding the environment and using knowledge as the basis for planning;
- coordinating and integrating environmental management and economic development;
- formulating cost-effective environmental policies; and
- regulating use of the environment; implementing policies, monitoring and enforcing.

1.4 Purpose and Contribution of this Evaluation Report. This evaluation report is inserted within the overall context of these Environmental Management strategy activities in progress within the Bank. The assessment of five infrastructure Projects contributes directly to lessons learned from past experience, particularly as they apply to the management functions of regulating the use of the environment and implementing policies, monitoring and enforcing? Specifically, the purpose of the EVO work program is to learn lessons about the usefulness and adequacy of Bank guidelines and to examine how it oversees compliance regarding infiastructure Projects. As a result, analysis and evaluation of environmental management impacts, conformity with loan contract stipulations, effectiveness of enforcement instruments, will serve to highlight areas for strengthening Country capacity to implement Bank-supported investments.

C. Approach to Evaluate Environmental Regulation and Supervision Functions

1.5 Project Selection for the Evaluation of Institutional Development Process. The thematic evaluation - environmental regulation and supervision - focuses on major infrastructure Projects. Of particular interest are those Projects whose conception, design, or execution were influenced by the mandates of the Seventh and Eighth Replenishments. In addition, since 1990 the Bank has issued procedures for assessing environmental impacts and has developed operations specifically designed to resolve environmental problems in the Region (see Box 1). The evaluation work program assesses some of these Bank measures and staff efforts to ensure appropriate management of environmental components of each Project. Based on findings, several areas are identified in which supervision and regulation strategies could be productively introduced to enhance the performance and effectiveness of future

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[8] The work program includes five completed Project Performance Reviews:

Fortin, Charles and Leslie Ricketts (October 1997). Highway Improvement Program, Chile (CH-0041), Arica-Tambo Quemado. Loan 613/OC-CH. Evaluation Office, Inter-American Development Bank, Washington. D.C.

Fortin, Charles and Leslie Ricketts (December 1997). Road Rehabilitation Program for the State of Ceará, Brazil. Loan 587/OC-BR, 833/SF-BR. Evaluation Office. Inter-American Development Bank, Washington, D.C.

Fortin. Charles and Thomas Catterson (May 1998). Pehuenche Hydroelectric & Associated Transmission Project. Chile (CH-0116), Loan 218/IC-CH). Evaluation Office. Inter-American Development Bank, Washington, D.C.

Fortin, Charles (August 1998). Patacamaya-Tambo Quemado Road Project. Bolivia (BO-0106), Loan 840/SF-BO). Evaluation Office, Inter-American Development Bank, Washington, D.C.

Fortin, Charles (January, 1999). Segredo Hydroelectric Project. Brazil (BR-0061), Loan 593/OC-BR). Evaluation Office, Inter-American Development Bank, Washington D.C.

Projects. The five operations in two sectors selected for ex-post evaluation (three highway and two hydroelectric Projects) reflect some of these recent developments, if not in their design, at least in their implementation.

Box 1. Evolution of Environmental Functions of BID

Since the first of these projects covered by the comparative assessment were approved, the Bank's capacity to address environmental and social impact issues has become well established within the organization. Building on the mandates of the 7th and 8th Capital Replenishments and the reorganization in 1994, the Bank has developed a substantial body of environmental policy guidance and a broad-based internal structure for dealing with the environmental dimensions of projects. These achievements have markedly increased its capacity to integrate environment into the mainstream of Bank operations.

The Bank's Environmental Policy of 1979 has provided a broad and flexible framework for the Bank's internal environmental compliance activities, as well as for a variety of environmental technical cooperation and loan operations. This framework was expanded by the mandates of the 7th and 8" Capital Replenishments and by a series of more explicit Bank strategies designed to operationalize these mandates in the areas of niral and agricultural development, integrated management of water resources, energy development, coastal and marine resources management, and the prevention and mitigation of the impacts of natural disasters, and private sector and environment for the MIF. Policies on Resettlement and Public Information Disclosure also established the Bank's approach to these critical areas, and in 1997, the Bank's internal due diligence and environmental compliance procedures were revised to more explicitly incorporate social impact issues in Bank projects. Public participation is an integral part of all these policies and strategies. On the whole, this is a greatly expanded source of policy guidance for the Bank and its borrowing member countries than existed when the projects considered by the assessment were developed.

Since the 1994 Reorganization, the Bank's technical capacity to address the environmental and social impacts related to projects has also broadened. Through the Sustainable Development Department's (SDS) environment (SDSENV) and social (SDS/SOC) divisions, the Bank can address policy issues, new strategies and lessons learned, and provide specialized technical assistance to project teams, as well as review projects prior to their approval by the Loan Committee. In addition, each of the Regional Operations Departments, including the Private Sector Department (PRI), has professionals expressly dedicated to environmental and social assessment, as well as to the development of environmental operations and the environmental components of operations in other sectors. Through the Committee on Environmental and Social Impacts (CESI), representatives of each of the environment divisions, the PRI, SDSENV, SDS/WID, and SDS/IND come together on a weekly basis to review project proposals for compliance with Bank policies and procedures and suggest approaches that might enhance the social and environmental sustainability of the operations.

The Bank has also been very active in trying to get its environmental message across during the ensuing years. Annual reports explicitly dealing with the environment have been distributed widely since 1990. Biennial NGO conferences on environment were held during the period 1987-1996 to be replaced by a continuous dialogue with a more broad-based group of social and environmental civic groups through Bank headquarters and COFs and at Annual Governors' Meetings. Bank personnel also engage in regular outreach activities and, through its WEBSITE and the Public Information Center, Bank publications, studies and operations documents are widely distributed to the interested public.

With the adoption of the Bank's New Institutional Strategy and the deepened focus on social reform, modernization of the state, competitiveness, and regional integration, a thorough review of the Bank's environmental policy and guidance will be conducted in order to integrate it into the Bank's new vision and be able to respond more effectively to the evolution of environmental policy and management in the Regions.

Source: Environment Division (SDS)

1.6 Environmental and Social Impacts. The individual Project Performance Reviews (PPR) for each Bank operation contain detailed analyzes of the short- and long-term environmental implications and impacts of Projects, as well as lessons learned and specific recommendations. For brevity, this synthesis report cannot elaborate on the richness of these findings. From an environmental perspective, for example, proper road maintenance in Ceará can mitigate the effects of erosion, local landslides, sedimentation and run-off into agricultural fields, water contamination, and destruction of vegetation and wildlife habitats. The environmental components of the Bolivian and Chilean road Projects included safeguards for national parks, wetlands, rare parrots, pre-Colombian burial towers, colonial churches, historic sites, and the highest natural forest in the world. The PPRs also provide assessments of social and cultural impacts as well as civil society participation, such as indigenous groups in northern Chile and the resettlement of families from the Segredo hydro-power site in southern Brazil. These reports also evaluate land and water rights conflicts at Pehuenche in Chile and the economic development impacts on municipal governments affected by the COPEL installation on the Iguaçu River. This synthesis report, therefore, focuses primarily on institutional aspects of environmental management listed below.

1.7 Regulating the Use of the Environment - Legal Instruments and Institutional Framework. Based on past Project experience and on management literature, activities for institutional strengthening tend to focus on certain domains of activity in which performance success is typically measured. Projects in this evaluation do not necessarily include, from the design phase, the whole range of possible actions supportive of efficient management. Within the perspective of this evaluation exercise, however, the successful performance of the environmental management functions can be predicated on the strengthening of institutions in several different areas such as:

- legislation
- organizational structure
- technical norms
- training
- equipment
- information exchange, and
- decentralizing capacities to monitor and respond expeditiously to "environmental situations".

1.8 Effectiveness - Executing Agency Capacity to Implement Policies, Monitoring and Enforcement. The Project Performance Reviews in the evaluation cycle attempt to identify and analyze what mechanisms have proven successful and which have fallen short of achieving desirable environmental management competence. Results are assessed in light of agency performance in protecting natural features in the Project area, mitigating possible negative impacts of civil works and, where relevant, how the agency managed further effects on local communities, resettled families, and cultural, historical, and archeological sites.

1.9 Sustainability - Project Effects on Institutional Capacity. This evaluation report also examines environmental management components and institutional development processes within the executing agencies and the Bank during consecutive time frames - before the Project, in its early stages, and during implementation. In addition to benchmark operations taking place during the Project cycle, a review of post-Project developments also provides the opportunity for assessing further capacity building efforts that extend beyond the actual Project implementation phase. These measures help to establish useful references with which to compare and evaluate pre-1990 organizational changes and to determine the catalytic effect that Projects can have in strengthening institutions for improved environmental management.

D. Evaluation Missions, Site Inspections, and Data Collection

1.10 Innovative Procedures. After document research and initial interviews at Headquarters and at the Country Offices, site inspections and evaluation missions to the five Projects took place during the period of 1997-1998 in accordance with the approved work plan. Detailed Project Performance Reviews were prepared containing substantive analysis and assessment of each operation, including findings and lessons learned. Normally, the officer in charge would then synthesize the results of the entire evaluation exercise in a Final Summary Report for peer review and presentation to the Board. In this case, however, executing agencies and other stakeholders also had prior access to the draft Project Performance Reviews in order to make corrections of fact and add clarifications regarding design, implementation, and Project results.

1.11 **Evaluation as In-Country Learning Tool. This** innovative final round of consultations proved extremely useful as a learning tool for the interested parties. They provided a unique opportunity for Project participants, including several who had never had previous contact, to exchange information, identify initial development impacts, assess the sustainability of operations, and make recommendations for mechanisms of continued collaboration. Several participants also expressed both surprise and appreciation that the **Bank** took such pains to follow-up on completed Projects with serious, in-depth evaluations of performance and outcomes.

Table 1.1 Key Evaluation Activities and Dates in Project Cycle

	Project Approval	**Project Completion**	**Evaluation Mission**	**Final Consultation & PPR Review**
Patacamaya - Tambo Quemado	***25*** March ***1990***	December ***1999*** (projected)	June ***1998***	April ***1999***
Arica - Tambo Quemado	***19*** December ***1990***	***18*** March ***1995***	August ***1997***	April ***1999***
Ceari Road Rehabilitation	***20*** December ***1989***	April ***1996***	April ***1997***	April ***1999***
Pehuenche Hydroelectric	December ***1986***	December ***1992***	March ***1998***	April ***1999***
Segredo Hydroelectric	July ***1990***	July ***1996***	October ***1998***	April ***1999***

2

Bolivia Highway Construction Project: Patacamaya-Tambo Quemado

A. Project Background

2.1 Loan Request. As part of the Export Corridors Project, the Bolivian government made a formal request to the Bank on August 15, 1989 requesting funds to construct the Patacamaya-Tambo Quemado highway. Other components included programs for strengthening the road maintenance system, protection of the environment and the archeological ruins in the vicinity of the highway's right-of-way. The final designs and economic studies for the road, originally proposed in 1975, were updated in 1989 to conform to the requirements for international financing and to criteria for environmental protection.

2.2 Project Objectives. The main objectives of the Project included the reductions of the export-import transportation costs within the Bolivian road network to and from the port of Arica on the Pacific coast of Chile, improvement in the country's capacity to maintains its roads, and the environmental protection associated with the construction and maintenance of this and other roads within the system.

Table 2.1 Components

Road Construction

- 188 kilometers
- kilometer spur leading to the town of Curahuara de Carangas
- 5 bridges

Institutional Strengthening (*ServicioNacional de Caminos* – SNC) for highway maintenance by

- constructing or improving field offices, workshops and warehouses, and
- acquisition of spare parts to keep maintenance equipment operational

Environmental Protection - Contracting a consultant to prepare and execute overall program:

- management plan for Sajama National Park & define borders
- public education measures
- training of Park guards
- long-term program to protect flora and fauna;
- reconstruction and protection of archeological and colonial ruins near highway;
- strengthen SNC's capacity to evaluate, supervise, and execute environmental protection programs related to highway construction and maintenance

Table 2.2 Environmental Management Measures: Patacamaya-Tambo Quemado Highway Construction Project

Domains	Pre-Project (1990)	During Implementation (1990-1999)	Post-Project (1999)
Legislation	Prior to Project, no environmental law specific to road construction. Sajama National Park designated as Bolivia's first protected area (1939), ratified (1945) but with no provisions for Park development, border definition, or to clarify overall purpose.	Bolivia's first experience in incorporating environmental components into the overall design and implementation of road infrastructure. In Sajama, Project financed installations, vehicles, Park administration and management plan, initial salaries for director and park guards.	Bolivia now possesses specific laws that require environmental safeguards for road projects. In Sajama, continued adherence to management plan; by April 1999, staff had not received their salaries for seven (7) months, not assumed by the national agency for protected areas. No budget for Park; estimated need $80,000-100,000 annually.
Organizational Structure	Within the *Servicio Nacional de Caminos*, there existed no Environment Division, only two units within the Planning Department, one in charge of studies, the other for project costs.	Although there was Project review by an environmental team relying on consulting services, no unit had been formally established.	SNC is undergoing restructuring. The environmental unit, now doing impact studies and inspections, will either become a Division in 1999 or act as special advisor to SNC executives.
Technical Norms	Not a specific Project component.	SNC established criteria for environmental baseline study, Park management plan, and protection of flora and fauna in Project area.	SNC possesses capacity to evaluate, supervise, and execute environmental protection programs related to road construction and maintenance.
Training	Not a specific Project component (except for guards at Sajama National Park	Capacities developed through Project planning and execution by various agents; park guards received training as part of management plan.	Same as above; also, skills of park guards routinely upgraded.
Equipment	SNC had insufficient resources (staff, fuel, spare parts) to maintain entire road network. None for Sajama National Park operations.	Curahuara de Carangas field office, constructed and equipped with Project financing, headquarters road maintenance operations.	While road upkeep countrywide remains problematic, ample equipment appears available for the maintenance of this Project road.
Information Exchange	Little contact among executing agencies, each operating within own particular contexts; institutions not familiar with Bank norms.	Individual leaders within pertinent agencies were responsible for achieving Project goals. Their institutions are not considered effective mechanisms of execution. The more diluted the responsibility, the weaker the cooperation.	Without Project and funding, no sustained articulation among leaders within agencies. Interest by SNC, without funding, for publication analyzing Project experience; estimated cost $30,000 for 1,000 copies.
Decentralizing Capacity	Road maintenance activities carried out precariously through ten district field offices of SNC with insufficient financial, human, and material resources to adequately maintain the country's entire road network.	Law of Decentralized Administration (1654, July, 1995) required SNC to transfer to individual department prefectures all maintenance field offices (staff, machines and equipment, repair shops and installations).	Law no. 1654 (September, 1997) returned administration and maintenance functions to the National Road Service. Curahuara de Carangas field office for road maintenance considered finest in all of Bolivia.

B. Regulating the Use of the Environment

2.3 Impact Assessment. The initial Environmental Impact Assessment, required by Contract, represents a remarkable achievement given the National Road Service's general lack of environmental experience and criteria specific to the construction of roads in Bolivia. The report demonstrates an appreciation of the complexity of relationships between a major physical infrastructure investment and its potential ramifications for the surrounding area, and prescribes appropriate mitigation measures.

2.4 Components. In addition to the environmental protection, this Project is unique in that it included resources for the restoration of historical and archeological treasures vulnerable both to road construction and to the effects of increased access and traffic in this region of the ***altiplano.*** The Bank and the SNC took great pains to successfully implement measures to ensure the protection of both environmentally sensitive natural areas and irreplaceable man-made colonial and archeological treasures. Perhaps for the first time in the Bank's experience, a large-scale physical infrastructure Project has included components for cultural, artistic and historical preservation by means of the restoration of colonial churches and archeological burial sites.

2.5 Laws. Bolivia now possesses specific laws that require environmental safeguards for road Projects. The environmental unit of the National Road Service carries out impact studies and inspections and, with restructuring this year, will likely achieve enhanced stature.

C. Effectiveness

2.6 Environment Unit. This Project experience supported the establishment of an Environment Unit within the National Road Service which currently develops studies and participates in the approval procedure for road projects.

2.7 Field Office. The maintenance field office in Curahuara de Carangas, financed by the Project, is considered the finest in all of Bolivia and will continue to be an important resource for road maintenance in the future.

2.8 Management Plan. Recommendations contained in the Environmental Impact Study of this IDB-financed Road Construction Project also provided the impetus for the National Directorate of Bio-Diversity Conservation to develop the management plan for the Sajama National Park currently being implemented in partnership with local community groups.

2.9 Cost. For the overall cost of the "environmental" components (US$600,000), implementation was carried out efficiently, even taking delays into account. Although ultimate impacts will determine the effectiveness of individual interventions, the Project deserves high marks for measures taken to protect and preserve the natural and built environment. Institutionally, the National Road Service possesses the capacity to evaluate, supervise, and execute environmental protection programs related to road construction and maintenance.

D. Sustainability

2.10 SNC Capacity. The design and implementation of this Project were instrumental in promoting the institutional strengthening of the National Road Service (SNC) to safeguard the environment affected by road construction projects. In fact, this Bank-supported road Project was the first ever in Bolivia to incorporate specific environmental components in its design and execution. The SNC proved itself capable to successfully execute environmental provisions in the Loan Contract.

2.11 Restoration. It is clear that these Bank-financed investments in restoration have saved irreplaceable historical and artistic treasures that surely would have disappeared altogether without these timely interventions. No other national budget resources would likely have been allocated to these activities. The restoration components, furthermore, served to mobilize scores of researchers, artists, and laborers to enhance the awareness and value of these church and burial sites.

2.12 **Park Investments.** Project funds financed the construction of Park headquarters, offices, accommodations, the purchase of vehicles, and the hiring and training of park guards who provide services that range fiom refuse collection to guiding international mountain climbers.

2.13 **Uncertain Future. A** much lower rating for sustainability is predicated on continued uncertainties surrounding salaries of park staff, funds for the implementation of the Park Management **Plan, the** upkeep and protection of historical structures, and road maintenance. Law **1654** (September, **1997)** returned the administration and maintenance functions back to the National Road Service. While road upkeep nationwide remains problematic, ample equipment and other resources appear available for the maintenance of the Patacamaya-Tambo Quemado highway.

E. Bank Guidelines and Supervision

2.14 **Environmental Provisions.** Contract provisions are noteworthy for several reasons. First, the environmental clauses are not limited to the mitigation of potential damage fiom the road construction itself. Rather, **as** in the case of Sajama National Park, they also call for the enhancement of natural surroundings and wildlife.

2.15 **Road Maintenance.** In October **1997,** the **Bank** expressed its continued concern regarding deficiencies in the road maintenance system as well as institutional and technical weaknesses which could compromise Bolivia's capacity to operate and maintain such costly infrastructure investments. Consequently, the Bank urged the government to:

- regulate and implement the ***Ley de Control de Pesos y Dimensiones de Vehiculos,***
- designate the appropriate agency for **this** responsibility,
- provide regulations which were to establish the new organizational structure of the National Road Service according to Law **1788** (September **16, 1997),**
- submit a SNC timetable allocating staff, material and financial resources in order to carry out its new activities and its strategy for adequately maintaining the roads under its jurisdiction,
- implement a program of road safety.

In **this** communication to the Minister of Economic Development, the Bank's Representative in La Paz reminded that continued Bank support for new projects in the transport sector would be dependent upon satisfactory Bank verification of the implementation measures noted above.

2.16 **Resources.** During the Orientation Mission for a new road Project **in** November **1998,** Bank **staff** agreed with the Bolivian authorities that the financial resources "left over" from the Patacamaya-Tambo Quemado Road Project (approximately US$5.1 million) would be used for the periodic maintenance of the road linking **La** Paz with **Oruro.**

2.17 **Compliance.** SNC's **1997** Environmental Protection **Report** declared the virtually total completion percentages of all the different activities. ***On*** May ***5, 1997,*** the Bank specialist in the Country Office recommended compliance approval of the Contract clauses pertinent to environmental protection. The execution agency had prevented the deforestation and the use of *queñua* bushes in the Sajama National Park, for the most part had eliminated the accumulation of stones and gravel near the roadway, had minimized the alteration of drainage patterns, had protected the wetlands and natural irrigation aquifers, had prevented hunting of *vicuñas*, the collection of wildlife eggs, and had been successful carrying out other environmental safeguards.

F. Lessons

2.18 **Opportunities. This** Road Project establishes important regional and international linkages. In addition, capital investments in the colonial churches, "*chullpas*", and in Sajama National Park create the opportunity for developing diversified economic activities **and** generating further benefits to local residents. The protection of the natural environment, therefore, together with the enhancement of key sites of built environment (historical and archeological structures) can pave the way €or future Projects and/or technical assistance for human capital and micro-business formation. The training of both women and men for income-generating activities can, in turn, also foster the conservation and maintenance of restored cultural treasures.

Table 2.3 Bolivia - Selected Environmental Management Laws (1986-1998)

1986	1990	1992	1993	1994	1995	1996	1997	1998
Environmental & Natural Resources Commission established	Formation of first national environmental agency - Secretaria General del Medio Ambiente (SEGMA) Creation of national environmental fund - Fondo Nacional del Medio Ambiente (FONAMA) Five-year ban on forest cutting & lumber exports (Pausa Ecológica Forestal)	Enactment of national environmental law - Ley del Medio Ambiente (1333)	Reform of Executive Branch (supercedes institutional arrangements of Law 1333): Ministry of Sustainable Development & Environment established Completion of National Environmental Action Plan (NEAP) Enactment of Public Participation Law Enactment of Decentralization Law Implementation Of Capitalization of State Enterprises Program	Key policy statement regarding Rational use of natural resources in Plan General de Desarrollo Economico y Social de la Republica	Enactment of Reglamento de la Ley del Medio Ambiente (RLMA) Administrative Decentraliza-tion Law mandates the transfer of road management to nine new Prefecturas	Approval of Land Reform Law (Ley INRA) Passage of Forestry Law Subsecretaria del Medio Ambiente reviews 1993 National Environmental Action Plan (NEAP) and prepares Marco Referencial para la Acción Ambiental en Bolivia Former National Road Agency (SNL) district offices become Departmental Road Agencies (SDCs)	Law 1654 returns road administration and maintenance functions to the National Road Service Law 1788 regulates the establishment of SNC's new organizational structure	Bill in Congress (Ley de Concesiones de Obras Públicas de Transportes) - government to no longer be responsible for the construction, improvement, rehabilitation, repair, maintenance and financing of roads Law would authorize government to hold open bidding for private maintenance contracts with 40-year terms

3

Chile Highway Construction Projects: Arica – Tambo Quemado

A. Project Background

3.1 Loan Context. The Chilean Ministry of Public Works (MOP) executed the road program through the Department of Roads with financing assistance fiom the IDB, the World Bank, and the Japanese **EXIMBANK.** The original multiple works program budget totaled **$907** million over four years. It began **in 1990** with a **$224** million World **Bank** loan and a **$150** million loan **from** the **EXIMBANK,** government funds of **$448.1** million, and funds fiom a previous IDB **loan** of **$84.9** million. The new IDB loan of **$246** million (613/OC-CH) increased the **Bank's** participation in this "time-slice" **program** in which activities were defined and submitted for evaluation on a yearly basis.

3.2 Project Objectives. The road improvement Project included *two* major components: **1)** rehabilitation of the **106** kilometer segment fiom Ruta 5 Norte near Arica to **Rio** Seco in the *altiplano* region; and **2)** paving of the gravel road which stretched fiom **Rio** Seco for **87** kilometers to the Bolivian border. **The** final **56** kilometers of this last segment winds its way **through** the *Parque Nacional Lauca,* contiguous **to** *two* other natural areas forming a World Biosphere Reserve as designated by Chile and the United Nations.

Table 3.1 Environmental Components

Increase technical capacity in the Department **of** Roads (DV):	Carry out environmental study **of** DV's Institutional capacity:
• Appoint a specialist in DV to supervise environmental aspects **of road** programs in coordination with consultants and executive secretary **of** the Environmental Technical Unit **of** the Ministry of Public Works	• Conduct study to determine if DV's norms and policies **for** the design and construction **of roads** and bridges adequately considered and mitigated environmental impacts
• Train key DV personnel in the new environmental policies and impact assessment guidelines	• Study indirect environmental impacts of recently completed **road** projects and apply lessons learned to new projects
• Screen and evaluate all road projects **for** environmental impacts.	• Formulate environmental policies and environmental impact assessment guidelines
	• Develop a training program congruent with recommendations, policies, **manuals** and guidelines resulting from the analysis.

B. Regulating the Use of the Environment

3.3 Framework in Place. Chile has established the basis for environmental management and has enhanced its legal framework with binding regulations. The preparation, approval, and implementation of the road Project coincided with the government's establishment of the National Environment Commission (1990), an Environmental Unit within the Department of Roads (1990 in practice; formally and legally in 1993), national environmental legislation (1994), and specific environmental regulations and impact assessment process - *Sistema de Evaluación de Impacto Ambiental* (1997). CONAMA officials are the first to admit, however, that the SEIA is a nascent system.

3.4 Global Maintenance Contract System. Because the majority of roads in Chile's Region I are being routinely maintained by private firms, they carry the primary responsibility for work site impacts. Under the new global maintenance contract system, however, the Department of Roads includes stipulations in each contract requiring the private company to follow environmental standards and to pay for the mitigation of any negative impacts under penalty of specified sanctions including cessation of works. Region I was selected as a pilot study site for implementation of this system. Results thus far have been positive.

3.5 Challenges. At the national level, CONAMA, despite budget cuts in 1998, has a staff of 360 who are undergoing continuous training for environmental management functions. While a major portion of legislation and guidelines are in place, regulation continues to be a challenge because the agency does not include conflict resolution as part of its mandate. It deals mostly with environmental safeguards required for the installation and operation of private enterprises.

C. Effectiveness

3.6 Environmental Unit. The Environment Unit of the Department of Roads is not strategically positioned within the organization to effectively intervene, neither in the design nor implementation phases of road projects. The minimal staff of four, including the Head (engineer) and three geographers, occupy a small, one-room office, which reflects the hierarchical mismatch and inequality of stature compared to other DV departments that it seeks to influence.

3.7 DV Offices in Parinacota and Santiago. Based on interviews in the Department of Roads' Parinacota (Putre) office and in DV's Environmental Unit in Santiago, it became apparent that institutional strengthening was a key issue at all levels of DV, especially with regard to environmental management of their projects. The evaluation team inquired about training needs for DV's Parinacota office and work crews. The local chief engineer commented that courses were designed in Santiago and sometimes matched local needs and sometimes did not. For example, DV did not anticipate that many people hired locally would not know how to drive motorized vehicles. Questions remain with regard to the training of the private sector workers.

3.8 Interagency Coordination. A gap may exist between their understanding of the written environmental guidelines and their ability to execute the appropriate actions. By the same token, the Environmental Unit staff expressed not only the desire for additional practical training but also the need to hire additional technical staff. Nonetheless, an important step that the Unit has taken to improve DV's environmental management has been to work with CONAF in establishing more opportunities for coordination between the two agencies. CONAF and DV have drafted management plans, scopes of work for projects, systems for information exchange and other mechanisms that can help to improve coordination and capitalize on each agency's expertise.

Table 3.2 Environmental Management Measures: Arica - Tambo Quemado Highway Construction Project

Domains	Pre-Project (1990)	During Implementation (1990-1995)	Post-Project
Legislation	National Environmental Commission established to coordinate environmental management of State ministries (including Public Works and Department of Roads), analyze policies, develop norms and guidelines, and enforce regulations on all aspects of environmental protection.	Environmental Base Law 19.000 (1994) established environmental management system and outline process of impact assessment. SEIA - System of Environmental Impact Assessment categorizes projects and method of assessment. Individual ministries devised own guidelines; assessments only on a voluntary basis during the period of 1994-1997.	Standardized enforceable environment impact regulations approved (1997). Establishes review periods and procedures for Environmental Impact Study or Declaration, publication in Official Record and local newspaper where project is planned; includes citizen access to documents and comments.
Organizational Structure	Within the Department of Roads there existed no Environment Division.	Environmental Unit of Department of Roads established in 1990-1991 as Bank requirement for Project; strategic recommendations for Unit's consolidation in 1993 *Estudio de Fortalecimiento Ambiental.*	Many steps remain to fully empower DV's Environmental Unit as a viable, effective entity. Unit does environmental inspection and assessment of only 1% of MOP's road projects.
Technical Norms	No specific norms.	First road construction project in Chile to directly incorporate measures for environmental protection and mitigation of negative impacts.	Environmental guidelines required in all DV road building and maintenance contracts with no official decree for contractual stipulations; only an internal policy that has generated conflicts.
Training	DV Environmental Unit did not exist.	Training activities carried out with the Department of Roads.	CONAMA deficiency in environmental specialists is being addressed by current training programs. Continued need in DV's environmental unit and in the Parinacota field office.
Equipment	DV Environmental Unit did not exist.	Environmental Unit office equipped.	Basic office equipment exists; need for increased vehicular support to inspect projects.
Information Exchange	DV Environmental Unit did not exist.	For environmental components of Project, new channels of communication created within MOP and, Department of Roads, & outside agencies.	Improving among Ministry of Public Works, Department of Roads, Environment Unit, CONAMA, COREMA, and CONAF.
Decentralizing Capacity	Virtually none within the Department of Roads for environmental management.	DV's small Environmental Unit is headquartered in Santiago with no regional offices; COREMA (Regional Environmental Commission) offices operate in all 13 regions.	DV's provincial offices of Arica and Parinacota have responsibility of the road into two segments. The Arica office maintains the first 87 kilometers (Ruta 11) and the Parinacota office in Putre from kilometer 88 to 193 at Bolivian border.

3.9 CONAF Staff Presence. Within the ***Parque Nacional Lauca,*** there are eight guards and one administrator who maintain a field office (and ***refigio)*** in the virtually deserted village of Parinacota, a historic site of only 17 residents, except for during religious festivals. The ***refigio,*** CONAF's largest, provides rustic accommodations to researchers studying the natural features in the region. CONAF staff is short-handed and without sufficient resources to carry out effective monitoring activities. During the period **of** 1980-1990, between 7,000 and 8,000 outsiders visited the ***Parque*** annually, generating an average of 200–300 vehicles per day. With 11 to **15** guards, CONAF could provide improved coverage in the three contiguous parks. At present, CONAF is developing its next 10-year management plan for the ***Parque Nacional Lauca.***

D. Sustainability

3.10 Challenges in Region **I -** Interoceanic Transport Corridor **.** One of the **main** causes of "wear and tear" on the Arica-Tambo Quemado road **has** been the increase in traffic, especially to and **fiom** Bolivia, a country that depends on Arica's ports for shipping products abroad. (Bolivian tourists also travel the road in increasing numbers during the summer months to reach Arica's beaches.) The Minister of Public Works announced Chile's participation in an ambitious new international road development program in August 1997 that would further increase international traffic **on** the Arica-Tambo Quemado road. Touted **as** key to Chile's economic **growth,** the proposed "bi-oceanic corridor" would link the Pacific and Atlantic Oceans via Peru, Chile, Bolivia, Paraguay, Argentina and Brazil.

3.11 Road Conditions. While many sections of the road (both rehabilitated and "newly-paved") are in acceptable condition, several stretches are in very poor shape, and at one point washed away due to excessive rains in February 1997. This situation is a reflection of natural conditions such as extreme temperature, topography, as well as inadequate maintenance. Given the relatively low volume of traffic, however, (200-300 vehicles per day), such attrition falls short of the durability one would expect from such an investment. Part of the problem results fiom road design that did not include embankments on stretches through the mountains. The road **was** constructed for maximum speeds of 40 k/h **on** curves and 70 k/h on straightaways. Heavy trucks traveling in excess **of** these speeds tend to displace their weight centrifugally causing a shifting of the surface pavement that becomes vulnerable to subsequent abuse by additional traffic. Therefore, the current road is in **no** condition to function as an interoceanic corridor which would require massive and extensive further investments with significant and potentially damaging impacts on the ***Parque Nacional Lauca Protection of Chilean Culture.***

3.12 External Assistance. Nationally, CONAMA **has** received and continues to receive significant financial and technical assistance from the IDB and the World Bank to strengthen the EIA system, develop norms, and complete the myriad other tasks that the consolidation of a new institution requires. The IDB project involves over **US$2** million in non-reimbursable financing for the training of government officials, the design of a public environmental education and information program, and the development of training courses for private sector companies on environmental standard compliance. In addition, the IDB Project provides technical assistance to CONAMA to improve its management capabilities.

3.13 CONAMA's Strategic Plan. A current World Bank project includes a five year effort (1994-1999) at a cost of $32.8 million ($11.5 million fiom the Bank and $21.3 million from the Chilean government) to develop and implement CONAMA's 1994-1997 Strategic Plan **and** to develop institutional capacity in the priority sectors **of** forestry, mining and industry in general. The main components of the 1994-1997 plan are the development of environmental legislation; incorporation **of** environmental impact assessment in public and private sector investments; implementation of an environmental management training program for the public sector; design of a national environmental data system; creation of an environmental education program and resource center; **and** the introduction **of** environmental economics concepts into public sector decision-making processes.

E. Bank Guidelines and Supervision

3.14 This was the first road construction project in Chile to directly incorporate specific measures for environmental protection and for the mitigation of possible negative impacts.

3.15 The IDB Loan Contract stipulations for the Arica-Tambo Quemado road arguably led to greater public and private scrutiny and more hands-on environmental management that the average DV road project.

3.16 For this Project, Headquarters proved to be agile and responsive to the Government of Chile's request for financing submitted in mid-1990. The Board of Directors approved the Loan on December 19 of that same year followed by Contract signing on March 18, 1991.

3.17 The Country Office interacted quickly and efficiently with the executing agency in order to meet its requirements. With regard to the environmental management component, Bank staff provided valuable orientation and feedback for DV's institutional capacity analysis and guidelines for environmental impact studies.

3.18 Site inspections of civil works on the Arica-Tambo Quemado road and evaluation of potential impacts in Parque Nacional Lauca also provided the basis for Bank staff to contribute to the mitigation and monitoring agreements between DV and CONAF. The contractual conditions of this Project were well focused on key components, realistic and achievable.

F. Lessons

3.19 For Projects and components which involve the National Forest Service and its protected areas, the Ministry of Public Works and CONAF could collaborate more productively if these two agencies prepared norms of conduct and specific guidelines to assure that protected areas are buffered against the potential negative impacts of infrastructure projects. The design of operations should reflect appropriate agreements "upstream" given that CONAF has no mandate nor capacity to carry out research, nor to analyze and evaluate technical studies contracted by the Department of Roads once implementation is underway.

3.20 Park officials recommend that a guard station be established at the entrance to the *Parque Nacional Lauca* to provide information, maintain displays, and distribute brochures. There is also a urgent need for much larger warning signs that indicate vicuña crossings. Trash along the road and its collection present a challenge. Without receptacles and environmental education measures, this problem will tend to exacerbate with increased traffic. Currently, park guards *are* responsible for trash collection along pre-determined segments of the road. CONAF's budget is minuscule and pays only for salaries, park stations, and fuel. Fees charged tourists and researchers at *refugios* (5,000 pesos/night) revert to the regional office and to Santiago.

3.21 The relatively isolated placement in the institutional structure handicaps the Environmental Unit's (DV) ability to interact with other departments much less establish an effective system of coordination and cooperation. However, for some projects with very significant impacts, the Unit carries out assessments, some project monitoring, and attempts to include environmental guidelines and procedures for use throughout the agency. All road building and maintenance contracts require the inclusion of environmental guidelines (global maintenance contract system). Non-compliance can result in financial penalties to contracted parties. There is no official decree, however, regarding these contractual stipulations, only an internal policy that has led to a number of conflicts between DV and contracted companies and between DV and affected public groups.

3.22 The CONAMA system is not well integrated vertically. Beyond the regional environmental commissions (COREMAs), there is weakness at the local level for the supervision and regulation of projects. In fact, CONAMA needs the involvement of both non-governmental organizations and local governments, some of which have well-organized environmental units. The politics of decision making, according to participants in the consultation, often run counter to technical recommendations. CONAMA's ambitious capacity building program, however, appeared to be well underway during the evaluation team's field visit. A World Bank project occupies two entire floors of

CONAMA's Santiago office. **As** it is both the creator of the "rules of the game" and the agency that applies the environmental standards, **CONAMA** will need time to mature into an effective institution capable **of** keeping pace with the country's fast-growing economic development. **CONAMA** is beginning to take stock of Chile's resource base, address pollution and other environmental problems, develop a cadre of environmental professionals and other actions that could result in it being a key steward of the country's natural resources.

Table 3.3 Chile - Environmental Policies and Directives: Legal and Institutional Framework (1990-1998)

	1990 National Policy	1994 National Legislation	1994-1997 Interim Period	1997 Environmental Regulations	1998 Projections
NATIONAL	CONAMA established to coordinate environmental management of State ministries; analyzes environmental policies, develops norms and guidelines, serves as information and communications center, enforces regulations on all aspects of environmental protection.	Environmental Base Law 19.300 (March, 1994). Established environmental management system and outlined process of environmental impact assessment (however, not enforced until regulations approved in April 1997). SEIA (Sistema de Evaluación de Impacto Ambiental) determines types of projects subject to analysis and method of assessment (in-dept Impact Study or shorter Impact Statement). CONAMA (Santiago) responsible for SEIA and review of interregional and national projects.	Individual ministries devised their own environmental guidelines; public and private sector projects subject to impact assessments *only on voluntary basis*; between 1994-1997, CONAMA evaluated some 160 projects values at $17 billion.	Standardized environmental impact regulations approved. Review period for Environmental Impact Study is 120 days; for Statement (also, Declaration), 60 days; after study is presented to CONAMA, project proponents are required to publish abstract of Study in the Official Record and in a local newspaper in capital of the region where the project is to be executed or in a national newspaper; citizens organizations have 60 days to present comments to CONAMA and have access to Study documentation; CONAMA required to take public comments into consideration before decision.	Estimated that in 1998 alone, CONAMA will review 1,000 environmental impact statements and 100 in-dept impact studies on projects valued at $16 billion.
REGIONAL	COREMAs are regional environmental commissions in each of Chile's 13 Regions; each presided over by an *Intendente*; includes region's governor, regional ministers of the Ministries that form CONAMA's Directive Council, regional advisors, and the regional director of CONAMA.	COREMAs are responsible for approving or rejecting environmental permits for all other projects.	On a voluntary basis, public and private sector projects subject to environmental assessment.	Same regulations apply to environmental assessment process at the regional level.	Projected increase in environmental review activity by the regional environmental commissions.

4

Brazil – Highway Rehabilitation Project (Phase I), State of Ceará

A. Project Background

4.1 Loan Context, In accordance with the 1987-1991 State Action Plan, the Roads Department (DERT) had signed 13 service contracts in mid-1988 to rehabilitate 15 segments of road totaling 725 kilometers. The State of Ceará financed these operations with its own funds at a cost of approximately US$2 million per month during an implementation period of 18 months. By July 1989, an estimated 68% of this activity had been completed. Due to equipment shortages at the field offices, the Roads Department carried out routine maintenance on these improved segments using machinery rented fiom private companies. Members of the Bank's analysis mission inspected these works and judged them to be of acceptable quality. The Bank-supported Program was intended to provide continuity to this effort already initiated by the State.

4.2 Project Objectives. The Project had two basic objectives, namely: 1) rehabilitate 1,400 kilometers of paved roads in order to improve conditions for economic activities in the State of Ceará, including tourism, and enhance the shipment of industrial and agricultural products; and 2) provide the State Roads Department with the means necessary to maintain and operate the road network efficiently and safely. The evaluation focused on this second institutional objective.

4.3 Maintenance Component, In the case of Ceará, the Project primarily addressed the rehabilitation of existing roads (not the construction of new ones) within 40-meter rights-of-way. As such, there was virtually no disruption nor removal of existing settlements nor interventions detrimental to economic activities. At the same time, roads as built environment can have significant impacts on contiguous, even more distant, natural environmental features. Potential impacts are evident both during construction and vehicular operation. At these stages road deterioration continues to pose a threat of disturbance to natural surroundings. Prevention of road degradation through proper maintenance, therefore, can minimize the chance of environmental damage. Effective and efficient road maintenance can mitigate such effects as erosion, local landslides, sedimentation and run-off into agricultural fields, water contamination, and destruction of vegetation and wildlife habitats. For this reason, the evaluation of this Project focuses on the road maintenance systems and practices of DERT manifestations of the institution's environmental management capacity as a whole.

Table 4.1 Main Components and Outputs

- Rehabilitation of paved roads (within a 4-year period, 1,400 kilometers), improved drainage, construction of bridges and structural repairs or replacement, fences, signs, landscaping, and environmental preservation
- Maintenance, operation and control of roads, establish 15 new inspection stations, acquisition of vehicles, tools, communications apparatus, and laboratory materials
- Civil works, 4 new field maintenance offices established, remodeling of offices and transit control posts, and building a training center in Sobral
- Training - 960 management, technical and operational personnel

B. Regulating the Use of the Environment

4.4 National Transport Policy. A federal law of 1973 established the National Transport System to coordinate road and railway modes and infrastructure, navigable river and port activities, and airlines and airports. The Constitution of 1988 defined the specific guidelines for each of these modalities. Regarding roads, emphasis was placed on the conservation and rehabilitation of those segments located along exportation corridors including secondary roads as well as those civil works already in execution.

4.5 Transport Sector Program (1986-1989). Within this context the Ministry of Transportation launched the Program for the Development of the Transport Sector (PRODEST) to harmonize and integrate the various transport modes in order to reduce economic costs to the country as a whole. For the roads component, the Program established the priority of maintaining and operating the existing network. In addition, the administration of regionally important roads under the jurisdiction of the National Roads Department (DNER) would gradually be transferred to the states.

4.6 State Plan (1987-1991). In accordance with national policy objectives for the transport sector, the State Government of Ceari gave road rehabilitation the highest priority among all state public sector investments. The goals were to rehabilitate and maintain 2,263 kms of road as well as maintain another 3,586 kms during the same period. Increases in the shipment of raw materials and final products, and in passenger traffic depend on timely and efficient movement on roads that are kept in good condition. Because of their relatively high intensity of economic activities, priority regions for investment included Sobral, Crateús, Quixada, Crato and Juazeiro do Norte, the main export and import corridors and state tourist attractions.

4.7 Federal Guidelines, the Norm. Throughout Brazil since 1974, the construction of both federal and state roads and highways followed the guidelines of the National Roads Department (DNER) as contained in the *Especificações Gerais para Obras Rodoviririas.* The environmental provisions of that document were largely restricted to erosion control by protecting exposed built-up areas on the roadside with grass, bushes, and trees, by planting on construction material extraction sites, near water courses, and drainage works. A companion document, *Manual de Conservação Rodoviária*, published in the same year, limited its environmental guidelines to the cleaning of road drainage systems, roadside slopes, excavations, tree cutting, and safety instructions. For a period of 20 years, all state road departments in Brazil utilized these federal specifications as the basis for their own construction and maintenance practices.

4.8 State of Ceará Guidelines. In September 1994, Ceará became the first Brazilian state (among very few) to develop and publish its own set of standards and specifications for road construction and maintenance operations (*Especificações Gerais para Serviços de Obras Rodoviarias).* Furthermore, the Ceará Highway and Transportation Department's (DERT) 699-page manual contains an entire chapter addressing measures for the protection of natural features.

C. Effectiveness

4.9 **Project Execution.** This Project was designed to rehabilitate 1,400 kilometers of paved roads and to provide the State Roads Department with the means necessary to maintain and operate the road network efficiently and safely. The executing agency far exceeded the first objective by reaching a target of nearly 1,900 kilometers of improved roads.

4.10 **Organizational Structure.** By 1992, DERT altered its organizational structure, eliminated several upper-level positions, and began the process of overall staff reduction. The introduction of annual maintenance plans (in accordance with Loan contract clauses) for the duration of the Program, and beyond, contained an articulation of state road policy and its implications for implementation. Gradual staff reductions were accompanied by an intensification of training to increase personnel capacity to carry out refurbished mandates. The introduction of privatized maintenance workers also reflected decisions to streamline operations for greater efficiency and effectiveness. The Department of Operations (DEOPE) decentralized both equipment and added responsibilities to the maintenance office in the field leading to collaborative efforts, mutual support systems, and "horizontal" resources sharing diminishing an excessive dependence on DERT headquarters in Fortaleza.

4.11 **Information Exchange.** Periodic rotation among senior field office staff has been a vehicle for information exchange, standardization of norms and procedures, and the transfer of knowledge for the solution to road maintenance problems. The evaluation team inspected improvised machinery which had been "invented" to respond to specific needs. Some training exercises also exposed a serious need and demand for an adult literacy program to enhance the capacity building process. Recognition of this deficiency among workers led to the creation of such a program. Machine maintenance and repair take place on Fridays. Staff presence at the field office on this day provides the opportunity for literacy classes, a prerequisite for effective technical training.

4.12 **Decentralized Capacity for Routine Maintenance and Emergency Response.** According to the Project Report (December 5, 1989), the Department of Operations had a total of 1,324 workers (69% of the Highway Department's roster). Fully 91% of DEOPE's staff operated out of the 20 maintenance field offices (*Unidades Residenciais*) - grouped within four macroregional divisions. The Supervisor of each region is responsible for road conservation activities within his/her jurisdiction and for management interactions between Headquarters in Fortaleza and the field offices. **Prior to the Project, deficiencies impeded the operational effectiveness and efficiency of these outposts.** For example, they had no traffic volume measurement and safety units; physical installations were inadequate and dilapidated; the machine workshops in disrepair and lacking space; insufficient equipment, vehicles, and machinery to carry out required road services. These conditions resulted in little or no maintenance of the state road network; nor did the state invest in the formulation of equipment and staff plans for these facilities. Consequently, during this period, the mitigation of negative environmental impacts did not rank as a high-priority concern.

4.13 **Integration Among Field Offices and Headquarters.** Prior to the Project, residencial field offices were largely isolated from central decision making. Currently, however, they are members of the *Comissão de Fiscalização*. As such, they are no longer excluded but actively collaborate as partners in all phases of new construction projects as well as with subsequent maintenance operations, thereby fostering a vertical integration with DERT headquarters at the state level. **This decentralization also allows the field offices to be more responsive to local needs in the region they serve.** With regard to the local environment, people are dependent on the water collected in *açudes* (natural or man-made ponds) for irrigation, drinking, and home use. The field office engineers demonstrated an awareness of the importance of these ponds and for protecting them in their road maintenance activities. Given these increased responsibilities within the network, DERT intends to place an extra engineer in selected field offices.

Table 4.2 Environmental Management Measures: Highway Rehabilitation Project (Phase I, State of Ceará)

Domains	Pre-Project (1989)	During Implementation (1989-1996)	Post-Project
Legislation	National Transport Policy (1973) National Road Department guidelines (1974) Federal directives for conservation and rehabilitation on export corridors (1986) Ministerial integration of transport system (1986-1989) Ceará State Environmental Policy (1987) State policy: rehabilitation, maintenance (87-91)	DERT begins to establish parameters of maintenance policy, concepts for evaluation of road conditions (1993)	National Roads Department issues highway manual for environmental conservation, monitoring and control (1997)
Organizational Structure	Within the Department of Roads there existed no Environment Unit	DERT organizational structure altered (1992) GEMA - Executive Environmental Group set up in DERT for Program (1996)	Environmental Unit is established within DERT (1997)
Technical Norms	General national norms adapted to state operations as required.	Ceará, first Brazilian state to develop own set of road standards, specs for natural features (1994) DERT issues guidelines, specs for control of environmental impacts from operations (1996)	DERT issues 2-volume environmental evaluation report for Phase II of Program with standards for licensing civil works projects and environmental impact analysis of road segments in Phase II (1997)
Training	Periodic technical training without specific environmental focus.	Extensive training activities carried out through Project with the Department of Roads, in headquarters and in maintenance field offices.	Continued emphasis on environmental training through Phase II and through independent (DERT) initiatives
Equipment	No traffic volume measurement and safety units; field office dilapidated; machine workshops in disrepair, lacking space, equipment, vehicles.	Maintenance equipment inventoried (1992) All Program equipment acquired and allocated to maintenance field offices (1995)	Equipment well-maintained
Information Exchange	Non-systematic, vertical, precarious; DERT had no computers and no mechanism to set up and administer the Program	Hardware and software acquired to monitor engineering services, personnel management, processing of legal matters, accounting. Horizontal integration achieved through rotation of field office heads and other personnel, sharing information, experiences, know-how	DERT possesses modern logistical support including new equipment for road maintenance, for the operation and control of traffic, inspection and control of truck cargo weight; direct computer linkages with maintenance field offices.
Decentralizing Capacity	20 residential field offices largely isolated from central decision making	Field offices actively collaborate as partners in all phases of new construction projects as members of the Comissão de Fiscalização	Field offices actively collaborate as partners in all phases of new construction projects as members of the Comissão de Fiscalização

D. Sustainability

4.14 **Toward Integration. Terms of reference for construction and rehabilitation projects, unlike before, currently contain provisions to ensure safety and appropriate environmental management. In** addition, DNER contracted two private **firms** to prepare **manuals** with **norms** for environmental protection, one dealing with conservation and the other **with** monitoring. Ceari currently even has its **own** norms specific to local circumstances which is an extremely rare accomplishment at the state level in Brazil. These standardized and well publicized documents assure a working knowledge of procedures designed to foster, as DERT personnel affirm, an "environmental mentality" within the organization.

4.15 **Maintenance.** The conservation and repair of road maintenance equipment is assured through contracts often with the manufacturers or their authorized representatives. The central repair facility in Fortaleza, moreover, is linked with repair workshops at the field offices installations. Vehicle and equipment maintenance is controled in accordance with specifications and scheduling contained in the ***Manual: Manutenção de Equipmentos***. Repair jobs are meticulously registered in ledgers indicating specific actions and person responsible.

4.16 **Subcontracts. The training component fully achieved its intended targets reaching administrative, technical, and operational personnel.** The executing agency sought and received cooperation for training activities **from** ASTEF (Engineer Paulo de Frontein Technical and Scientific Association) linked to the Federal University **of** Ceari. Training for the civil works components was carried out by SOEC (Civil Works Superintendency of the State of Ceará). Fully 2,067 trainees participated in these upgrading activities indicating that individual staff members engaged in several courses offered through the Project.

4.17 **Equipment and Maintenance Facilities. Before this Project, DERT had no computer equipment which meant that there was no mechanism to set up and administer the Program. This** situation changed with the acquisition of hardware and software to monitor engineering services, personnel management, the processing of legal matters, and other activities within the State's Integrated Accounting System. At present, DERT possesses modem logistical **support** including new equipment for the road maintenance, for the operation and control of traffic, inspection and control of truck cargo weight.

4.18 **Post-Project Developments.** The earlier guidelines initiatives were followed by detailed and comprehensive norms and procedures resulting from Bank agreements for Phase II of the Road Program. The ***Manual Rodovicirio de Conservação, Monitorarnento e Controle Ambientais*** (January 1997) establishes appropriate terminology and concepts related to conservation, directives for environmental management and monitoring during both construction and operation, procedures and frequency, with special attention to corrective measures to recover areas which had been degraded by civil works in the past. The two-volume ***Relatório de Avaliação Arnbiental, Prograrna Rodovitirio de Integração do Estado do Cearti II*** (March 1997) contains specific standards to be used in the licensing of civil works projects. Volume II provides a detailed environmental impact analysis of 15 segments **of** roads included in Ceari 11.

4.19 **Phase 11.** For **this** Project, Bank guidelines and supervision with regard to environmental management were **both** appropriate and instrumental. Within the State of Ceari, the Department of Roads **has** also taken important initiatives by formulating its **own** procedures and standards for construction, road rehabilitation, and the mitigation of potential negative impacts on the **natural** surroundings in its jurisdiction.

E. Bank Guidelines and Supervision

4.20 **Road Rehabilitation Program, Loan Contract Clause 6.05 - Conservation of Civil Works.** The Contract stipulates that the Highway Department maintain the civil works of the Program in accordance with generally accepted technical standards. Furthermore, for a period of 10 years after completion ***of*** initial construction activities, the implementation agency **is** to present to the Bank **an** annual maintenance plan for **both** civil **works** and equipment. The Bank-required maintenance plans did not include specific environmental reporting. Proper maintenance, however, was to take into account environmental considerations such as those outlined in the 1994 Manual and the more detailed 1997 Manual, referred to above. The initial 1992 Maintenance Plan established a model and basis of comparison for annual plans required in subsequent years.

4.21 **Guidelines.** This evaluation focused on the the agency's capacity for environmental management of public sector infrastructure investments and civil works maintenance. In this regard, both **Bank guidelines and staff efforts proved instrumental in effectively supporting the process which took the Roads Department from timid, incipient steps to an advanced stage of consolidated policies and transparent procedures for environmental management.**

4.22 **Project as Catalyst.** Prior to this Bank-supported Program, the State of Ceará had already demonstrated commitment and had allocated significant local resources to rehabilitate and maintain its road network. Most recently, since 1986, the Development Plan of the New Republic, federal laws, along with the 1986-1989 Development Program of the Transport Ministry established the legal and institutional framework at the national level which provided incentives for policies and directives for transport strategies within the State of Ceara (1987-1991). Building on these initiatives, the **Program itself sewed as a catalyst not only for further road improvement operations but also for institutional changes within DERT** conducive to adherence to environmental guidelines. Local counterpart funds for maintenance reached US$11.2 million, or 84% of total investments for this component. In addition, DERT was responsible for all training activities and actually allocated 30% more resources to this activity than originally budgeted.

F. Lessons

4.23 This Program provides a good example of what can be accomplished by a design that is compatible with available implementation resources, political will at the state government level, and local initiatives to put legal and technical systems in place for effective environmental management. The process of institutional strengthening within DERT continues into Phase 11, with the establishment and operation of DERT's own environmental unit and staff.

Table 4.3 Brazil - Selected Transportation Policies and Directives: Legal & Institutional Framework (1973-1991)

	1973	1974	1986	1986-1989	1987-1991
FEDERAL	Federal Law 5917 - September 10, 1973 National Transport Policy established Defines national transportation system (surface, sea, air)	National Roads Department publishes: 1. "General Guidelines for Road Construction" 2. "Manual of Road Maintenance" Environmental concerns limited to erosion contrl dainage systems	Law 7486 - June 6, 1986 Development Plan (I) of the New Republic Establishes directives for each mode of transportation -------- For roads, directives for conservation and rehabilitation on export corridors	Transport Ministry Development Program - Integration of transport system -------- For roads, priorities: maintenance and operation of existing roads; gradual transfer of regionally important roads from jurisdiction of National Road Department (DNER) to administration by states	
STATE OF CEARÁ		Decree 10722, March 14, 1974 System established for the construction of roads according to federal and municipal directives and considered priority by State Government		Law 11.411 (12-28-87) establishes State Environmental Policy, COEMA - State Environmental Council, and SEMACE - State Environmental Superintendency to enforce norms for environmental protection and to issue operating licenses for potential polluting activities	Plan of Changes - Ceará State policies and actions -------- For roads, network expansion, production-market and interregional linkages, rehabilitation and maintenance. Targets: rehab and maintenance of 2,263 kms: maintenance of another 3,586 kms.

Table 4.4 Brazil - Selected Measures for Road Maintenance and Environmental Management, Program Phase I and Phase II (incipient)

	1992	1993	1994	1995	1996	1997
FEDERAL					National Roads Department (DNER) publishes "Resident Engineer's Manual for Land-Use Planning Along Federal Highways"	National Roads Department (DNER) publishes "Highway Manual for Environmental Conservation, Monitoring and Control" with special attention to corrective measures to improve degraded areas from past civil works
STATE OF CEARÁ	DERT: Organizational structure altered Management downsized for efficiency Studies initiated to reduce staff overall Norms, performance standards established; required resources identified Maintenance equipment inventoried	DERT: Begins to establish parameters of policy and related maintenance activities Introduces concepts and parameters for evaluation of road conditions Staff reduction in progress	Ceará becomes first Brazilian state to develop own set of road standards and specifications with entire chapter on protection of natural features Contracts with Federal University: pavement analysis and management, cadastral surveys of network, system of traffic volume counting and weighing of trucks DERT staff reduction in progress	All Program equipment acquired and allocated to decentralized maintenance field offices DERT staff reduction in progress	DERT issues "Environmental Guidelines for Highway Operations" DERT issues "Additional Specifications for the Control of Environmental Impacts from Highway Operations" Partial privatization of maintenance workers (24% of total) GEMA - Executive Environmental Group set up in DERT for Program (Law 12.488 establishes state forestry policy)	DERT issues two volume "Environmental Evaluation Report for Phase II of Program" Contains specific standards to be used in the licensing of civil works projects Volume II provides detailed environmental impact analysis of road segments in Phase II Environmental Unit is established within DERT Partial privatization of maintenance workers (25% of total)

5

Chile – Pehuenche Hydroelectric an# Associated Transmission Project

A. Project Background

5.1 Project Description. The objective of the Pehuenche Hydroelectric Project was to harness part of the hydroelectric potential of the Maule and Melado River systems to satisfy the growing demand for electrical energy in the country in the late 1980s. The main feature of the Project was the construction of a 500 megawatt electrical generating facility that would supply electricity to the Central Inter-Connected System grid.

5.2 Components. The Project's four major components included: 1) system for capturing water through a diversion and tunnel on the upper Maule, below the existing power facilities, that would take water through a mountain and deposit it in the Melado River Reservoir, upstream from a dam built across the river. (The dam raised the level of the Melado River thereby allowing it to be diverted through another tunnel back towards the Maule River at a point above the power station; 2) power station and its various elements; 3) roads and related transport infrastructure; and 4) transmission lines.

5.3 Impacts on the Maule and Melado Rivers. ENDESA, the National Electric Company, produced an environmental impact study in May, 1986. The report stated that, because many of the most important works of the project would be underground, the project would not "provoke relevant alterations related to the environment", only a "few small and localized negative impacts". On the other hand, the report candidly cites the fact that for 78 percent of the time, all of the water of the Maule River would be diverted into the tunnel, thereby drying up the river for a distance of 12 kilometers. Similarly, in the case of the dam on the Melado, this river would be dried up for a distance of approximately 5 kilometers to its confluence with the Maule. The rivers diversion has proven to be the most contentious issue to the present day.

Table 5.1 Environmental Management and Mitigation Component

• Program to safeguard the existing Melado Valley parrot colony and contribute to further understanding of the behavior of the species
• Study of the vegetative composition of the forests to be flooded and measures to safeguard rare or endangered species
• Study of the ichthyology of the Maule and Melado River systems
• Slope protection through reforestation

B. Regulating the Use of the Environment

5.4 **Pre-CONAMA. This** Project (1987-1992) preceded the establishment of the National Environmental Commission in 1990 and the Environmental Base Law of 1994 that introduced the management system and the process of environmental impact assessments (not enforced, however, until its regulations were approved in 1997).

5.5 ***Dirección* General *de* Aguax** DGA took on new competence as an institution with the introduction in 1984 of the Law of Water Rights. Still, historically its activities have been mainly concentrated on settling water rights questions and on measures **to** avoid or mitigate water contamination. More recently, the agency has become involved in the review of hydraulic systems. A conflict between the Colbun and Pehuenche companies regarding water rights and flows was finally resolved in court. In *this* case, DGA became involved only to offer expert testimony, and not to referee or finally judge in any decisions.

5.6 New Activities. Beginning in 1989-1990, DGA adopted new practices **on** a permanent rather than periodical basis, as was the case prior to **this** period. Critical in **this** regard **was** the establishment in 1990 of the ***Departamento de Conservación y Protección de Resursos Hidricos.*** From that time onwards, environmental concerns were included in the preparation of projects. Furthermore, apart from **this** function, DGA has sponsored independent region-wide studies related to water resources, studies relevant to defining the boundaries of protected areas, surveys of lake water quality, and irrigation resources. When studies are contracted with universities, **this** collaborative relationship generates much needed financial resources to the academic institutions and to individual departments for equipment, staff, and student **support.** Furthermore, these institutional contracts (rather **than** agreements with individual autonomous researchers) enhance and guarantee a high quality of work under the auspices of the university's name and reputation.

C. Effectiveness

5.7 Design and Implementation:

- The design of **this** Project did not include all the studies that would have been necessary to determine the full and important impacts **of** the infrastructure investment.
- **The** design of **this** Project did not include sufficient and appropriate provisions to ensure environmental stability.
- The implementation of this Project did not take place within an overall framework consistent with an integrated approach to sound watershed management.
- During the design, implementation and operation of **this** Project, there **was** little evidence of effective efforts to establish mechanisms or lines **of** communication (either formal or informal) **to** incorporate key affected parties in the discussion of Project components and ramifications.

5.8 Impacts:

- Hydro-power **users** and downstream irrigation farmers continue their conflict over water **rights.**
- The Pehuenche Project demonstrates **that,** along with the other ***centrales* within** the Maule and Melado river system, the use of water resources for one predominant purpose (in **this** case, hydro-power) can effectively preclude other uses.
- The Project **Report** indicated that ***this*** Project would have a positive impact on tourism development in the region. **This** has not occurred.

5.9 Out-Sourced Environmental Study. At the time of the initial environmental examination of the design for the hydropower plant, the Pehuenche Electric Company was just being formed. A consultant under contract to ENDESA carried out the preliminary environmental impact study (1986). Although borrower for the loan and signatory to all of the contractual clauses related to the environmental studies, management and mitigation, Pehuenche S.A. out-sourced all of these activities. During interviews with company hierarchy in Santiago, the respondents expressed little conviction about the need for environmental measures which they felt the company was obliged to put in place in order to obtain the loan. They remain unconvinced of the utility of environmental review, and somewhat antagonistic of it as "a brake on development". Nevertheless, according to the records and recall of several of the "environmental" consultants (University of Chile, CONAF, University of Talca), the company provided all of the support and assistance they required to carry out their own individual studies.

5.10 Uneven Response. Furthermore, CONAF reports that the Company took extra measures to attempt to protect the endangered parrots, including re-routing one of their access routes to the dam site, and issuing specific instructions to construction contractors and staff to protect the birds. Project records, however, portray the Company in a relatively passive role of furnishing periodic reports to the Bank on the activities being undertaken, without either affirmative actions or commentary on the reports as furnished to them. At the present time, the Technical Management unit of the Company, run by electrical engineers, has, in their own words, few real concerns about the environmental dimensions of the power plant and its installations and no resident staff capabilities for dealing with issues of *this* nature should they arise.

5.11 Ad Hoc Contracting. This is probably a reasonable posture on their part as the plant is now operating, as was its design, with a minimum core staff of highly competent professionals using modern computerized, remote controls. The Company continues to out-source certain services, especially routine periodic maintenance. They further recognize that should environmental issues arise, the field of consultants and contractors available to assist them in dealing with these issues is even wider than it was during construction of the facilities.

5.12 Parrot Experience. The National Forest Service was recruited to carry out the activities related to the protection of the endangered species. This choice of institutional contractor was most appropriate because of their on-going mandate and programs related to endangered species nationwide, and in particular, because of their evident predominant capabilities in the case of this species. To its credit, CONAF is continuing its own program of protection of the species and population surveys they have carried out suggest that the parrots have recovered and even increased their numbers in the project area. They have also been rather forthright with the lessons learned fiom the captive breeding activities and caution against the need for such an interventionist program in the future under similar circumstances.

Table 5.2 Environmental Management Measures: Chile – Pehuenche Hydroelectric and Associated Transmission Project

Domains	Pre-Project (1987)	During Implementation (1987-1992)	Post-Project
Legislation	Código de Aguas (1981) establishes minimum ecological flows from hydraulic civil works Law of Water Rights (1984) National Energy Commission and Strategy Three-Year Program of Energy Investments (1986-1988)	National Environmental Commission established to coordinate environmental management of State ministries (including Public Works and Department of Roads), analyze policies, develop norms and guidelines, and enforce regulations on all aspects of environmental protection (1990).	Environmental Base Law 19.000 (1994) established environmental management system and outline process of impact assessment. SEIA - System of Environmental Impact Assessment categorizes projects and method of assessment. Individual ministries devised own guidelines; assessments only on a voluntary basis during the period of 1994-1997. Standardized enforceable environment impact regulations approved (1997).
Organizational Structure	Dirección General de Aguas (DGA) focused mainly on settling water rights questions and on measures to avoid or mitigate water contamination.	DGA establishes Departamento de Conservación y Protección de Recursos Hídricos (1990) which includes environmental concerns in project preparation	DGA more involved in reviewing hydraulic systems
Technical Norms	General national norms adapted to [illegible] as required.	General national norms adapted [illegible] as required.	DGA (Department of Water Resources Conservation and Protection) plays important role interacting with CONAMA in the discussion of environmental norms.
Training	Periodic technical training without specific environmental focus.	Within Pehuenche Electric Company, no specific environmental training.	Within Pehuenche Electric Company, no specific environmental training.
Equipment	Pehuenche Company had no environmental unit and no equipment.	Pehuenche Company had no environmental unit and no equipment.	Pehuenche Company has no environmental unit and no equipment.
Information Exchange	Non-systematic, vertical, precarious; ENDESA prepares ecological profile of the Colbun reservoir (1985) and preliminary study of environmental impact of Pehuenche project (1986)	Pehuenche contracted the preparation of environmental studies (baseline data and analysis), with clauses explicitly prohibiting publication and dissemination of results.	As a private company, once watershed area falls under the jurisdiction of the power company, all information regarding the environment is also privatized for internal consumption only. DGA sponsors studies on water resources, defining boundaries of protected areas, lake water quality, and irrigation resources.
Decentralizing Capacity	Not pertinent to Pehuenche Electric Company or to Project	Not pertinent to Pehuenche Electric Company or to Project	Not pertinent to Pehuenche Electric Company or to Project

D. Sustainability

5.13 Watershed Management Program - CH0036 (with Bank financing). As an offshoot of an earlier Bank-supported activity (*Programa de Manejo de Cuenca*, 1993-1994), DGA attempted a follow-up to one of the recommendations of that program, namely, to formulate watershed master plans *(Plan Director).* Since the DGA does not currently have an overall policy for management at the watershed level, these plans for six pilot watersheds were intended to assemble elements to contribute to a global vision of what an overall watershed management policy for the country would look like. The first case was the Rio San José watershed in the I Region, where problems with aquifers and salinization are prominent. Each *plan director* was meant to be part of a strategy used as an instrument of communication to discuss with other stakeholders forming, eventually, part of a general regional plan for water resources. The University of Chile has been called upon to provide the conceptual framework for this activity. The Department of Water Resources Conservation and Protection has been an important player interacting with CONAMA in the discussion of environmental norms.

5.14 Budget Increases. For DGA, there have been some relatively important budgetary increases for water resources studies since 1990. Especially in 1994, the budget tripled for such studies, 3040% of which helped financed "environmental" studies. Broadly, this is due to a change in the director and changes in policy in 'this area. Study themes are decided at higher levels, presidential and ministerial, and by the director of DGA. At the same time, the chief of the Studies and Planning Department makes inputs and proposes studies and has sufficient autonomy and discretion to contract additional studies either through consulting firms or the universities.

5.15 Project Approval and Monitoring. DGA sits on the regional COREMA councils and provides opinions based on technical considerations. After project approval, with the exception of large ones, there is no follow-up or monitoring of what happens during implementation and operation of projects. This is the next challenge and, coming in 1999, DGA plans to take some initiatives in this regard.

5.16 Key Role. The DGA is another important player for the growing number of professionals and quality research that has emerged especially in the last eight years. The permanent practice of carrying out studies, mostly by contracting private firms or universities, represents a demand for which there has been a response. Still relatively modest, but increasing, budget resources for studies has been an additional incentive for the creation of firms and public sector (educational) teams to bid on studies related to natural resources. Furthermore, in addition to basic scientific studies which are useful for establishing key baseline data as referents for future comparison and evaluation, studies are increasingly requiring multidisciplinary teamwork, integrating professionals from various specialized areas. The pilot watershed management project, for example, involves DGA staff, a private consulting firm, and the university for conceptual input.

5.17 Recent Organizational Policy. As an institution, CONAF has been examining its role in this set of activities and within the framework of the current national legislation related to environmental impact assessments. Since the inception of the environmental impact review system in 1994, CONAF estimates that it has participated in more than 90 percent of the reviews which, at times, were far afield from its recognized capabilities in forestry and natural resources. CONAF personnel felt the organization was drawn into, and may itself have entered into, these environmental review cases because of it recognized expertise in the field. It is now organizational policy, however, to limit their involvement in EIAs or similar exercises to cases within their very direct purview and interests, i.e., mainly as concerns forestry issues. Their ability to take on this more selective role reflects a maturing of the capabilities for environmental review under the National Environment Commission (CONAMA) and its system for environmental impact evaluation.

5.18 Research Centers. The Universities have also proven themselves adept in performing the functions mandated for them under the basic studies related to vegetation and ichthyology. In both cases, the universities made it their business to propose and carry out a sound methodological approach despite the fairly vague mandates under which they were contracted. In general, they are an excellent choice for these types of studies which add to the basic knowledge of the environment and its ecosystems. Studies of this type provide faculty and students with opportunities to apply the premises of the basic sciences in living laboratory situations and thus enhance the teaching environment while accomplishing an important task. This demand for knowledge and research has had other effects such as the creation of new courses and the training of students in multi-disciplinary programs leading to increased expertise to address questions of environmental impacts, not just studies in basic sciences. Similarly, as independent

participants with their own rigorous academic standards, they can play an honest broker role in examining environmental impact.

E. Bank Guidelines and Supervision

5.19 Bank Leverage. This Project resulted in the sacrifice and/or serious compromise of natural resources (hydrological systems) in the Maule and Melado region. There is no apparent indication that Bank supervision took effective advantage of this Project opportunity to promote broad discussion of engineering design alternatives or other issues of interest to key affected parties. Rather than the outcome of decisions based on a conscious watershed management strategy, these effects emerged from Bank concurrence with key components contained in original Project and Loan documentation and in insufficient supervision of the "Project Evaluation Methodology" submitted by Pehuenche S.A. itself. This outcome highlights the need to invest appropriate time and other resources in the project design phase to take into account all major components of a watershed system for effective environmental assessments. This is particularly important in cases where the Bank's leverage is relatively weak, such as support to privatizing sectors of local economies, that is, once Projects are in the operational phase and/or when loans have been repaid by the borrower.

5.20 Supervision. Early on in the process of Project development the Bank demonstrated a commitment to the environmental review process and to putting appropriate mitigation measures in place. Further scrutiny indicates, however, that these efforts by Headquarters and the Country Office were not totally effective. The Office provided virtually no informed commentary on the actual findings and reporting associated with contractual clauses. Although there was at least one instance in a memo from Headquarters suggesting the need for examing the impact on the river ecology after the dam had been built, it appears that Bank staff was more anxious to expedite completion and compliance of these stipulations and proceed to other implementation activities.

5.21 Information Exchange. In addition to the non-involvement of several key affected parties (including local government authorities), Pehuenche S.A. was allowed to maintain total control over the contents of environmental studies. In fact, contracts with the universities explicitly prohibited publication and dissemination of scientific baseline data. As sole proprietor of information, the company neither shared the results nor allowed for the horizontal integration and exchange of research among the contracted university professors. This retention of data pertinent to the condition of natural resources in the area only heightens the distrust which prevails between the company and environmental groups. The Bank has a "key" role to stipulate emphatically that the results of such studies become fully available, in timely fashion, for public access by all interested parties.

5.22 Baseline Studies. Bank involvement in this Project resulted in the inclusion of a limited number of environmental studies, partly from the urging of agencies responsible for natural resources. These studies, however, were canied out before construction and, in no way, were designed to determine and measure post-Project impacts. These studies contain quality basic science data relevant to river basin conditions prior to investments. The Bank has a role to insist that such studies be used as baseline referents for Project monitoring during implementation and operational phases.

5.23 Issues Ignored. The Pehuenche Hydro-power facility is one of eight (existing or projected) plants designed to utilize the Maule and Melado river systems to generate electrical energy. For the most part, this master plan existed before ENDESA requested Bank support. One way or another, with or without IDB support, the plant would likely have been built. The environmental concerns raised and addressed were relatively minor; more crucial concerns (overall hydraulic regime of the river basin, allotments for irrigation downstream, fish populations, nature-based tourism, and minimum ecological flows) were largely ignored. The Bank has an important role to raise all major concerns, insist on their consideration and possible incorporation into Project designs, and remain attentive to their implementation.

5.24 Scoping. Following from the above, ENDESA and Pehuenche S.A. played passive roles in identifying environmental ramifications of Project implementation. As issues were raised by the Bank and CONAF, the companies responded to these modest and limited requests for studies (none of which would have altered pre-determined construction designs and construction already underway). In such cases, the Bank should incorporate

key parties, early on, and establish an adequate "scope" of pertinent studies and measures that would sufficiently address and mitigate potential negative Project impacts.

F. Lessons

5.25 The design of this Project did not include all the studies that would have been necessary to detexmine the full and important impacts of the infrastructure investment.

5.26 The design and implementation of this Project did not take place within an integrated framework consistent with sound watershed management. As a result, the Project did not include sufficient and appropriate provisions to ensure environmental stability.

5.27 During the design, implementation and operation of this Project, there is little evidence of effective efforts to establish mechanisms or lines of communication (either formal or informal) to incorporate key affected parties in the discussion of Project components and ramifications.

5.28 Hydro-power producers and downstream irrigation farmers continue to face off at loggerheads over water rights. Water-use conflicts underscore the need for public engagement around environmental assessment and review.

5.29 The Pehuenche Project demonstrates that, along with other centrales within the Maule and Melado river system, the use of water resources for one predominant purpose (in this case, hydro-power) can effectively preclude other uses.

5.30 The Project Report indicated that this Project would have a positive impact on tourism development in the region. To date, this has not occurred.

Table 5.3 Chile - Environmental Policies and Directives: Legal and Institutional Framework (1990-1998)

	1990 National Policy	1994 National Legislation	1994-1997 Interim Period	1997 Environmental Regulations	1998 Projections
NATIONAL	CONAMA established to coordinate environmental management of State ministries; analyzes environmental policies, develops norms and guidelines, serves as information and communications center, enforces regulations on all aspects of environmental protection.	Environmental Base Law 19.300 (March, 1994). Established environmental management system and outlined process of environmental impact assessment (however, not enforced until regulations approved in April 1997). SEIA (Sistema de Evaluación de Impacto Ambiental) determines types of projects subject to analysis and method of assessment (in-dept Impact Study or shorter Impact Statement). CONAMA (Santiago) responsible for SEIA and review of interregional and national projects.	Individual ministries devised their own environmental guidelines; public and private sector projects subject to impact assessments *only on voluntary basis*; between 1994-1997, CONAMA evaluated some 160 projects values at $17 billion.	Standardized environmental impact regulations approved. Review period for Environmental Impact Study is 120 days; for Statement (also, Declaration), 60 days; after study is presented to CONAMA, project proponents are required to publish abstract of Study in the Official Record and in a local newspaper in capital of the region where the project is to be executed or in a national newspaper; citizens organizations have 60 days to present comments to CONAMA and have access to Study documentation; CONAMA required to take public comments into consideration before decision.	Estimated that in 1998 alone, CONAMA will review 1,000 environmental impact statements and 100 in-dept impact studies on projects valued at $16 billion.
REGIONAL	COREMAs are regional environmental commissions in each of Chile's 13 Regions; each presided over by an *Intendente*; includes region's governor, regional ministers of the Ministries that form CONAMA's Directive Council, regional advisors, and the regional director of CONAMA.	COREMAs are responsible for approving or rejecting environmental permits for all other projects.	On a voluntary basis, public and private sector projects subject to environmental assessment.	Same regulations apply to environmental assessment process at the regional level.	Projected increase in environmental review activity by the regional environmental commissions.

6

Brazil – Segredo Hydroelectric Project, State of Paraná

A. Project Background

6.1 Project Description. The Project includes a hydroelectric power plant on the Iguaçu River with a capacity of 945 MW (from three 315-MW units) along with its dam, spillway, powerhouse, associated structures, and a 500-kV line approximately 1.8 km in length extending from the power plant to the existing transmission system. With the enhanced generating capacity COPEL could accommodate the anticipated increases in demand for electric power in the State of Parani and within the interconnected network serving the southern, southeastern and mid-western regions of Brazil. The Project also included studies on potential environmental impacts and the implementation of measures to alleviate any adverse effects of the Segredo hydroelectric power plant.

6.2 Diversion of Water from the River Jordan. As an adjunct to the original Segredo Project, plans also called for the construction of another dam with a height of 95 meters forming a 3.4 square kilometer reservoir on the River Jordan. The diversion of water from the Jordan would flow through a 4.7 kilometer underground shaft in order to maintain acceptable levels in the Segredo reservoir and to boost the power generating capacity of Segredo by 62.4 MW. The spillway would maintain minimum flows in the downstream Jordan river bed (an environmental requirement) and also generate a small 6.54 MW hydroelectric plant at the site.

6.3 Bank Financing. The total financing plan drew on Bank sources (18.1% of total Project costs), and local counterpart contributions from COPEL's own internally-generated funds, from the Government of the State of Parani, and from loans by ELETROBRÁS (Brazil's central electric authority) and FINAME (Special Agency for Financing to Industry). COPEL used the Bank loan to cover engineering costs for hiring individual consultants, the purchase of electrical equipment and machinery, the payment of interest charges accruing during construction, the IDB inspection and supervision charge, and for direct-cost contingencies. **No Bank funds were used for resettlement nor to implement environmental protection measures.** The ELETROBRÁS loan paid for resettlement expenses and, along with COPEL and the State, invested in the remaining Project components including environmental protection.

6.4 Affected Residents and Resettlement. The creation of the reservoir affected some 550 families totaling approximately 2,750 people. Fully 40% of these mostly small-scale farmers were property owners or long-term occupants. The remainder rented parcels including a few who worked the land without any legal tenure. Approximately 47% who own houses occupied less than 25 hectares; fully 50% of the households earned less than US$110 per month. Resettlement was designed to assure land tenure, housing and the means to increase family income levels.

Table 6.1 Environmental Management and Resettlement Measures

Family Resettlement	Environmental Measures	Urban Infrastructure
• Cadastral survey	• Biological reserve	• Mangueirinha
• Negotiation, Exrpropriation	• Archeological sites	• Reserva do Iguaçu
• Relocation	• Ichthyology	• Honório Serpa
• Agri-production		

B. Regulating the Use of the Environment

6.5 Environmental Compliance. When COPEL began the Segredo Hydroelectric Project in 1980, prior to Bank financing, the company acted in compliance with the environmental legislation in force at the time. When new legislation was enacted in 1986, therefore, the company had no legal obligation to subject itself to these requirements. COPEL, nevertheless, freely took the initiative to comply with these new standards. In this respect, ***COPEL was the first hydroelecmc company in all Brazil to carry out, on its own, environmental plans and programs to preserve the natural surroundings and improve living conditions of families in a region affected by the construction and operation of the power plant.***

6.6 Minimum Ecological Flow. Brazilian law requires a flow of only 10 cubic meters per second on this stretch of river. Flow levels in this particular case appear to compromise the maintenance of river life as well as the generation of other social-economic and recreational benefits. The application of this standard, especially during dry seasons of the year, produces only a precarious and insufficient flow along a five-kilometer segment of river, to the detriment of this localized ecosystem.

6.7 Monitoring and Control of the Reservoir and Limnological Evaluations. Using 28 parameters to measure water quality, cysmological and climatological changes, erosion rates, agricultural pollution, flood control and overflow projections, researchers are expecting to help establish predictable patterns for water quality management measures and plans for multiple uses of this resource.

Table 6.2 Environmental Management Measures: Brazil – Segredo Hydroelectric Project

Domains	Pre-Project (1990)	During Implementation (1990-1996)	Post-Project
Legislation	CONAMA Resolution no. 001 requires environmental impact study and reports for approval at state level for hydroelectric plants. Preliminary license issued based on EIA and RIMA approved by Directorate of Water ('87). Construction license issued for Environmental Plans and Programs ('87, renewed '90 and '93). Federal Constitution with environment chapter ('88); State Constitution for power construction to included EIR and approval by Legislature.	Decree no. 99.274/06 - Administration of National Environmental Policy: delegation to state government of powers to issue project licenses - preliminary, construction, & operation - (1990). Plan for Monitoring and Control of the Reservoir issued (1990). State Decree no. 7509 preserves for permanent public use 1,288 hectare ecological station (91). IAP issues license for plant operations (1992). IAP approves EIA and RIMA for River Jordan diversion and issues license for Environmental Plans and Programs (1993).	CONAMA Resolution no. 237 revises procedures and criteria for environmental licensing (1997).
Organizational Structure	Environmental Institute of Paraná did not exist. COPEL's environmental unit	Environmental Institute of Paraná (IAP) established (1992).	Both IAP and COPEL's environmental unit continue efforts for increased collaboration.
Technical Norms	Federal norms for studies and projects using water resources for generation of electricity (84)	Norms and guidelines were developed and/or improved at State (IAP) and within COPEL's environmental unit.	COPEL scientists use 28 parameters to monitor reservoir water quality, seismological and climatological changes, erosion, pollution, flood. IAP uses statewide guidelines (*Manual de Licenciamento Ambiental* - Directorate of Control of Natural Resources) to analyze projects.
Training	Routine training programs within COPEL	Continual staff upgrades at IAP and COPEL	Continual staff upgrades.
Equipment	IAP not yet established; COPEL adequately equipped.	IAP and COPEL adequately equipped for increasing responsibilities.	IAP and COPEL upgrading with technological hardware and information systems.
Information Exchange	COPEL establishes civil society group to propose resettlement solutions (1984). Environmental Impact Report issued (1987)	Environmental Impact Study issued for diversion of water from River Jordan (1992).	COPEL's environmental unit provides its kn how through contracts to other states and po companies for environmental services.
Decentralizing Capacity	COPEL's environmental unit headquartered in Curitiba; residential field offices at all hydro-power installations for constant monitoring.	COPEL's environmental unit headquartered in Curitiba; residential field offices at plants for project execution & environmental monitoring	Environmental Institute maintains 20 regional offices throughout Paraná, each with decentralized technical teams, and delegated responsibilities.

C. Effectiveness

6.8 **Participation in Decision Making.** COPEL was instrumental in incorporating affected groups in the resettlement decision making process. As early as September 1984, COPEL had established a group to propose solutions for families to be displaced by the Project. Together they approved criteria, basic principles and procedures for the appropriation of land and the relocation of residents.

6.9 **Resettlement.** The resettlement strategy and implementation were generally successful and families contacted expressed their satisfaction not only with their living quarters but also with community facilities and social services.

- **Information Access and Exchange.** The energy company made special efforts to inform affected families and the general public about the Project and resettlement. Information exchange took place through individual interviews, disseminated material in posters, brochures, in newspapers and on the radio, in public meetings and presentations during which COPEL also became informed of the needs and desires of families to be resettled. This preparation helped to reduce possible bottlenecks and dissatisfaction with the resettlement process.

- The **upgrading and duplication of housing** on each resettled parcel created an unanticipated opportunity. Initially, resettled housing was made of wood. Later, families received a second house constructed of brick and other higher quality building materials according to standards employed in subsequent COPEL projects. As a result, other family members living in urban areas were able to join their families and return to the pursuit of agricultural activities, thus offering the potential for higher productivity from more family labor, as well as providing a bit of relief from population pressures on the city.

- The **concentrated pattern of settlement** on ample productive land and residential living in relatively close proximity facilitate opportunities for mutual support and cooperative activities by means of shared costs, higher scales of production with its market advantages, job creation and diversification, and greater income.

- The **commercial orientation** of producing, processing, and marketing agricultural products through cooperative action provides the opportunity for the integration of women and children in the economic development of families and of the community at large.

- **Resettlement Inefficiency.** While the upgrading and duplication of housing resulted is better living conditions for families, it came at an inefficient extra cost to COPEL, a lesson learned for future resettlement activities.

6.10 **Protection of Natural Ecosystems.** This hydroelectric power plant Project forms part of a series of dams that interrupt river flow on the Iguaçu River. As such, it created major impacts on the human and natural environment. Nevertheless, within the limitations of this overarching circumstance, COPEL is taking appropriate and effective measures to protect local and regional ecosystems.

- **Scientific Research and Preservation.** Identification, capture and relocation of 2,300 animals to the newly-established Biological Reserve through agreements with the Federal University of Paraná in coordination with the Brazilian Environmental Institute (IBAMA).

- **Ichthyological Studies - Experimental Station.** Establishment of a spacious and well-equipped research station on the shores of the reservoir where experts from the State University of Maringá and other researchers carry out studies that have identified the existence of 26 new species of fish, previously unknown to science.

- Management Plan. Establishment of measures to protect priority areas for endangered fish species including recovery of watershed vegetation, the reduction and permanent control of pollution, and soil conservation programs in micro-watersheds.

- Archeological Site Research and Preservation **of** Cultural Memory: Research completed in **87** archeological sites where **4,000** items were collected and analyzed, along with a myriad of artifacts representing historical traditions of the region, on display the the COPEL museum.

- Biological Reserve. Purchase of **1,288** hectares with the Iguaçu watershed where COPEL established the Ecological Station of ***Rio*** *dos Touros* with a management plan prepared by the Federal University of Paraná.

- Forestry Police. The members of this effective and dedicated unit maintains an agreement with the Environmental Institute of Parani to provide technical assistance to manage forests and animal life and another agreement with COPEL to protect the Biological Reserve against trespassers and poachers.

D. Sustainability

6.11 Environmental Institute **of** Parani (IAP). Founded in ***1992,*** the Institute has gained in stature as an increasing effective agency for environmental oversight. It maintains **20** regional offices and delegates responsibilities to decentralized technical teams for project analysis based on statewide environmental guidelines.

6.12 IAP collaboration with COPEL. For the Segredo Project, IAP insisted that COPEL pay close attention to the needs of families to be resettled. At the same time, through its projects, COPEL **has** created the opportunity (and necessity) for the Environmental Institute to develop appropriate mechanisms of response in order to efficiently process and approve applications for licenses to build and operate hydroelectric power plants and other industrial facilities in the state. To this end, IAP **has** streamlined its procedures, upgrade staff skills, and invested in technological hardware and information systems.

6.13 Impacts **on** the Region. The Project and COPEL's continued presence in the region have generated uneven impacts on neighboring municipalities.

- Maintenance and Sustainability **of** Municipal Works and Facilities. COPEL's financing of services and physical infrastructure in surrounding municipalities raises questions about their continuance and upkeep in the future. The company hired private firms **to** build roads, bridges, and community facilities. COPEL inspected and monitored each phase and, upon completion, transferred **this** infrastructure over to the jurisdiction of municipal authorities. The sustainability of civil works depends on the sense of ownership, political will and the availability of local resources in order to assure infiastructure maintenance overtime. For the present, there is little assurance of continued maintenance by local authorities.

- Revenue Imbalances in Local Government. The presence and functioning of the hydroelectric power installation create distortions and imbalances in how the administration of the Municipality of Reserva do Iguaçu carries out its business. Over ***90%*** **of** the local government's revenues are derived **from** COPEL royalties and contributions, another ***5%*** from other government transfer payments, and only ***5%*** from agricultural production.

- Municipal Autonomy. The presence **of** COPEL and its contribution of voluminous financial resources to municipal coffers amount to the ***sine qua non*** for the survival of Reserva as a local government entity and, consequently, poses a potential challenge to the political autonomy of the municipality.

E. Bank Guidelines and Supervision

6.14 Supervision and Inspections. With regard to the environmental components, Bank staff performed well during the design and execution of the Project with timely site visits and careful analysis of impact reports. COPEL, the implementation agency, recognizes that periodic monitoring and the contractual requirement to present reports on Project progress, made a favorable contribution to the institutional strengthening and management of the energy company as a whole. The Project Completion Report also confirms that the Bank's operational procedures and norms for the inspection of the Project were both satisfactory and adequate.

F. Lessons

6.15 COPEL and other public-private entities would do well to examine their apparent and potential roles as public agencies of regional development. Local populations typically welcome the energy company's presence due to the benefits they can derive from investments, revenues and job creation in the area. This presence, however, can undermine a municipality's obligation and resolve to achieve the autonomy that is necessary for relative self-sufficiency. In addition, it can also weaken the capacity of residents to make normal political claims to meet their legitimate needs for government services.

6.16 Municipal governments within the areas of influence of hydroelectric power plants have a role to participate in decision-making regarding investments in infrastructure and community facilities. Mechanisms should also be established to ensure local government maintenance commitments independently of administrative and/or political changes in government overtime.

6.17 Energy companies are challenged to establish sufficient and appropriate limits to the social and environmental investments made in power plants' area of influence. The fine-tuning and standardization of these investments should be predictable in order to attract investors while meeting the company's environmental and social responsibilities in ways that are replicable in similar circumstances.

Table 6.3 Brazil - Selected Environmental Protection & Resettlement Measures: Segredo Hydroelectric & River Jordan Diversion

1984	1986	1987	1988	1990	1991	1992	1993
Ministry of Mines and Energy Approves **Norms** for the preparation of *Studies and Projects Using Water Resources for the Generation of Electric Energy* COPEL establishes civil society group to propose solutions for family resettlement Away from Segredo Project Site	**CONAMA** Resolution nº 001 Requires Environmental Impact Study (EIA) and Environmental Impact Report (RIMA) for approval at ***state government level*** for hydroelectric power plants over 10 MW	Environmental Impact Report issued: Segredo Hydroelectric Plant Preliminary license issued based on EIA and RIMA approved by **SUREHMA** *Directorate of Water Resources & the Environment* Construction license issued for *Environmental Plans and Programs* (renewed in 1990 and 1993)	**Federal Constitution** approved with *specific chapter on the environment* Followed by revision of the **State Constitution of Paraná (1989)** instructing that the construction of any hydroelectric power installation must include an environmental impact report and be approved by the State Legislative Assembly	**Decree nº 99.274/06 -** Administration of **National** Environmental **Policy:** Delegation to *state government* the powers to issue project licenses (preliminary, construction, & operation) Environmental Impact Studies: *Plan for Monitoring and Control of the Reservoir* Project Report issued & Bank approved	Project's Loan Contract with the Bank issued **State Decree nº 7509** preserves for permanent public use 1,288 hectares of the *Rio dos Touros* Ecological Station	Environmental Impact Study: Diversion of Water from the Jordan River **IAP** Environmental Institute of Paraná established replacing SUREHMA and ITCP (Institute of Land, Mapping, & Forests) **IAP** issues license to begin *operation of Segredo Hydroelectric Plant* (renewed in 1994)	**IAP** approves EIA and RIMA for the *River Jordan Diversion component* Issues construction license for *Environmental Plans and Programs* (renewed in 1994) Issues license for *plant operation* in 1996 CONAMA Resolution No. 237 (1997), revises procedures and criteria for environmental licensing

7

Recommendations

I. ***For*** *infrastructure projects, depending* ***on*** *each country's institutional capacity and policy framework, the Bank should continue to exert persistent influence to shape and to make operational those mechanisms designed to achieve environmental regulation of Projects. Therefore, the Bank should* ***also*** *provide rigorous supervision and the corresponding financial support required to meet satisfactory environmental standards.*

Commentary. For example, **within** the National Road Service (Bolivia) and the Department of Roads (Ceari, Brazil), Bank involvement and supervision were instrumental in establishing the benchmarks to both minimize negative impacts of investments and support enhancement of **natural** features. Within these agencies there now exists a culture of environmental concern, in large part, according to **this** observer, because Bolivia and the State of Ceari now possess specific laws that require environmental safeguards for road projects.

11. *With respect to infrastructure investments having direct impact* ***on*** *historical and archeological sites, the Bank should continue to foster, where appropriate, the inclusion* ***of*** *Project components to preserve these areas. Such sub-components, to be negotiated with borrowers and subject to cost-benejii analysis, could help both to mitigate possible undesirable effects of projects as well as to generate further benefits* ***to*** *affected populations.*

Commentary. Stand-alone operations for environmental management are a part of the Bank's approach to capacity building for protection of natural resources and environmental enhancement. Contract requirements and support for institutional strengthening within the context of infrastructure Projects **also** help to serve similar objectives. In addition to these efforts, Project experience demonstrates that even greater benefits can accrue, at modest cost, **by** encompassing activities of interest to the local community. For example, for much less than **1%** of total Project cost, a cluster of non-road operations, including Sajama National **Park,** can provide additional incentives for the regulation and supervision not **only** of civil works but also the natural and built environment nearby. The inclusion of such activities can also promote a wider and deeper sentiment of public ownership and responsibility, thereby enhancing the sustainability of investments. Where advisable, future infrastructure proposals could seek to capitalize on similar opportunities.

III. *The introduction and strengthening of environmental management instruments (regulation and supervision measures, in particular) are part of* ***a*** *continuing process. The Bank should ensure resources (human and financial) to perfect and adopt compatible approaches and methodologies for the evaluation of such efforts, together with appropriate data, indicators, and benchmarks that trace both Bank and borrower performance.*

Commentary. As an executing agency takes measures to establish its own systems of environmental regulation and supervision of infrastructure investments, congruent with the Bank's own management strategy and guidelines, there arises the need to facilitate the evaluability of the performance and effectiveness of these mechanisms. This entire evaluation work program, furthermore, has demonstrated to the executing agencies of these Projects both the importance the Bank attaches to follow-up and its continual monitoring of capacity building activities in progress with a view to future Projects in the pipeline.

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