

**DAMS, DEVELOPMENT, AND THE ENVIRONMENT IN LATIN AMERICA AND THE  
CARIBBEAN: SOME EXPERIENCES OF THE INTER-AMERICAN DEVELOPMENT  
BANK**

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# **DAMS, DEVELOPMENT, AND THE ENVIRONMENT IN LATIN AMERICA AND THE CARIBBEAN: SOME EXPERIENCES OF THE INTER-AMERICAN DEVELOPMENT BANK**

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## **Abstract**

The Inter-American Development Bank (IDB) was established in 1959 to foster economic and social development in Latin America and the Caribbean. Its membership currently totals 46 countries of which 26 are borrowing member countries. The working capital of the Bank is presently US\$ 100 billion, allowing it to approve annual lending of at least US\$ 6 to US\$ 7 billion over the next 15 to 20 years.

Since its inception, IDB's involvement in large infrastructure projects, including dams, has been substantial. The Bank has assisted countries in the Region in the construction of their transportation systems (land, air, water), urban development, energy, sanitation, water supply, etc. In the energy sector, the IDB has provided financing for the construction of a large number of hydroelectric projects. A large proportion of IDB's financing for dam-related projects has gone to energy generation and irrigation, with a relative priority given to energy generation.

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From 1960 to 1999, the Bank financed 140 projects involving dams, for a total of US\$ 9.4 billion. Most of these projects were in Argentina, Brazil, Chile, Colombia, Dominican Republic, Guatemala, Guyana, Mexico, Peru and Venezuela. Eighty-two projects involved dams higher than 15 meters. Twenty of them were higher than 100 meters, including seven of 150 meters or more. Environmental considerations were explicitly included since the 1970s and resettlement issues since the 1980s. Both considerations are now part of all project lending, not only of those related to dams and reservoirs.

For years, governments, civil society organizations, development officials, and the private sector have debated the costs and benefits of large dams. The controversy about dam construction in the region is compounded by the current and future need to supply water for different and conflicting human uses and the need to conserve and protect freshwater ecosystems in a sustainable manner.

The paper begins with a summary of the Bank's involvement in these projects since the 1960s. It presents the Bank experience with environmental management issues, and the highly controversial social issue of involuntary resettlement. It continues by summarizing the emerging experience of the IDB with private sector financing for dam-related investments, and finalizes with a brief discussion of some of the more challenging issues now facing institutions like IDB, with this type of involvement.

## **Foreword**

The Inter-American Development Bank<sup>4</sup> (IDB) is the oldest and largest of the regional multilateral development banks. The IDB was established in 1959 to foster economic and social development in Latin America and the Caribbean. Its membership currently totals

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The views and opinions expressed herein are those of the authors and do not necessarily reflect the official position of the Inter-American Development Bank.

<sup>4</sup> Throughout this paper we will refer to the Inter-American Development Bank as the IDB or the Bank.

46 countries of which 26 are borrowing member countries. The IDB operates through a network of Country Offices located in all of the borrowing member countries as well as France and Japan. In 1994, the Eighth General Increase in Resources of the IDB was approved, resulting in an increase of the working capital of the Bank of US\$ 40 billion to a total accumulated capital of US\$ 100 billion. It has been estimated that this capital increase allows the IDB to approve annual lending of at least US\$ 6 to US\$ 7 billion over the next 15 to 20 years.

Since its inception, the IDB's involvement in large infrastructure projects has been substantial. The Bank has assisted countries in the Region in the construction of transportation systems (land, air, water), urban development, energy, sanitation, water supply, etc. In the energy sector, the IDB has provided financing for the construction of a number of hydroelectric projects. A large proportion of IDB's financing for dam-related projects has gone to energy generation and irrigation, with relative priority given to energy generation. This is consistent with the fact that the region is relatively well endowed with water resources and produces 69% of its electricity with hydropower (Millán 1999).

For decades, governments, civil society organizations, development officials, and the private sector have debated the costs and benefits of large dams. Proponents point to the social and economic benefits that dams make possible, such as providing electric power, flood control, irrigation for agriculture, and water supply for growing towns and cities. In fact, those in favor maintain that without these structures, the standard of living of the large number of people who benefit from these structures all over the world would decline. Critics argue that project sponsors, public and private, systematically downplay the adverse environmental, social and economic impact of dams. Opponents claim that the total tangible and intangible costs of dams to society far outweigh the accrued

benefits. Proponents want to construct more new dams while the opponents would like to stop construction of new dams and decommission some of the existing ones. Both sides claim that any objective analysis of the available facts and figures would vindicate their respective positions. Repeated clashes between proponents and adversaries of impoundment projects have made this, one of the most intensely debated issues in sustainable development. The controversy about dam construction in the region is compounded by the current and future need to supply water for different and potentially conflicting human uses and the need to conserve and protect freshwater ecosystems.

This paper provides a historical overview of the IDB's experience with financing dam-related projects. Section I, provides a summary of Bank's involvement in these projects since the 1960s. Section II presents the Bank's experience with environmental management issues. In Section III, the highly controversial social issue of involuntary resettlement is reviewed. Section IV summarizes the emerging experience that the IDB has with private sector financing for dam-related investments. Finally, in Section V, the challenges facing multilateral financing institutions such as the IDB are discussed.

## **I. Introduction**

The IDB has approved more than US\$ 9 billion for 140 dam-related projects since 1960 (see Table 1) (IDBa 1999). A large number of these operations were directed to hydropower generation (85%, of the total amount including multipurpose projects). The remainder was allocated to impoundments providing water supply and irrigation. Mexico was the largest recipient of financing for water-impoundment projects (in terms of number of projects totaling 60%) where irrigation was the main use of the water resources. The remaining operations were approved in Dominican Republic, Guyana, Chile, Argentina, Peru, and Guatemala.

**Table 1: Distribution by Sector of Loan Amounts in the Financing of Dam  
Operations: 1960-1999**  
(In nominal million US\$ and percentage)

Sector	Amount	Percentage	Number of Projects
Energy	5,966	63.63	75
Multipurpose: EN <sup>5</sup> , AG-RIE	1,261	13.46	12
Irrigation and Drainage	694	7.40	38
Water Supply	523	5.58	7
Multipurpose: AG-RIE, PA, EN	315	3.36	2
Multipurpose: OS-AGU, EN	199	2.13	1
Multipurpose: EN, OS-AGU, AG-RIE	195	2.09	3
Environmental Protection and Conservation	175	1.87	1
Multipurpose: EN, PA	44	0.48	1
<b>TOTAL</b>	<b>9,372</b>	<b>100</b>	<b>140</b>

A preponderance of the investments in hydroelectric projects (75%) was approved late in the 1970s and 1980s (see Table 2). Eighty percent of the hydroelectric projects were located in Argentina, Chile, Brazil, Colombia and Venezuela.

Table 2 shows investments in dam-related projects approved by the Bank since early 1960's. These figures are presented by decade and sub-sector.

**Table 2: Dam-Related Loan Amounts Approved 1960-1990**  
(By decade and by sub-sector, in million US\$)

Sector	1960-1969	1970-1979	1980-89	1990-99
Energy	183.30	1,932.40	3,396.71	1,657.00
Irrigation and Drainage	8.78	373.51	359.08	52.25
Water Supply	9.96	24.02	348.92	325.00
<b>TOTAL</b>	<b>202.04</b>	<b>2,329.93</b>	<b>4,104.71</b>	<b>2,034.25</b>

<sup>5</sup> See Annex 1 for the definition of codes.

Since 1960, the IDB has financed 82 large dams, including 40 impoundment projects having dam heights between 15 to 50 meters, 22 projects with heights of 50 to 100 meters, and 20 projects with heights above 100 meters.

Data on the associated characteristics of these 82 projects, such as dam volume, reservoir volume, spilling discharge, crest length and installed power generating capacity, is not readily available, making it difficult to rigorously apply the widely accepted definitions of “large dams”<sup>6</sup> and “major dam projects”<sup>7</sup>. However, approximating the latter category by dam height alone, the IDB has participated in the financing of seven “major dam” projects in four decades of operation.

As it will be seen in Section IV, the IDB has not provided financing to the public sector for dam-related projects in the 1990s. The existing pipeline of dam-related projects (four in Brazil) are being financed through the private sector window of the IDB; they are relatively small in size (with the exception of Ita) and major environmental or social problems have not been identified.

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<sup>6</sup> The International Commission on large Dams (ICOLD) defines “large dams” as those with heights of 15 meters or more.

<sup>7</sup> The International Journal on Hydropower and Dams defines as “major dam projects” those with any of the following characteristics: a) dams with heights of 150 meters or more; b) dam volume greater than 15 million cubic meters; c) reservoir volume of more than 25 billion cubic meters; and d) installed capacity of more than 100 MW (IUCN 1997).

Table 3, shows the “major dam” projects the IDB has financed since the early 1960’s.

**Table 3: Major Dam Projects Financed by the IDB, 1960-1999**

Country	Project Title	River	Height in meters	Year(s) Loan Signature Dates
Argentina	Piedra del Aguila	Limay	160	1981/85/88 <sup>a</sup>
Brazil	Foz do Areia	Iguaçu	153	1976
Brazil	Emborcação	Paranaíba	156	1977/79
Colombia	La Esmeralda	Batá	237	1971/74
Colombia	Guavio	Guavio	250	1982/84/88 <sup>b</sup>
Ecuador	Amaluza	Paute	180	1972/74/77/79/82/89 <sup>c</sup>
Honduras	El Cajón	Comayagua	226	1979/80/84/95 <sup>d</sup>

**NOTES:** a) The 1988 loan financed primarily transmission lines; b) In 1988, the IDB extended the financing due to cost overruns; c) The 1989 investment targeted the environmental protection of the basin; and d) The 1995 program financed a watershed management plan and environmental protection and management of the basin.  
SOURCE: IDBa, 1999

Dam-related projects can have serious environmental and social impacts. The IDB has been explicitly concerned with environmental and social impacts of all projects, including dam-related operations since the early 1970’s. The next section explains how environmental management considerations have evolved to the point where they are now “mainstreamed” into all operations, including water impoundment projects.

## II. Environmental Management

Before the late 1970’s, the IDB did not have an explicit program of environmental management at the institutional level (IDB 1991). It was during these years that planning and construction of several dams financed by the Bank were initiated. Even though the IDB had no established guidelines on environmental management in the 1970s, a review of environmental practices in several multilateral development agencies, conducted in 1977, concluded that environmental awareness was most evident in IDB and World Bank financed projects (IDB 1991). Recognizing the importance of sound environmental management, the IDB approved an Environmental Management Policy in 1979. This

policy established basic environmental criteria for the analysis of any proposed operation. During that period, the Bank issued a series of checklists to facilitate the identification of adverse environmental impacts of projects early in the project cycle (IDB 1991).

In 1980, the IDB, along with nine other multilateral institutions, formed the Committee of International Development Institutions on the Environment (CIDIE). The Bank presented a report to CIDIE on the environmental aspects of selected operations, including impoundment projects (IDB 1991). Concomitantly, non-governmental organizations, donor governments, and the press scrutinized the environmental activities of many of the multilateral development banks. In the late 1980's, the Bank strengthened its commitment to environmental protection by implementing an Environmental Impact Assessment (EIA) classification and review process and by establishing an Environment Division. Each investment operation was classified by the Environmental Management Committee (CMA). Based on its environmental impact, projects were classified into one of four categories: a) Category I: operations designed with the sole purpose to improve environmental quality; b) Category II: operations with no significant direct or indirect environmental impact; c) Category III: operations which may have a moderate impact requiring a semi-detailed EIA; and category IV: operations which may have significant negative impacts on the environment and require a detailed EIA (major dam projects fell in this category). These procedures applied to all investment operations under preparation.

From 1988 to 1990, the Operations Evaluation Office (OEO) of the Bank conducted a review of how environmental factors were identified and addressed in the planning, execution and operation of eight water impoundment projects financed by the IDB in the LAC region. This review included eight case studies and a desk review of 48 completed hydroelectric projects approved between 1961 and 1989. It concluded that:

“...our group of case studies did not produce any environmental “disasters”, which a small sample would be unlikely to detect if they are rare events in the portfolio of Bank Projects.....Generally speaking, the small size of most of the impoundment, coupled with their advantageous locations and climates, minimized human health risks, did not encourage obviously detectable waves of human immigration, did not produce severe water quality deterioration in the reservoirs, and did not encourage explosive blooms of aquatic vegetation.....Several of the cases showed erosion and sedimentation to be the most obvious problems and emphasized environmental monitoring, watershed management, and institution building in their diagnostic appraisals” (IDB 1991, para. 1.13, page 6) (see box on La Fortuna for a case study).

The study provided a set of four recommendations related to **project identification and design** of water impoundment operations:

- a) *Preliminary and Full Environmental Impact Assessment (EIA)*: The IDB should continue to require a full EIA as part of project feasibility analysis, including studies identified during the environmental reconnaissance stage;
- b) *Integrated Basin Planning*: Operations funded by the IDB should be integrated with regional river basin development, environmental pollution control, and watershed management plans. In order to yield maximum benefits, individual projects need to be part of a plan for the entire drainage area;

## Panama: La Fortuna Hydroelectric Project

Approval year: 1983

IDB Loan Amount: US\$ 130 million

Total Cost: US\$ 372.4 million

This project consisted of a 1 km<sup>2</sup> reservoir in the Valle de la Sierpe, upper Chiriquí watershed, Chiriquí Province, Western Panama, and generating facilities some 35 km northwest of the town of David. The project entailed the construction of a 60-meter high rockfill dam, which started being constructed in 1979 as part of Panama's Electrification Master Plan. The main objectives of the project was to expand the electric power generation system through the construction of a hydroelectric power plant at the upper course of the Chiriquí River, with an installed capacity of 255 MW and an average energy to be produced of 1,320 GWH per year. The project also includes the construction and setting up of the associated transmission system. The works consisted in the construction of: a) the first stage of the rock-fill dam of 60 meters in height; b) a discharge spillway; c) temporary works for diversion of the river during construction of the dam; d) pressure tunnel; e) underground machinery; f) a discharge tunnel without lining; and g) the construction of three access roads and a housing center for workers. The IDB loan also financed a study of the watersheds of the Chiriquí and Chico rivers. The main objective of the study was to assess the use of natural resources in these two rivers, specifically in the watershed areas in which part of the water resources would be regulated by the Fortuna dam and that of Estrella-Los Valles. Furthermore, pre-feasibility studies in the fields of agriculture, irrigation; marketing, agricultural extension, agricultural credit, agro-industry, and resettlement were prepared. This project was considered to be successful from an environmental perspective. The preparation of management plans, detailed environmental studies that emphasized the importance of complete watershed protection for the reservoir and watershed, and biological inventories very early in the process were some of the factors contributing to the success of the project. Furthermore, participation of the local labor force in the clearing of the reservoir basin provided an atmosphere of cooperation among the local communities. Several other factors, such as a) the watershed's relative remoteness, b) pre-existing natural forest cover, c) lack of previous human habitation and disturbance, d) small size, and e) ease of enforcing protective regulations, also contributed to an environmentally benign project. Therefore, site selection is a crucial factor that may determine the environmental impact of the project. The Fortuna region was considered one of the best-managed watershed and wildlife areas in Panama.

SOURCE: IDBb, 1998

- c) *Reservoir Protection Zone:* A protection zone should be established around reservoirs to: 1) restrict land use and human activity, 2) minimize health risks, 3) reduce soil erosion, and 4) establish wildlife habitat;
- d) *Avoidable Problems and Secondary Benefits:* The Bank should foster early identification of potential environmental damages and of cost-effective mitigation measures to minimize them. Furthermore, secondary benefits (e.g. downstream pollution reduction, fisheries development) should also be identified early in the process (IDB 1991).

For **project implementation**, the study recommended:

- 1) *Environmental Unit:* The borrower should establish an Environmental Unit before construction begins in order to monitor environmental management measures early;

- 2) *Environmental Impact Monitoring Program*: should be established to monitor and document the project's impact on the environment during dam construction and operation;
- 3) *Reporting Requirements*: The IDB should require periodic reporting by the Environmental Unit or borrower on environmental impacts during construction and operation;
- 4) *Environmental Oversight*: The Bank should be involved with the environmental supervision and monitoring of the projects it finances in order to assure that environmental management measures are taken into consideration (IDB 1991).

Many of these recommendations have been and are being implemented in public sector water impoundment projects, as it is described later. Also, as it will be described in Section IV, the Private Sector Department of the Bank, includes, when applicable, some of these recommendations during project consideration.

This is the only Bank study that has evaluated environmental performance in dam-related projects. The projects it reviewed were all prepared before the Bank formally incorporated strict environmental impact assessment procedures into the review process. In 1996 the CMA was redefined, streamlined, and renamed the Committee on Environment and Social Impacts (CESI). This redefinition was not merely a bureaucratic change of name. New procedures were approved broadening the scope of the CESI's review. CESI's main objective is to review and enhance the quality of IDB operations. Under these new procedures, CESI's scope includes: a) the promotion of adequate environmental and natural resources regulatory and management frameworks; b) the adoption of environmental protection, management, mitigation and enhancement measures; c) indigenous rights, community development, and involuntary resettlement issues; d)

consultation requirements; e) gender considerations; f) issues of social impact and sustainability (IDBa 1997).

The revised procedures incorporate environmental and social issues into projects in all sectors. By reviewing projects in the early stages of the development cycle, the CESI concentrates on reviewing and specifying the scope of the issues, alternatives and impact studies that IDB project teams responsible for the preparation of projects should undertake. The CESI provides written instructions about the level and scope of environmental analysis that must be undertaken in project preparation. This focus in early stages of project preparation provides opportunities to address impacts through prevention, better management and operation design, avoiding the need for, or lowering the costs of, impact remediation. Early in the stage of preparation, CESI specifies whether a full Environmental Impact Assessment (EIA) should be prepared, or whether specific Technical Studies or other measures will be required in lieu of the EIA (i.e. resettlement plan). The new CESI procedures apply to all IDB operations, including those financed by the Private Sector Department.

The results of this change in perspective and approach are evident in Table 4.

**Table 4: Environmental Impact Analysis (EIAs) and river basin approach in 88 water-impoundment projects, by decade**

<b>Category</b>	<b>1960-1969</b>	<b>1970-1979</b>	<b>1980-1989</b>	<b>1990-1999</b>	<b>Total</b>
EIA was made	0	9	7	11	27
EIA was not made	2	6	2	0	10
No data available	24	19	8	0	51
Basin approach was followed	0	0	2	1	3
Basin approach was not followed	2	9	3	2	16
No data available	24	25	12	8	69

It can be seen that EIAs started in the 1970s and the river basin approach was incorporated one decade later<sup>8</sup>.

Of the 88 cases analyzed, 45 (51%) were energy projects, 27 (31%) were irrigation and drainage projects, 5 (6%) were water supply and sanitation projects, and 11 (12%) were multipurpose.

In 20 of the 27 cases for which an EIA was prepared, the EIA was completed before execution of the project (14 energy projects, 2 irrigation and drainage, 2 water supply and sanitation, and 1 multipurpose). In 7 instances, the EIA was undertaken during or after execution (6 energy projects and 1 multipurpose).

One of the major controversies in dam-related projects is generated by social issues. In the following section the Bank's experience with involuntary resettlement issues in water impoundment projects is discussed.

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<sup>8</sup> It must be pointed out that the number of projects for which no data is available is large in both cases and that not all cases justified either an EIA or to follow the river basin approach.

### III. Involuntary Resettlement

The IDB's approach to resettlement issues has evolved since 1984, when the Project Analysis and Operations Departments<sup>9</sup> jointly agreed on socio-cultural checklists for dealing with an array of social concerns during the preparation and analysis of projects, including involuntary resettlement (IDB 1996). In order to ensure a more systematic control of resettlement issues, in 1990 the Environmental Management Committee of the Bank (CMA) included this issue as an area of concern. That same year, the CMA issued two documents (Procedures for Classifying and Evaluating Environmental Impacts of Bank Operations and Strategies and Procedures on Socio-Cultural Issues as Related to the Environment) in which involuntary resettlement, along with other areas, was addressed. These documents emphasized the need to establish proper mechanisms to deal with the relocation of affected populations. Consequently, the IDB produced in 1993, guidelines to be used by executing agencies in borrowing countries and by Bank staff involved in the preparation and analysis of projects. These guidelines offer principles and strategies to be followed in Bank financed development projects, which involve involuntary resettlement and provide a framework for the preparation of resettlement plans (IDB 1996).

The socioeconomic and cultural impact of resettlement have been extensively documented, especially in Africa and Asia. In Latin America, the number of studies on such impacts, have increased in the last few years. The focus of research has been, understandably, on hydroelectric projects, mainly because the large number of households displaced by reservoir creation by definition makes involuntary resettlement extremely visible (IDB 1996). Early research concentrated on the negative consequences

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<sup>9</sup> These two Departments and others were merged during an internal reorganization that took place in 1994.

of involuntary relocation, pointing to borrowers and multilateral development banks for not giving early consideration to the issue during the design and preparation of development operations. The conclusions reached by some of these studies were used in the 1980s by development banks to improve their policies and procedures involving involuntary resettlement schemes.

The Eighth Capital Replenishment document of the Bank, issued in 1994, which has guided IDB's policy since, specifically emphasized the need for early preparation of resettlement plans and their presentation to the IDB Board of Executive Directors prior to the approval of investment operations. Specifically it states that:

“...the Bank will continue to apply the strategies and procedures devised for projects that require communities to be relocated. This will include consulting with the affected population... incorporating resettlement plans in environmental impact assessments, and drawing up detailed resettlement plans....When a project has a resettlement component, the resettlement plan will be prepared at the earliest stages of project design and available at the time the project is presented to the Board. This resettlement plan is provided in environmental summaries and environmental impact assessments. The Bank also will keep a list of ongoing projects that call for resettlement of communities, and will continue to update its procedures and guidelines in this area”.

Also, as part of the Bank's 1994 reorganization, the Indigenous Peoples and Community Development Unit was established to provide policy support and technical expertise in relation to, among other things, resettlement issues (IDB 1996). One of the Unit's first endeavors was the preparation of an Operational Policy on Involuntary Resettlement.

This policy was approved by the IDB Board of Directors in July 1998. The document applies to all Bank funded operations, including private sector investments. The main objective is “to minimize the disruption of the livelihood of people living in the project’s area of influence, by avoiding or minimizing the need for physical displacement, ensuring that when people must be displaced they are treated equitably and, where feasible, can share in the benefits of the project that requires their resettlement.” (IDB 1998).

The IDB’s experience with involuntary resettlement has been varied. Since 1970, at least 120 IDB projects have involved or were expected to involve involuntary resettlement (IDB 1998) including, but not limited to impoundment projects. As of December 1997, 54 of these projects have been completed, 56 are in execution, and 10 were in the pipeline. Unfortunately, detailed information on resettlement components is not available for all projects (see Table 5). Still, some conclusions can be derived. First, the number of people affected is probably different than that depicted since there is no information available on the relocation component for 38% of the total projects reviewed. Second, a large number of the people affected were identified for projects in execution, hence, once the project is completed, the actual number of people affected may differ from what is presented.

**Table 5: Number of People Affected: 1970-1997**

<b>Project Status</b>	<b>Number of Projects<sup>a</sup></b>	<b>Number of People Affected</b>	<b>Projects with Information</b>		<b>Projects with no Information</b>	
Completed	54	145,004	26	48%	28	52%
Execution	56	483,105	45	80%	11	20%
Pipeline	10	25,189	4	40%	6	60%
<b>TOTAL</b>	<b>120</b>	<b>653,298</b>	<b>75</b>	<b>62%</b>	<b>45</b>	<b>38%</b>

<sup>a</sup> Includes all projects, not only dams.

As expected, the review concluded that most resettlement has occurred in hydroelectric projects with over 240,000 people affected (see box below for a case study in Costa Rica). Also, a large number of people affected were identified in urban development

projects, particularly in sites and services projects, transportation, water supply and sanitation, and irrigation. With the decrease of the IDB's involvement in dam financing, since the mid '80s, the number of people recently affected by projects in execution pertains mainly to urban infrastructure projects, including water supply and sanitation, and urban development.

Of the 54 completed projects, 25 had documented evidence of a resettlement plan being prepared, 14 had no plan, and in the remaining 15, it was unclear whether a plan was ever prepared. Out of the 25 projects that had a plan, 13 had insufficient information to assess the quality of the plan, only five were considered acceptable to the IDB, and the remaining 7 were considered inadequate (IDB 1998). Some of the deficiencies identified were: a) weak conceptual basis; b) poor coordination with the project causing the displacement; c) lack of consultation; d) poor baseline information; e) lack of attention to rehabilitation measures; and f) inadequate legal or institutional framework.

An improvement in projects that are currently in execution can be noticed. Of the 56 projects, 38 had a resettlement plan prepared; 11 had no plan prepared because it was not a contractual condition, or the resettlement activities were in the form of compensation; and for the last 7 it is unclear, from the information available, whether a resettlement plan was ever prepared.

It is clear that in the last few years there has been an improvement in the number of resettlement plans for projects under preparation, but it is unclear the number of plans prepared for previously completed projects. Still, it can be concluded that in recent years, the issue is being considered systematically in all Bank-financed operations.

Information on the implementation of resettlement plans can be found for 42 of the completed projects. In 14 cases, resettlement was reported to have been satisfactory.

### **Costa Rica: Arenal Hydroelectric Project**

Approval date: October 1974

Total loan amount: US\$ 50,5 million

Total project cost: US\$ 91 million (estimated); US\$ 179 million (actual)

Resettlement cost/borrower: US\$ 4 million (estimated); US\$ 16 million (actual)

Cost of resettlement: US\$ 6,540/person

Number of people affected: 500 families (2500 people)

Number of people resettled: 1,208

This project consisted of a 70-meter earth dam with a multi-annual regulation reservoir of approximately 1.2 km<sup>3</sup> of useful capacity. The reservoir feeds three generating units of 52.5 MW capacity each. The main objectives of the project were: a) to increase the installed hydroelectric generating capacity; b) increase and regulate the flow of the Santa Rosa River to serve the Corobocí Hydroelectric Plant downstream; and c) transfer a regulated flow to irrigate approximately 12,000 hectares. The construction of the plant and reservoir required the resettlement of the town of Tronadora and Arenal; the first being an agriculturally-based settlement and the last a trading and commercial center. There were two basic resettlement objectives: a) improve the standard of living of the affected population and b) create an integrated project to provide for the physical, social and economic development of the new communities. For the purpose of overseeing the relocation activities, the Instituto Costarricense de Electricidad (ICE) established a Resettlement Office. As part of the resettlement plan, two new communities were created; Nuevo Tronadora consisting of 150 parcels ranging from 1.5 to 3.5 hectares, 54 urban lots, 130 houses and supporting infrastructure, and Nuevo Arenal, composed of 149 parcels ranging from 0.5 to 8 hectares, 199 urban lots varying between 600 and 1,200, 325 houses, and supporting infrastructure. The resettlement of the communities provided improved infrastructure and facilitated the needed resources for their development. Furthermore, land tenure changed with the project. Prior to the project, land ownership was concentrated in large holdings by absentee owners. The only source of income for the inhabitants in the region was employment in these large holdings. After the project, most of the families owned their land and their income derived from small-scale farming activities.

SOURCE: IDBb, 1998

Problems occurred in the 28 remaining. Some of the major problems identified were: 1) cost overruns; 2) delays in project execution; and 3) increase in social conflict.

On the impact of resettlement plans, information was unavailable in 31 of the completed projects. In 5 of the 23 completed projects for which information was available, the outcome was described as satisfactory, that is, the living conditions of the affected population was restored or improved.

Although a significant improvement in the preparation of resettlement plans in IDB projects has occurred, there is still much to be done about obtaining and recording information on involuntary resettlement components and on the success or failure of the implementation of the plans. Information remains scarce.

With the increase in the number of urban infrastructure projects in IDB's pipeline, and with the Bank's involvement in private sector financing of water impoundment operations, involuntary resettlement remains very much a current, controversial and delicate social issue.

#### **IV. The Financing of Private Sector Dam Projects**

In the past, construction and operation of dams in the Region was in the hands of governments and public utility companies, and the multilateral development banks were the main source of capital for these endeavors. In the last decade, substantial changes have occurred. It is increasingly difficult for governments to raise financing for large infrastructure projects that are also perceived as commercial (e.g. energy generation). Furthermore, public-sector funding and lending priorities have shifted from physical infrastructure to social infrastructure. But the demand for energy is still increasing and must be satisfied. For example, in order to meet current demands in Brazil, installed capacity will have to increase from 57,600 MW as of 1996, to 90,210 MW in 2006 (IDBb 1999). The increasing demand for power-sector investment capital has resulted in governments encouraging the private sector to fill that void by granting concessions and/or ownership schemes.

In 1994, anticipating this shift from public to private sector financing in several sectors like potable water and energy, the IDB established the Private Sector Department (PRI). PRI's main objective is to finance private sector participation in infrastructure investments through long-term direct lending, syndicated lending, and guarantees in the LAC Region. By way of syndicated lending, IDB loans are used as catalysts to attract other loans from private sources. The IDB is limited to financing 25% of total costs up to US\$ 75 million. Eligible sectors include energy, transportation, water and sanitation, and

telecommunications.

PRI's requirements for the preparation and analysis of projects, in terms of feasibility studies, economic analysis, environmental studies, etc. are the same as those required by the Bank for public sector projects. In general, PRI's guidelines state that:...."projects must have a positive developmental impact and be economically, technically, and financially feasible" (IDB 1997). The IDB requires economic analysis, technical feasibility studies, and environmental and social plans/studies from borrowers. For environmental and social plans, and for a typical dam-related project, the borrower must present the following: a) an Environmental Impact Assessment (EIA), b) a Resettlement Plan, c) a Health and Safety Plan, and d) a Contingency Plan (see box below for an example of the type of studies prepared for an specific project). In addition to Bank requirements, borrowers must comply with existing local environmental regulations, such as licensing requirements for the construction and operation of a hydroelectric plant, which are often strict.

Table 6 shows the water impoundment projects presently in the pipeline for private sector financing for the years 2000 and 2001. The IDB portion of the financing comes from its private sector window representing less than 10% of the total cost for two projects (Machadinho and Dona Francisca) and 14% for the hydroelectric plant in Cana Brava.

**Table 6: Hydroelectric Private Sector Projects in the Pipeline 2000-2001 (amounts in US\$ million)**

Country	Title	IDB Loan Amount	Total Cost
Brazil	Hydroelectric Plant Cana Brava	75	532
Brazil	Hydroelectric Plant Machadinho	75	790
Brazil	Hydroelectric Plant Dona Francisca	12	147

Presently, there is only one project financed by the private sector window that is ready to begin execution (see box below for the case study of ITA in Brazil). Therefore, it is too early to assess the success or failure of private sector financing of dam-related projects, and its treatment of environmental and social issues.

It would be unreasonable to attempt drawing any conclusions on the yet limited experience of IDB with private sector financing of dam-related projects, until some of these projects are well under execution, and the monitoring studies on implementation of environmental management and social mitigation measures have been completed and submitted to the Bank.

## Brazil: Hydroelectric Project ITA

Approval Date: December 1997  
Total loan amount: US\$ 75 million  
Total project cost: US\$ 1.070 billion

ITA's hydroelectric plant was part of a 10-year (1997-2006) strategic electricity expansion plan developed by ELETROBRAS (the former Brazilian Federal Electricity Utility) consisting of 12 projects. ELETROSUL (Southern Brazil Public Utility Company) performed feasibility studies of power generation of ITA in 1978. In 1983, ELETROBRAS awarded ELETROSUL a 30-year water use concession for the project. By 1990, due to financial constraints, all investments were suspended. During the 1990's, Brazil's government initiated a series of reforms in the electricity sector. Changes in the regulatory and legal framework opened the sector, allowing the participation of the private sector in the construction and maintenance of power plants and the commercialization of energy. In 1994, ELETROSUL launched an international bidding process and invited the private sector to participate for the construction and maintenance of ITA. The project entails a 35-year self-generation concession for the construction and operation of the ITA hydroelectric power plant with a total installed capacity of 1,450 MW. The plant is located on the Uruguay River, on the border of the states of Santa Catarina and Rio Grande do Sul, in the Southern Region of Brazil. The dam site is located between the municipalities of Aratiba (State of Rio Grande do Sul) and Ita (State of Santa Catarina). The works consist of the following: a) a concrete-faced rockfill dam, 880 meters long, 125 meters high; b) construction cofferdams; c) two spillways; d) three saddle dikes; e) penstocks and power tunnels; f) five diversion tunnels; g) support facilities (roads, offices, temporary housing, storage areas, etc). The reservoir will have a perimeter of 757 km and a total surface of 141 km<sup>2</sup>. The construction of the project began in 1996 and the river diversions works were completed in October 1997. The startup of generation unit No.1 is expected to be June 2000, and the startup of the last generation unit will be September 2001. Between 1987 and 1988, ELETROSUL prepared the following studies on the project's area of influence: forest inventory, economic assessment of forestry potential, flora and fauna, water quality monitoring program, and database on the affected population including socioeconomic characterization. In October 1987, ELETROSUL signed an agreement, recognized by the federal government, with CRAB (Regional Commission for People Affected by Dam Construction) establishing the conditions for the relocation of the affected population and delineating the implementation of socially oriented measures in the reservoir area. In 1988, the Rural Resettlement Principles and Guidelines were defined and, by 1990, the Environmental Impact Assessment (EIA) and the Environmental Impact Report were completed. In 1996, the Brazilian National Institute for Environment and Renewable Resources (IBAMA), prior to issuing the project installation license, approved the Environmental and Social Management Plan (ESMP). The ESMP focuses on the environmental and social mitigation measures and monitoring activities. It is expected that the construction and operation of the plant and reservoir will affect the socioeconomic conditions of the affected population with minor environmental impacts. Approximately 10,260 hectares of land will be flooded, affecting 2,870 properties, or 3,785 families. Several consultation activities took place during the preparation of the project including: public hearings of the project EIA; establishment of a group of affected population to seek out an agreement on the resettlement plan; formation of a various commissions; and others. The Bank is making substantial efforts to monitor, during construction and operation, the implementation of all of the recommendations in the studies described above. As part of the loan contract, IDB requested the hiring of an independent engineering consulting firm to monitor construction and operation. Information on the implementation of the measures is limited since execution is just starting. On resettlement, 73 percent of the rural families, and the totality of the urban families have been relocated.

SOURCE: IDBb, 1997

## V. Conclusions

Although the rate of increase in the demand for power in the region is decreasing due to market saturation and greater efficiency in end-usage, demand is still growing at an average annual rate of 5% (Millán 1999). Demand for alternative sources of energy (i.e. natural gas) has increased but there are instances in which hydro alternatives represent the most economic way to produce energy. Countries like Brazil are likely to continue the use of hydropower and energy generation in the next decade given the limited

alternatives available. In Venezuela, the lower Caroni River is still under development and other sites upstream may be economical. In other countries, such as Peru and Ecuador, the shift to natural gas may be gradual and the fulfillment of immediate needs for energy may still come from the development of hydropower projects (Millán 1999).

The Bank's experience with dam-related projects has been diverse. The IDB has been involved in some controversial projects such as Yacyreta between Argentina and Paraguay and Guavio in Colombia, but it has also participated in environmentally sound and socially beneficial projects such as Arenal in Costa Rica, with a resettlement component that has been considered successful; Playas in Colombia which was completed on time, under budget, and without any major perceived environmental and social issues; La Fortuna in Panama and Salto Grande in Argentina-Uruguay that had few identified environmental problems, just to mention some (Millán 1999).

In the past few years, environmental considerations have been taken into consideration much more systematically. First, the establishment of the Environment Division in the late 1980s and later the mainstreaming through environmental units and specialists in the operational departments and Field Offices, supported the incorporation of environmental and social considerations for all types of IDB financed projects.

The nature of IDB's involvement in dam-related projects in the future is unclear. If the Bank's present pipeline is representative of the current trends in the region, private sector financing of these projects is expected to increase.

Private sector financing poses interesting challenges to financing institutions that had in the past dealt only with public sector financing. Under these circumstances, the nature of the involvement of these institutions regarding the social, economic, and environmental issues of dam-related projects needs to be clarified. Unlike projects for the public sector,

where requests for financing are submitted in the very early stages of study, most of the private sector projects that are presented to these institutions for supplementary financing or guaranteeing, may be in the early stages of execution or are about to initiate execution. The only option then may be to implement and closely monitor social and environmental impact mitigation measures during the construction and operation phases. Modifications and/or arrangements needed during execution may be requested by the Bank to minimize detrimental environmental and social impacts, but not during the crucial phase of design and selection of alternatives. Also, project by project economic analysis may need to be substituted by financial analysis. As in the case of the social and environmental considerations, the analysis made by the Bank may be reverted to the end of the line, losing the benefit of its contribution in decision making. It seems like, under these circumstances, there is a strong need for sound economic, social and environmental policies to be in place in the countries to address these issues, so that individual projects conform to them. The Bank could certainly contribute to this.

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## **Annex 1: IDB's Relevant Sector Codes**

<b>CODE</b>	<b>DEFINITION</b>
AG	Agriculture
AG-COR	Rural Community Development
AG-PEC	Livestock Development
AG-RIE	Irrigation and Drainage
EN	Energy
EN-DIS	Distribution
EN-ELE	Electrification
EN-HID	Hydroelectric
EN-TRA	Transmission
FO	Forestry
FO-CON	Conservation
OS	Sanitation
OS-AGU	Water Supply
OS-ALC	Sewerage
PA	Environmental Protection