

**Key Issues:**

**7-Resettlement**

13-Improvement of Infrastructure

**Climatic Zone:**

Cfa: Humid Subtropical

(Mild with no dry season, warm summer)

**Subjects:**

- Resettlement Programme for 600 families
- Partnership between the Developer and Local People

**Effect:**

- Improving Quality of Life after Resettlement
- Increase of Harvest and Land Improvement

**Project Name:** Salto Caxias Hydropower Development Project

**Country:** Brazil

**Implementing Party & Period**

- **Project:** Campanhia Paranaese de Energia (COPEL)  
1995 (Commencement of Construction) -
- **Good Practice:** Campanhia Paranaese de Energia (COPEL)  
1995 –

**Key Words:**

Resettlement Programme, Partnership between Developer and Affected People

**Abstract:**

Among the pertinent environmental aspects was the relocation of 600 families affected by the construction of the Salto Caxias Hydroelectric Power Plant, with a UHE of 1,240 MW, built by COPEL in the Municipal district of Capita0 Leonidas Marques, State of Parana, Brazil. The families were relocated in 10 farms constituting 19 associations of rural procedures. In addition to reallocation of land, an entire infrastructure was built, composed of 600 houses and store-rooms, 322 km of water system, 415km of roads, 11,690 hectares of soil preparation, electrical networks and rural telephony, as well as education and health systems. Nowadays, they serve as national standard.

**1. Outline of the Project**

State owned electric utility Campanhia Paranaese de Energia (COPEL) supplies powers throughout the southern part of Brazil. COPEL owns 18 electric power plants, i.e. 17 hydro and 1 thermal as of the end of 1990. It was recognized in the beginning of 1990s that rapid growth of electricity consumption would require further electricity supply without delay. Thereupon, COPEL planned to construct Salto Caxias hydropower plant on the River Iguacu in the state of Parana, Brazil.

Salto Caxias hydropower plant is the fifth hydropower plant on the River Iguacu and it located on the most downstream of all between the cities of Capita0 Leonidas Marques and Nova Prata do Iguac. Salto Caxias dam is 68 m high, 1,100 m long, and has created a reservoir covering 180 km<sup>2</sup>. The dam



is a gravity roller-compacted (RCC) type.

Construction works began in January 1995. The first of four turbines went on-line in February 1999 and the final unit entered into commercial services before the end of 1999. Projected average annual output from Salto Caxias hydropower plant will be 5,431 GWh.

In consequence of the completion of Salto Caxias, hydropower plants on the river Iguac will provide more than 6,500 MW of capacity, which is almost 40% of COPEL's total installed capacity.

Table 1 Specifications of Salto Caxias Hydropower Project

Item	Specification
Construction Period	1995 - 1999
Power Plant	
Max. Output	1,240 MW (310 MW x 4 nos.)
Max. Discharge	
Effective Head	
Dam	
Type	Roller Compacted Concrete Dam
Height	67 m
Crest Length	1,100 m
Catchment Area	
Reservoir	
Water Surface Area	180 km <sup>2</sup>
Gross Storage Capacity	
Effective Storage Capacity	



Fig.2 Location of Salto Caxias Hydropower Project

## 2. Major Impacts

A reservoir newly created by Salto Caxias dam extends its area to 180 km<sup>2</sup>. Consequently, 600 families living near the small town of Foz do Chopim were faced forced eviction. The affected families formed a small group, so called "Comissao Regional de Atingidos por Barragens do Iguacu (CRABI)" - (Regional Commission of Affected People by Dams Construction in the River Iguacu), and claimed damages against COPEL for their forced eviction.

### **3. Mitigation Measures**

COPEL received the claim of CRABI and accepted it faithfully. Thereafter, COPEL entered into a lively discussion with CRABI in order to agree a resettlement programme. The agreement, which built up the guidelines and approaches of resettlement programmes, was executed in October 1993.

Then, COPEL, on its own initiative, supported to set up a “Group for Multi-disciplinary Studies” with participation of 140 organizations, including rural worker’s associations, universities, representatives from the state environmental authority, the public justice ministry the state of Parana’s legislative assembly, etc.. This “Group for Multi-disciplinary Studies” played a vital role in securing a democratic forum for discussion about various issues, including but not limited to the social, economic, traditional culture. This step was very important as a means of ensuring that the project would be implemented in accordance with the best environmental conservation techniques. It was also social commitment to guarantee that affected people would be able to participate in the resettlement programme during the planning, decision making and execution of the project.

The Agreement required that COPEL should comply with the following assignments.

- COPEL should conduct the resettlement programme so as to promote social justice and to prevent rural exodus.
- COPEL should ensure the fair solution in the resettlement process for minor proprietors and lessees, proprietors without title deed, other workers and farmhands who were directly impaired by the reservoir.
- COPEL should only acquire resettlement lands with the consent of people to be evicted.
- Family and relative groups will be taken into consideration as well as neighbor’s relationship.
- Each lot of land to be acquired should not be less than 17 hectares per family.
- The lands to be acquired should be more fertile than those condemned.
- The size of each lot of land should be determined taking account of the family work force, and quality of soil for cultivation.
- A legal conservation area of 20 % of acquired land should be maintained in each lot. In addition, a defined lot for an experimental agricultural project should be nominated, for which financial support would be provided.
- A plan for agricultural exploitation and improvement of quality of soil for cultivation soil should be developed and implemented.
- A complete infrastructures, i.e. roads, fresh water supply, electricity, telephone network, houses, community centers, schools, etc. should be provided.

Once a partnership between COPEL and CRABI had been established, COPEL took a first step in implementing the resettlement programme. Lands were acquired on the basis of the regional climate, terrain, soil type and its agricultural suitability. Current use of acquired lands were mapped and available information, including superficial and underground water, were evaluated. In promoting the collaboration and dialogue between COPEL and CRABI, the involvement of CRABI facilitated the data acquisition.

The main goal of the resettlement programme was to obtain lands suitable for farming and keeping cattle by ecologically sound methods of production.

#### **Conservation of Existing Forests**

An important issue was how to conserve the existing forests on a parallel with the development of new

farm lands. Only minimum vegetation was removed and natural vegetation classified as forest could be preserved. Approx. 300,000 saplings of native species were replanted on wastelands degraded by previous owners in order to comply with the requirements under the agreement.

### **Improvement of land use**

Land grading work was carried out in accordance with modern soil conservation techniques. This included 375 km of terraces along the contour lines and 450 km of passes in order to avoid erosion and pollution of existing springheads and rivers within acquired lands. It should be noted that people to be resettled participated in this work as a member of CRABI together with hired contractors, having a budget made available to them by COPEL.

### **Sustainable Agriculture**

Agricultural production system in the area close to the future reservoir had been based on the conventional techniques that had a great environmental impact through the use of pesticides, highly soluble fertilizers, hormones and antibiotics. These practices had seriously affected the environment, specially water, soil and biodiversity.

Such method of production had been demonstrated to be unsustainable economically, socially and environmentally. To remedy this situation, COPEL had trained a technical team and concentrated efforts on encouraging, with strong participation of CRABI, to change to organic method of production. Besides an education programme and awareness-raising for families, several trials were carried out and they showed more positive results than expected.

### **Education**

An education programme with two centers for 980 students was established. It developed a special education programme including both classroom activities and community projects. The programme contributed to the development of a new cooperative working method, making people aware of environmental preservation with commitment from public institutions. It also promoted decentralized and democratic management. It benefited young people and adults through the addition of such subjects as rural sociology, psychology of human relationships, and philosophy alongside the regular curriculum disciplines.

### **Health**

Two health centers were set up for the 600 families as well as a family doctor programme, which promotes preventative medicine to replace the traditional medical practices.

## **4. Results of the Mitigation Measures**

The resettlement works on site were conducted during the period between 1996 and 1998.

The total cost of the resettlement amounted to US\$ 56,410,000 (1.95 Real per US dollar) for which COPEL bore all the cost.

In recent years, COPEL and CRABI are promoting annual cultural events. The cultural festival with cultural, folk, religious, dance and theatrical exhibitions seeks to preserve the region's cultural and social heritage. Each cultural event attracts almost 5,000 participants including resettled people, representatives of the authorities, universities and other organizations.

## 5. Reasons for Success

The resettlement programme had as one of its purposes the promotion of deep discussion about;

- The way to use natural resources
- Process, including rural development, that are oriented toward the future
- Being aware of the shortage of natural resources, mainly water
- The possibility may offer an improvement of the quality of life and economic growth

The results of the resettlement programme have shown that a partnership between COPEL and CRABI had been very successful. In this case, CRABI's willingness to work with COPEL on implementing the resettlement programme was essential in achieving such successful results. It is important to point out that CRABI and other NGO continue to work on motivating people in the areas of agricultural improvement, agricultural science, water management and the values of life within a rural community.

## 6. Further Information

### 6.1 References

- 1) Salto Caxias hydroelectric Power Plant, Brazil  
The web site for the power industry, industry project  
(<http://www.power-technology.com>)
- 2) The Role of Hydropower in Sustainable Development, IHA White Paper (Feb.2003)
- 3) GIS Management of Socially Affected Areas by Constructions of Hydroelectric Power Plants  
(<http://gis.esri.com/library/userconf/proc03/p1033.pdf>)

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