

PROFESSIONAL
PRACTICE

**NEW ASPECTS OF IMPACT ASSESSMENT
IN THE PLANNING PROCESS:
THE CASE OF AMAZON TRANSMISSION SYSTEM**

*Silvia H. Pifes, Geraldo Pimentel, Lorena Pires,
Braz J. Araujo, Emilio L. LaRovere¹*

INTRODUCTION

The main energy source for electricity production in Brazil is hydropower, supplying 95 percent of the present domestic demand. The potential for hydropower generation at a location within or adjacent to major power markets is almost completely tapped in Brazil's northeastern and southeastern regions. There are, however, opportunities for additional hydropower production in the northern region of the country (Amazon basin).

It can be envisioned that large blocks of power (30 to 35 GW) will have to be transmitted from remote hydropower plants in the north to main load centers in the northeastern and southeastern regions soon after the year 2000. Transmission distances could range from 2,000 to 2,800 kilometers and would cross different regions and ecosystems. Thus, building transmission

¹ Silvia Pires, Geraldo Pimentel, and Lorena Pires are affiliated with the Amazon Transmission Planning Commission (CPTA)/ELETROBRAS, Rio de Janeiro; Braz J. Araújo is at Universidade de Sao Paulo; and Emilio L. LaRovere is at Universidade Federal do Rio de Janeiro, Brazil.

systems to cover long distances is a basic part of the long-term planning of the Brazilian electric sector.

The planning of such a huge transmission system is a complex undertaking, from both a technological and environmental impact perspective. Such planning must examine a broad range of demand and supply scenarios, transmission technologies, and environmental questions. Individual projects must be integrated on a regional basis.

Since the early 1980s, the Brazilian electric sector has studied the viability of such a transmission system. In 1989, the Amazon Transmission Planning Commission (CPTA) was created and charged with continuing the needed studies. The commission is composed of technical experts from Brazilian Utilities and the Research Center of Electrical Energy (CEPEL). These efforts are coordinated by ELETROBRAS, the Brazilian National Electric Company. Researchers from universities and experts from consulting firms are also participating.

The objective of this report is to present and describe the status of the CPTA's innovative introduction of social and environmental questions into the planning process. The presentation is divided into three discussions:

- ▶ The CPTA study structure
- ▶ The adopted style of planning
- ▶ The environmental studies used in technology selection

CPTA STUDY STRUCTURE

CPTA Working Groups and Stages

The CPTA study structure recognizes both the need to involve multiple disciplines and to work from the general to the specific. Six working groups were formed by CPTA: power market, generation expansion, transmission planning, technology and industrial development, engineering, and environmental. CPTA studies are being carried out in four stages:

1. **Technology Reselection** — Analysis of potential technologies and the elimination of unsuitable ones

2. **Technology Selection** — Selection of one or more technologies to be used in the transmission system.
3. **Configuration Selection** — Definition of the basic components of the transmission system, potential transmission corridors, and potential arrival points at the major power markets.
4. **Configuration Specification** — Detailed definition of the technical characteristics of the transmission system and its components, as well as selection of transmission line routes.

Technology preselection has been completed. Technology selection was initiated in January 1991. Following completion of configuration specification, design (and its associated environmental licensing process) and construction will be undertaken by the individual utilities that will operate the transmission system.

CPTA Environmental Studies Stages

CPTA is conducting environmental studies during each of the four CPTA study stages. Their components, which reflect environmental study characteristics and terminology, are as follows:

1. **Initial Environmental Inventory**
 - a. During technology preselection — definition of potential social and environmental questions
 - b. During technology selection
 - Development of the public participation process
 - Preliminary characterization of the social and environmental characteristics of each region to be affected
 - Environmental impact assessment of technology alternatives
2. **Final Environmental Inventory** (during configuration selection)
 - a. Detailed characterization of the social and environmental characteristics of the region to be affected
 - b. Environmental impact assessment of corridor alternatives
3. **Viability** (during configuration specification) — assessment of line route alternatives within selected corridors

The CPTA environmental studies will be followed for each specific project by an environmental licensing process, already established by the electric sector, that contains the following components:

- Preliminary license
- ▶ Environmental impact studies
- ▶ Environmental impact report

Interaction between Different CPTA Studies

Interaction between the various CPTA working groups has proven critical to the integration of environmental considerations into the planning process. The findings of each group, as well as their interrelationships, must be considered at each decision-making point. The evaluation criteria of each working group, including the environmental group, take into account the interests of the other groups.

At the start of the CPTA planning process, a glossary of the basic concepts used by the different technicians involved was established. Its purpose is to facilitate communication between transmission system experts and environmental experts. It also facilitates communication with participating technicians from the individual utilities, who have been found to have both differing experience and knowledge.

NEW STYLE OF PLANNING

The CPTA study structure is a new style of planning for the Brazilian electric sector. It is new in two ways:

1. Environmental questions are being considered in parallel with technical and economic studies.
2. Public involvement is being integrated into both the planning and environmental processes.

Parallel Planning and Environmental Studies

This is the first time in the transmission planning process of the Brazilian electric sector that environmental questions are being considered in parallel with technical and economic studies. This is being done from the very beginning of the planning process and prior to any decision making. Integrating environmental questions into the planning process, rather than considering environmental issues to be a problem or an obstacle to overcome, has changed the planning process. The analysis of alternatives is now not aimed at selecting the least-cost alternative, but at identifying the alternative that best balances the interests of the electric sector, other government agencies, social groups, and environmental needs,

The traditional decision-making process, based on cost-benefit analysis, did not fully address this broader range of interests. New concepts and methods have been introduced to the planning process—concepts and methods that address the full range of variables.

The goal of environmental studies within the planning process is to develop projects that are less disruptive to the environment and to society. The environmental impact assessment is used to support not only project selection but to support the planning process itself and to act as a means of environmental management and social negotiation.

Public Participation

Public participation must be a part of both the planning and impact assessment process. The Brazilian process of redemocratization has made it possible to discuss the effects of government decisions related to large projects built over the last two decades. Social groups directly and indirectly affected by those projects can now express their views about the implementation of these projects and the local, regional, and national difficulties they may have generated. The Brazilian electric sector has endeavored to adopt a more open decision-making process for its new plans, programs, and projects. In its second environmental master plan (PDMA-1990), the electric sector includes interaction with society as a basic principle of its planning process. Thus, CPTA has begun to involve the public at each study stage, focusing on major decision-making points.

The paragraphs that follow describe the studies currently being carried out by CPTA that are directed toward establishing procedures that integrate environmental studies and public involvement into the planning process.

THE ENVIRONMENTAL STUDIES OF TECHNOLOGY SELECTION

During this stage, the state-of-the-art of preselected technologies, a determination of what aspects of these technologies require further study, the consequences to domestic industry of adopting each technology, and the social and environmental impacts of each technology are reviewed. In addition, as a part of the evaluation of social and environmental impacts, the characteristics of the region to be affected are defined and an impact assessment methodology that takes into account societal values is developed. The impact studies are directed toward contributing to both the selection of the appropriate technology alternatives and definition of a less disruptive design criteria.

The following paragraphs describe ongoing studies related to:

- ▶ Public participation
- ▶ Environmental characterization of regions
- ▶ Environmental impact assessment methodology

Public Participation

Participation opportunities are being defined for each planning stage. This includes identifying the decision points where participation is appropriate, developing rules and methods governing participation, identifying the types of individuals and groups who should participate, and selecting appropriate forums for participation. This program is being developed jointly by the CPTA team and researchers from Universidade de Sao Paulo (USP) and Universidade Federal do Rio de Janeiro (UFW).

The CPTA public participation program is being developed in three phases. Phase one involves examining the electric sector's planning process; identifying relevant institutional, social and political trends; and selecting

basic concepts that will be used in the design of specific participation methods.

Methods and procedures for public participation during technology selection are being developed during *phase two*. This will include determination of the decision points at which participation will occur, the social groups to be involved, the appropriate forums, and the activities that will occur. Mechanisms for incorporating the results of each opportunity for participation into the decision-making process and for reporting the decisions made back to the participants are being developed.

During *phase three*, the objectives of phase two will be pursued for the two remaining stages of the planning process, configuration selection and specification.

Basic concepts for participatory planning

Taking into account experience elsewhere in the world, the relationship between society and the Brazilian State, Brazilian experience, and the CPTA's characteristics, basic approaches to public participation were discussed. It was recognized that the need for public participation in the formulation of public policies is a result, in part, of the global trend of embracing democratic ideals in which the concepts of representation, participation, citizenship, and decentralization are emphasized. The current desire to participate in the planning process is more than a reaction against institutional practice; it reflects a broader attitude.

Based on prior experience, the characteristics of the planned transmission system, and the characteristics of the regions it will cross, it is possible to anticipate who will be the interested social groups and their likely interests at each stage of the electric sector planning process. The organization and function of these potential participants were also investigated. It was observed that the public's inadequate understanding of the planning process was the main source of conflict between the public and the electric sector. More specifically, in the past, the public has put forward questions and asked for solutions at inopportune moments. This has led to conflict, and opportunities for change offered by the public were lost.

Considering all of these aspects, it was concluded that the current trend for public participation is to intervene in the planning process, in the decisions about new projects and energy policies, and in the definition of priorities for implementing agreements already reached between the electric sector utilities and social movements.

Based on these factors, the following dimensions for public participation were identified:

1. **Social participation** – who to involve and when to involve the public in a systematic and structured way starting at the beginning of the electric sector's planning process. This includes recognizing that in order for the process to be credible, participation should not only be allowed but encouraged.
2. **Communication** – what are the best means for establishing regular communication between the different components of society and the electric sector.
3. **Negotiation** – how to reach an understanding or agreement with other interested government bodies.
4. **Respect for minority interests** – recognition that the needs of the majority do not always outweigh the often unique ideological and cultural interests of the minority.
5. **Recognition of the rights of affected groups** – recognition that affected groups have a right to be compensated for their loss.
6. **Institutionalization** – establishing the forms of public participation-including limits, attitudes, and procedures-as written policy and establishing the organization to carry out that policy.
7. **Regional integration** – revisions of electric sector planning procedures so that they take into account the need for integration of projects into their regional setting.

Decision-making points

As an important part of ensuring that the above dimensions are incorporated into the participation process, key decision-making points and related participation opportunities were identified. At the time, the formal procedures of the Brazilian environmental licensing process called only for public hearings at the end of its environmental impact studies of a single chosen route and prior to obtaining a preliminary license to build the project. Public participation at three earlier decision-making points were identified by CPTA studies. The following three moments will make it possible for public values to be reflected in technology selection, configuration selection, and configuration specification:

1. **Prior to technology selection**, a technology environmental impact assessment containing a description of the project, the technology alternatives, and the potential environmental impacts is made available to the public and interest groups. The consequences of not implementing the proposed action are also described. As a part of a strategy of regional integration, the opportunities for electrical supply that could be offered to communities through which the power line would pass are presented.
2. **Prior to configuration selection**, the CPTA should present the corridor alternatives and their technical, economical, and environmental trade-offs. Substation locations, since they will bring jobs to an area, should also be considered as a part of the dimension of regional integration.
3. **Prior to configuration specification** (at the viability stage), the CPTA should present specific route alternatives and their technical, economical, and environmental trade-offs.

Aspects to be negotiated

The CPTA transmission system will pass through the Amazon forest. The Amazon region includes many preservation and Indian areas that are protected by law as a part of Brazil's national heritage. Any projects that affect protected areas must be authorized by the National Congress. Thus, negotiation with members of the Congress and political parties is required to obtain project approval.

In addition, the system will pass through different regions, states, and cities-and thus, through the jurisdictions of several environmental secretaries. Although these jurisdictions are linked by the National Environmental System, the various agencies will all have to be involved in the environmental licensing process. A formal structure for coordination with these agencies during the earlier CPTA studies is needed to ensure continuity when negotiating among these forums.

Environmental Characterization of Regions

The proposed transmission system encompasses large areas of the country, including remote and almost unknown regions that have very different natural and socioeconomic characteristics. Natural Amazon forests, areas being deforested, areas already affected by large infrastructure projects, and areas of intensive agriculture or cattle raising could be affected. Next to load centers, densely populated areas or areas developing with urban expansion could be affected.

Thus, a knowledge of the social and environmental characteristics of the regions to be crossed by the system is considered an essential input into project studies.

Initially a general overview of a complete region is being obtained. As the study limits are defined, the scope of analysis will be narrowed. At the initial inventory/technology selection stage, the study area is large, encompassing all potential alternatives. The primary constraints are the location of potential generation points, the location of major load centers, and environmental limitations imposed by legislation. The objective of this phase is to identify areas willing to welcome the project and those areas' inadequacies and problems. Both can influence the choice of generation points. The participation program developed for this phase plays an important role in identifying an area's positive and negative features.

Environmental Impact Assessment Methodology

At each stage of the CPTA planning process, an environmental impact assessment methodology is needed that suits the objectives to be achieved and the level of analysis. Inherent difficulties in the impact assessment process are increased at the technology selection stage, since a program rather than a

spatially and physically defined project is being evaluated. The common assessment methods, both those widely used and those discussed in the literature, are designed for **specific** projects and not programs. Methods for quantifying impacts and estimating costs are therefore not readily available. Means for incorporation of the findings of public participation into program decision making also need to be developed.

The needed methods are being developed at the present time. The focus to date has been on selecting environmental impact indicators, tools for measuring impacts qualitatively and quantitatively. These indicators will reflect the characteristics of the technologies that will influence the environment, e.g., right-of-way width, number of circuits, tower height, electric field, etc. A general description of the environmental impacts associated with each transmission technology under consideration has been developed. Emphasis was placed on the differences between the technologies rather than impacts inherent to all transmission line technologies. The impacts were categorized into impacts of land occupation, impacts of electrical effects and visual impacts. As noted earlier, the potential benefits of each technology to the regions they would pass is also being considered.

FINAL CONSIDERATIONS

The CPTA planning process represents an innovation in the Brazilian electric sector. The consideration of environmental issues as planning variables and the inclusion of public participation has introduced changes throughout the entire planning process. The sector's attitude towards socioeconomic issues is now becoming pro-active rather than reactive. Technology-oriented planning tools are being supported by public participation. New tools of public participation, regional characterization and environmental impact assessment are being developed. It is recognized, however, that continued political support for this approach will be essential to its implementation.

REFERENCES

- Araujo, Braz et al. 1992. "Basic Concepts for the Participatory Planning of the Amazon Transmission System." *Nucleo de Politicas Estrategicas (NAIPPE)/USP*. Sao Paulo, Brazil (in Portuguese).
- Eletrobras/CPTA. 1990. "Technology Preselection Report. " Rio de Janeiro, Brazil (in Portuguese).
- Eletrobras. 1990. "II Brazilian Electric Sector's Environmental Master Plan (1991-1993)." Rio de Janeiro, Brazil.
- Eletrobras/CPTA. 1990. "Incorporating the Public in the CPTA Planning Process." Technical Note GA-005/90. Rio de Janeiro, Brazil (in Portuguese).
- Eletrobras/CPTA. 1992. "Technology Selection Stage as a Process of Technological Assessment. " Technical Note GA-007/92. Rio de Janeiro, Brazil (in Portuguese).
- Eletrobras/CPTA. 1992. "Environmental Impact Assessment in the Technology Selection Stage. " Technical Note GA-008/92. Rio de Janeiro, Brazil (in Portuguese).
- Eletrobras/CPTA. 1992. "Preliminary Characterization of the Amazon Transmission System Study Area." Technical Note GA-009/92. Rio de Janeiro, Brazil (in Portuguese).
- La Rovere, Emilio *et al.* 1992. "Analysis of the Public Participation Experience in the Electric Sector." PPE/COPPE/UFRJ. Rio de Janeiro, Brazil (in Portuguese).