

Hydropower Plants and Indigenous Lands in Brazil

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INTRODUCTION

The hydroelectric energy generation in the Brazilian Amazon Region is complex not only for the important natural resources of the area but also for the impacts to the local populations, especially the indigenous people. Brazil has 684 indigenous lands, which corresponds to 13,16% of the Brazilian territory. From the total of indigenous lands already identified, 65,3% are located in the Brazilian Amazon Region. Due to its natural resources, this region attracts various interests, generating permanent conflicts with indigenous people, who have cultures, ways of life and different levels of contact. The interference of projects on indigenous lands is quite significant if analyzing each separately, but can take more harmful and permanent characteristics when examining the integration of all these interests in the Amazon Region.

This article aims at analyzing some present subjects in the process involving Hydroelectric Plants and Indigenous Lands in the Amazon Region looking for feasible paths that point out a more sustainable and equitable development. Two basic assumptions were considered in this study, both related to the need for energy and the treatment of indigenous issues in Brazil. The first considers that there is a growing energy demand in the country, caused by population growth, urbanization, the economic development and the consumption pattern of modern society, which needs to be addressed. The second argues that indigenous issues sometimes run in parallel with the intentions of the traditional economic development, and create conflicts with different sectors of public, private and military administration.

ENERGY GENERATION IN BRAZIL

Brazil has 56.6 million of permanent private households supplied with electricity, considering a population of 190,755,799 residents (IBGE, 2010). From the total population, 63.86% is from the Southeast, South and Center-West regions. The Northeast represents 27.83% of the total population and the North 8.32%, and these regions have the highest rate of persons residing in rural areas, with 26.87% and 26.47%, respectively. The Southeast region is the most concentrated, with 42.13% of the total population, and has 92.95%, of its population living in urban areas, pattern followed by Center-West and South regions. Brazil has 84.36% of its population living in urban areas, a situation that contributes to increase the energy demand, showing a scenario where an urban coverage in terms of electricity is almost complete. Table 1 presents the Brazilian population by regions, showing the percentage per region, and the percentage of urban and rural residents in each region.

Table 1. Brazilian Population by Regions with Rural and Urban Percentages

Brazil and Regions	Total	%	Urban	Rural
Brazil	190.755.799	100	84.36%	15.64%
North	15.864.454	8.32%	73.53%	26.47%
Northeast	53.081.950	27.83%	73.13%	26.87%
Southeast	80.364.410	42.13%	92.95%	7.05%
South	27.386.891	14.36%	84.93%	15.07%
Center-West	14.058.094	7.37%	88.80%	11.20%

Source: IBGE, 2010.

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The Brazilian electric energy matrix is predominantly hydroelectric, as shown in Table 2, which presents the Brazilian installed capacity by source.

Table 2. Brazilian Installed Capacity by Source (February, 2014)

Sources	Number of Power Plants	Installed Capacity (KW)
Hydro	1.094	85.952.305
Gas	152	13.895.609
Oil	1.146	7.672.334
Biomass	476	11.414.335
Nuclear	2	1.990.000
Coal Coke	13	3.389.465
Wind	109	2.257.773
Solar	55	5.915
Import		8.170.000
TOTAL	3.047	134.747.736

Source: ANEEL, 2014.

The installed capacity of hydropower generation in Brazil nowadays is approximately 86 GW, corresponding to 44% of the inventoried potential until December 2012 (Eletrobras, 2014). Table 3, below, shows the inventoried and estimated hydroelectric potential of the Brazilian river basins. The Paraná River Basin, located in the South, Southeast and Center-West regions, attends approximately 50% of this potential while the Amazon River Basin only 5.36%. This is due to the fact that Amazon is a region of plains and great biological diversity, with large distances to the energy consumer centers, in contrast to the rapid economic development and the plateaus of the center-south regions (ANEEL, 2005). The intense harnessing of the South and Southeast regions' hydroelectric potential implies at the search for remote areas' potential, which naturally points to the Amazon region as a major target for present and future hydropower generation.

Table 3. Inventoried and Estimated Hydroelectric Potential of the Brazilian River Basins (December, 2013).

River Basin	Inventoried [a]		Estimated [b]		Total [a+b]	
	(MW)	%	(MW)	%	(MW)	%
Amazonas River	61.084,95	31,1%	33.913,79	70,2%	94.998,74	38,8%
Tocantins River	24.404,16	12,4%	1.907,60	3,9%	26.311,76	10,7%
Atlântico Norte/Nordeste	2.101,09	1,1%	706,70	1,5%	2.807,79	1,1%
São Francisco River	21.020,69	10,7%	1.560,98	3,2%	22.581,67	9,2%
Atlântico Leste	12.578,41	6,4%	1.422,50	2,9%	14.000,91	5,7%
Paraná River	56.522,28	28,7%	6.321,69	13,1%	62.843,97	25,7%
Uruguai River	11.026,57	5,6%	415,70	0,9%	11.442,27	4,7%
Atlântico Sudeste	7.915,78	4,0%	2.073,06	4,3%	9.988,84	4,1%
BRAZIL	196.653,93	100,0%	48.322,02	100,0%	244.975,95	100,0%

Source: Eletrobras, 2014.

Brazil has 3,049 electric power plants in operation, which makes a total of 134,057,470 kW. For the coming years, it is expected an increase of 36,154,822 kW from 220 projects under construction and 475 contracted projects (ANEEL, 2014). Energy sources explored in Brazil include wind, hydro, solar and thermal. In relation to the electricity consumption by sector, the Brazilian industrial sector accounts for 48%, followed by the residential sector with 22%, the commercial sector with 14%, the public sector with 8%, the agriculture with 4% and the energy sector with 4%.

Brazil currently has 1,094 hydroelectric power plants in operation (situation in 02/12/2014), in which 195 are related to hydropower plants, reaching a total of 85,952 MW of installed capacity (ANEEL, 2014). The Brazilian hydroelectric generation potential is located largely in the Amazon River Basin (38.8%). However, not all of this potential was inventoried, which can greatly change the numbers presented. The national inventoried potential represents 80% of the total hydropower potential, but the biggest Brazilian Basin, the Amazon Basin, has only 64% of the known potential (Eletrobras, 2014), indicating a great potential to

expand hydroelectric generation in Brazil. Thus, numerous conflicts with indigenous communities can be anticipated, once the region has a high concentration of indigenous lands.

INDIGENOUS LANDS IN BRAZIL

The protection of indigenous lands is guaranteed by the Brazilian Federal Constitution (Brazil, 2009), that recognizes to cultural and social organization of indigenous peoples and the differentiated way they address territorial issues, which are essential for the reproduction of indigenous groups. The Constitution establishes that the Union has the exclusive power to legislate on indigenous population (article 22, section XIV), demarcate and protect their lands (art. 231, caput), protect their cultural manifestations (art. 216 §1) and, through the Public Prosecution, defend judicially their rights and interests (art. 129, V). The article 231 of the 1988 Federal Constitution, in addition to recognizing the indigenous social organization and cultural diversity, secured the lands they traditionally occupy (§1) and the exclusive usufruct of the riches of the soil, the rivers and the lakes existing therein (§2). The harness of water and mineral resources in indigenous lands can only be accomplished with the authorization of the National Congress and after hearing the involved communities (art. 231 §3), and shall follow an administrative procedure regulated by law, which has not been edited yet. The delay in this regulatory process has the potential to harm both the electricity sector and the indigenous population.

Nowadays, Brazil has 684 indigenous lands in a total area of 112,099,275 ha, corresponding to 13.16% of the national territory. From these 684 indigenous lands, 421 are already registered, which represents 92.23% of the total area of the Brazilian indigenous lands and 122 are still in process of identification. From the total of indigenous lands already identified, 68% are in the Amazon region (ISA, 2014).

The Brazilian indigenous lands' demarcation procedure is defined by the Indigenous Statute - Law No. 6,001/1973, and the Decree No. 1775/1996, and includes the following stages (Ladeira et al, 2002; Santilli, 1999):

Identification
Formation of a specialized technical group coordinated by a qualified anthropologist to make a report with a proposal of limits for the delimitation of the indigenous land. After the approval of the report, the summary must be published in the Federal Government's Official Publication.
Declaration
Publication of the summary opens a period of dispute, after which it is emitted a Declaration Statement of the Indigenous Land.
Demarcation
Implementation procedure of the physical demarcation of the area.
Homologation
Confirmation of the physical demarcation of the indigenous land held by a Presidential Decree.
Registration and Extrusion
Procedure to legally register the indigenous Land and to remove the non-Indian occupants.

DISCUSSION

The Amazon region is traditionally occupied by extractive, riparian and indigenous population, mostly living in harmony with the environment. However, as a region rich in natural resources, Amazon converge and aggregates innumerous interests, generating permanent conflicts with this traditional population, especially the indigenous people, which has cultures, ways of life and different levels of contact with non-indians. The interference of projects on indigenous lands is quite expressive, when analyzed separately each interest is a problem in itself, but the integration of all these interests in Amazonia greatly increases the complexity of the conflict.

Indigenous lands have different degrees of contact with non-indigenous people, generating many different perceptions of reality, especially in Amazonia, which has isolated indigenous people, those contacted by violence and those more integrated into the non-indigenous world. All this diversity is presented in a local and regional configuration that has its own dynamic of stakeholders and interests, and an asymmetry in terms of power distribution that should be taken into account in the decision making process of any

project. Each of these situations requires the adoption of different strategies that should be defined case by case according to their realities in order to allow the appropriated levels of action for the electricity sector. It is important to know this reality and the stakeholder dynamics in advance, especially when indigenous groups are involved, to avoid some common problems and to reduce the restoration time of the affected population and the operation of the plant.

The analysis of this question allows the identification of elements to be considered in the relation between indigenous people and hydroelectric power plants in the Amazon region that can assist the electricity sector's planning. Some of these considerations include (Paz, 2006; Paz et al., 2011):

- All projects with some connection to indigenous people should consider this issue as early as possible in the electric sector expansion plan in a more more systematic approach. This analysis should be effectively included in the inventory phase, so that it can influence the selection of the best cascade and coordinate strategies for a fair negotiation process aiming at a favorable outcome. Another suggestion is to consider indigenous issues when selecting priority river basins to be inventoried. The 2030 Brazilian Long Term Expansion Plan is an example of what is already being done in this direction due to the consideration of Conservation Units and Indigenous Lands in the selection of the available potential in Amazonia;
- The assessment and mapping of pre-existing local and regional socioenvironmental conflicts is crucial to substantiate the negotiation process of the project. This is another item that should be considered in the planning process and the choices related to the electric sector expansion because it will allow the development of effective strategies, also including the involvement of other sectors for building a joint regional development plan;
- The pressure of stakeholders can paralyze and even make unfeasible a project. Thus, population resettlement as well as other social actions that promote significant changes in the ways of life of the affected population should be prioritized. This process must not only restore the living conditions of affected groups prior to the arrival of the project, but also be an opportunity to promote their improvement.
- It is necessary to make a review of what is considered direct and indirect impact because an erroneous assessment can generate unresolved legacy and, ultimately, environmental conflicts. The assessment of cumulative and synergistic impacts should also be made considering this aspect in order to effectively analyse the successive modifications of ecosystems and the intensification of the direct and indirect impacts of the projects in the basin. Otherwise, it will imply in future costs not accounted at the planning of the restoration of the project's environmental losses.
- Transparency throughout the process, including the opening up of official information from the planned projects for public consulting, can prevent speculation and uncertainty, thus contributing to enrich possible interventions.

It should be recognized the effort of the Brazilian electric sector in order to work more closely connected to environmental and social issues, which is gaining increasing importance since Tucuruí and Balbina power plants were planned. An example is the Waimiri-Atroari Indigenous Land Program (PWA), created by Eletronorte due to the construction of the Balbina power plant. The Waimiri-Atroari Indigenous Land has historically faced the presence of non-indigenous interests in their areas, from the search for indigenous slaves in the mid-17th century, the construction of BR -174 road in 1974, until the installation in the area of Taboca mining company, from the Paranapanema group. When PWA agreement was signed in 1987, the indigenous land was invaded by non-indigenous people and reduced in size, and the demarcation was revoked by Decree 86.630/1981 once it was found a new tin mine deposit in the area. This scenario was before the arrival of Program. Today, the Waimiri-Atroari Indigenous Land is demarcated (Decree 94.606/1987) and approved (Decree 97.837/1989), having a total area of 2,585,911ha, and an efficient program of surveillance allows the area to free from invasions.

The Waimiri-Atroari Program was designed with the purpose of giving back to the indigenous people their autonomy, prioritizing training for an independent self-management. The main benefits are food independence, surveillance and environmental monitoring actions, education in indigenous language, new

villages' construction, improvement of health conditions, among others, that contribute to population growth. These results are a major advance in treating impacts of hydro power projects on indigenous lands.

Despite the existence of legislation formulated to ensure the permanent indigenous possession of the lands they traditionally occupy, it is verified, especially in Amazonia, the invasion and pressure on indigenous lands for various economic interests, like mining operations, military and large farmers interests, illegal loggers, and so on. This scenario allows and even encourages conflicts between indigenous and non-indigenous people, many of them prior to the arrival of the Electric Sector in the region.

FINAL CONSIDERATIONS

The conflicts between indigenous people and the electric sector can be minimized with the promotion of a fair negotiation process, respecting the socio- cultural differences, which necessarily involve knowledge of the reality of the indigenous lands located near existing and planned reservoirs, as well the potential or already installed conflicts that occurs at a local or regional level. The electric sector planning already seeks to incorporate environmental and social variables as early as possible, so that the potential impacts can influence the modification and improvement of engineering projects, and the decision-making process as well. The consideration of indigenous issues in the electric sector planning process promotes an understanding of local pressures and conflicts and can provide important assessment elements to be considered in the negotiation process. This can be translated into a reduction or a better prediction of project costs, and an opportunity for the electric sector to promote mediation and partnerships among different private and public stakeholders, thus promoting balance between the rational use of resources and the improvement of the life quality for all.

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