

An IA peaceful march to Amazon - is it possible?

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Abstract: The hydropower projects still represent an important resource for the Brazilian energy supply due to the vast spatial availability of hydropower potential, although these projects have also been a controversy in the Brazilian energy sector because of their significant environmental degradation. Until the 1970s, the implementation of Brazilian hydropower plants occurred under low land use regulations as the Balbina and Tucuruí projects, which also induced the creation of the Brazilian Environmental Policy Act in 1981. The 1980s and 1990s are characterized by a weak spatial planning of hydropower plants, and in the 2000s the Federal Government recovered to a planning capacity that is motivated by a favourable international economic context for infrastructure investment. Based on this context of relationship between the available hydropower potential and the land use regulation, this paper analyses why nowadays the Amazon region is the last boundary for Brazilian hydropower supply and how some tumultuous cases are crossing over this Amazon frontier, as the current Belo Monte Hydropower Plant in Xingu River and the present and future hydropower projects for Tapajos Basin. As the result, the exploitation of hydropower potential and the complexity for the Brazilian impact assessment increased and currently the Amazon region represents the last Brazilian frontier for hydropower projects and the newest challenge for Impact Assessment: beyond the Amazon frontier, far from a peaceful march.

Key words: hydropower plants; environmental impact assessment; environmental licensing; environmental planning and management.

Available hydropower potential in the Amazon

The Brazilian hydropower potential is estimated around 260 GW (AGÊNCIA NACIONAL DE ENERGIA ELÉTRICA, 2008), which 70% are still available for new hydropower plants. Geographically, the Brazilian Amazon region holds more than half of this available hydropower potential. On the other hand, almost all the hydropower potential of non-Amazon regions has already been exploited in recent decades.

The Brazilian Amazon region represents an important resource of hydropower for the coming years, especially considering that the Brazilian Plan of Economic Growth, in which is estimated that is necessary a new supply of 3.2 GW per year, for the growth of gross domestic product, especially to serve the mining and steel industry (EMPRESA DE PESQUISA ENERGÉTICA, 2011).

In this context, this paper presents the temporary dynamics of Brazilian hydropower plants in both Amazon and non-Amazon regions since the 1950s, considering the Amazon region as that still holds a huge available hydropower potential associated with significant environmental restrictions. This Brazilian scenario might not allow an IA peaceful march in the coming years.

It is noteworthy that this study considers only those dams that were built in Brazil from 1950 (about 99% of Brazilian hydropower plants) and only those with a minimum of 100 MW installed power.

Brazilian history of hydropower installation

Between 1950 and 1979, the Brazilian economy is characterized by nationalization plans of production and distribution of electric energy, the rise and consolidation of energy sector nationalization (GOLÇALVES, 2009) and the large inflow of international funding for the implementation of large infrastructure projects. The regional planning policies established in this period was an important factor that guided the implementation of large infrastructure projects in some regions still inhabited - like Amazon region - justified by generating employment and reducing regional inequalities (BORTOLETTO, 2001).

During this period, the Amazon region represented a large hydropower potential to be explored, whereas the mechanisms of environmental protection were still weak or precarious. The environmental management was held mainly from procedures of industrial pollution control in end of pipe, and not by instruments of territorial planning of development projects (SÁCHEZ, 2006).

Therefore, four hydropower plants were installed in the Amazon region in this period, generating a total amount of 8.70 GW, i. e., only 6.5% of the region's hydropower potential. Among those four, it is highlighted the Tucuruí dam, which the installation began in 1976. This set of hydropower plants was especially motivated to supply great centres of industrial or domestic consumers in this region during the period. In other regions, were installed about 54 plants, generating an amount of 31.8 GW.

The Balbina hydropower plant, also installed in the Amazon in this period, can be highlighted as well; not in terms of its energy efficiency, but because it caused significant environmental impacts that engendered negative repercussions to the establishment of dams in the Amazon region. According to Ross (2006), the area where Balbina hydropower plant was implanted is geomorphologically characterized as a transition between medium and small hills to a mainly flat, where the altitude is less than 100 meters. For the viability of the project, it was necessary to flooding of about 2,500 km² of Amazon forest - the equivalent area of the Itaipu and Tucuruí reservoirs - both constructions contemporary to Balbina.

Thus, Balbina's capacity to generate power is minor due to topographic issues that do not provide a desirable height difference. The result is an installed power of 250 MW with an average generation of about 112 MW per year (Fearnside, 1988), resulting in the worst Brazilian ratio of installed capacity by area.

As a result of this kind of situation, populations affected by infra-structure projects began to organize an agenda for liability claims that would guarantee the right of residence in their territory or even just compensation for lands flooded by the dam. Emerged, in the 1970 decade, internationally organized social movements and conferences started questioning the development model based on economic growth and its consequences for society (SANTOS, 2004).

In Brazil, all the social and political movement of the 1970s induced the creation of the National Environmental Policy in 1981, the main regulatory framework that support the Brazilian planning and environmental management, sustained by environmental policy instruments such as environmental zoning, environmental licensing, environmental impact assessment, the specially protected areas etc. (SÁNCHEZ, 2006).

The environmental impact assessment was introduced in this period as a methodological process linked to environmental licensing for those activities that may cause significant environmental degradation, hence it was properly regulated in Brazil only to the scale of projects (SÁNCHEZ, 2006). Thus, since 1981, the country gradually established a series of regulatory mechanisms that create new conditions and restrictions for the decision-making processes about the spatial planning of hydropower plants.

As a result of those new environmental instruments and the Brazilian economic crisis lived in the 1980s, only 25 hydropower plants were installed from 1980 to 1999, which, only three hydropower plants were installed in the Amazon: Samuel (0.22 GW), I Corumbá (1.99 GW) and Serra da Mesa (1.28 GW).

Therefore the implementation of hydropower plants in the Amazon from 1980 to 1999 was not prioritized, probably because the negative impact that the construction of the Balbina hydropower plant (and others) generated in public and in the international financial institutions. Moreover, the gradual increase of land use regulation may also have led decision makers to adopt a more conservative solution for the provision of hydroelectric power.

Brazil lived an economic crisis in the end of 1990s, which may have organized a new scenario of economic opportunity for the exploration of Brazilian hydropower plants. In addition, the federal government initiates a broad institutional restructuring in hydropower generation model that increases the capacity of sector planning (GONÇALVES, 2009). Moreover, the greatest strength of environmental policy instruments has allowed a more organized set of norms and guidelines that may have restricted the land use since 2000.

Although were installed less hydropower plants in this period, it is possible to classify the first decade of the XXI century as a resumption of hydropower plants planning, especially in the Amazon region, where there was an increase of hydropower plants installed.

There were 35 hydropower plants installed between 2000 and 2011, of which 14 were located in the Amazon region (total 7.87GW) and the rest in non-Amazonian (total 12.35 GW) - demonstrating a geographic reorientation of hydropower plants planning for that region. This shift can be explained by the shortage of hydropower potential in most of the river basins of the south, southeast and northeast regions (AGÊNCIA NACIONAL DE ENERGIA ELÉTRICA, 2008), leaving therefore the Amazon region to increase energy supply.

However, it is important to note that this increase in spatial planning capacity of hydropower plants did not occur in complete adherence with the restrictions and guidelines for disciplining the land use. Moretto (2008) and Moretto et al. (2010) analysed some controversial environmental licensing processes of hydropower plants in this period. In all cases, the authors demonstrated that there was some disregard of rules or guidelines of the environmental impact assessment.

Is an IA peaceful march possible in the current decade?

The Brazilian Plan of National Energy Expansion 2011-2020 intensifies the hydropower exploitation in the Amazon region, with a contribution of about 115 GW (EMPRESA DE PESQUISA ENERGÉTICA, 2011). According to this plan, of the 31 new projects planned to be installed, in the period from 2011 to 2020, 14 hydropower plants are located in the Amazon region, highlighting the huge hydropower plants, like as Estreito (1.09 GW), Santo Antônio (3.15 GW), Jirau (3.3 GW), Belo Monte (11.23 GW) and Teles Pires (1.82 GW).

Figure 1 shows the whole temporal dynamics of the hydropower plants installation in the Amazon and in the non-Amazon regions since 1950, clearly showing the return of hydropower planning for the Amazon region, in number and power installed.

The current Brazilian government decision is to return to the installation of large hydropower plants, which will require large reservoir areas, especially in the Amazon region. In this way, seven hydropower plants will perform a total of 27.5 GW. Other 27 hydropower plants will be medium or small set, totalling 10 GW of installed power what represents new smaller projects or updating old installed, especially in other Brazilian regions that already have low availability of potential hydropower.

Although the debate is currently focused on the hydropower plant of Belo Monte, already licensed for installation, it is necessary to highlight a potential source of future conflicts in the Tapajós River in the Amazon region, where there are planned six large hydropower plants and where several protected areas and indigenous lands were already established.

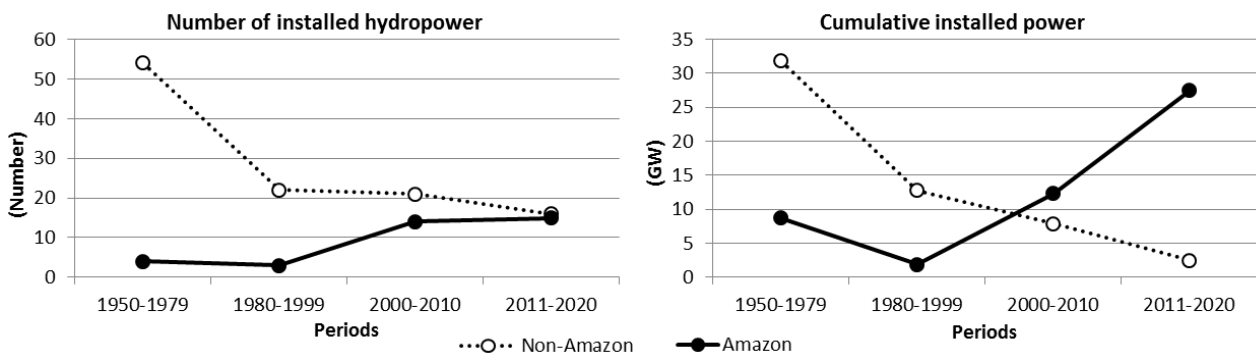


Figure 1. Temporal dynamics of hydropower plants installation in Amazon and non-Amazon region.

Considering Figure 1, the first analysis period (1950 to 1979) is characterized by the lowest land use restrictions, promoting the decision to undertake large hydropower plants in non-Amazon and the exploitation of low available hydropower potential in the Amazon region.

In the second (1980 to 1999) and third periods (2000 to 2010) the option was for installation small hydropower plants in both Amazon and non-Amazon, though there was an installation improving in the third period analysis in the Amazon. Finally, considering the scarcity of hydropower potential in non-Amazon regions, in the fourth period there is a strong trend towards consolidation of hydropower installation in the Amazon region, where are already established several protected areas and indigenous lands.

Considering the increase of Brazilian regulations and guidelines for disciplining the land use and considering the political repercussion of Amazon region, it is plausible that the hydropower installation will occur with intense social conflicts.

Therefore, the IA of hydropower plants is definitely marching into the Amazon, where there are several restriction for land use, like as several protected areas and indigenous lands in Tapajós river that forms a important mosaic of areas with the purpose of contain the deforestation and expansion of the agriculture frontier.

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