CONTRIBUTIONS OF STRATEGIC ENVIRONMENTAL ASSESSMENT TO ENERGY PLANNING IN BRAZIL: TOWARDS A SUSTAINABLE APPROACH

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ABSTRACT: This work discusses how Strategic Environmental Assessment (SEA) concepts may contribute to a more sustainable energy planning in Brazil. The energy expansion strategy adopted in the National Energy Plan (PNE 2030) has faced controversy because of its potential environmental and social impacts. The current model favors the installation of hydroelectric plants in high socio-environmentally susceptible regions such as the Amazon.

Energy planning in Brazil was studied to make this analysis regarding the opportunities for integration of environmental and social aspects in strategic decisions. It was also compared with energy planning in the Netherlands, a country that has extensive experience in the application of strategic approaches to impact assessment. Based on the comparisons made, it was possible to conclude that the Brazilian energy sector still faces many strategic challenges, not only related to the observation of sustainable development fundamentals, but also due to presenting a planning model with few opportunities to consider social and environmental variables. This model also indirectly prevents the sector from achieving its own targets as witnessed by the fact that the construction works in the Amazon are often interrupted by legal proceedings, delays in licensing, and riots, making it necessary to rely on emergency plans to provide adequate electricity supply.

Furthermore, PNE 2030 has indicated the intention to expand the construction of hydropower plants to protected areas in the future. That reinforces a high degree of uncertainty in the achievement of the sector targets as the use of resources from more vulnerable and delicate environments can make the conflicts more severe.

This article concludes by identifying elements of the SEA and the Dutch energy expansion process that could contribute to a strategic sustainability reach in the Brazilian energy sector.

1. INTRODUCTION AND THEORETICAL BACKGROUND

In the past few years, Brazil had experienced a high level of economic growth. In order to support the country development, expansion of energy generation facilities became one of the main goals of the previous governments. However, the strategy adopted by the Ministry of Mines and Energy (MME) has generated a lot of discussion.

Hydroelectricity is usually considered a renewable and clean source of energy, and has much international support for its exploitation such as investments from the carbon market. Moreover, the production of electricity from this source is comparably cheap, which has led the government to give priority to hydroelectric power generation in its energy expansion plan.

Brazil has a huge hydroelectric potential, but the National Energy Plan (PNE 2030) states that around 70% of it has not been exploited yet. However, most of the unexploited potential is located in the Amazon, the largest rain forest area in the world, which has rich biodiversity and where most of Brazilian indigenous people live. Past exploitations in the Amazon have been accompanied by numerous impacts and conflicts in the region, leading experts to question the strategy considered sustainable by the government.

The Strategic Environmental Assessment (SEA) has emerged as an important tool to improve the sustainability approach and global impact analysis on Policies, Plans, and Programmes (PPPs). The Netherlands, having used SEA since 1987, is experienced in this regard. Therefore, the Dutch approach to SEA was considered as the main reference for this study.

This research analyzes the way SEA could promote the integration of sustainability considerations into the energy planning scheme in Brazil.

2. ENERGY PLANNING IN BRAZIL

Brazil's energy expansion process follows the phases shown in Figure 1. The process starts with the development of the Energy Policy by the Federal Government. Then the MME prepares the National Energy Plan (PNE) for a horizon of about 30 years and, based on that long-term vision, also prepares the Decennial Energy Plan (PDE) with more detailed strategies.

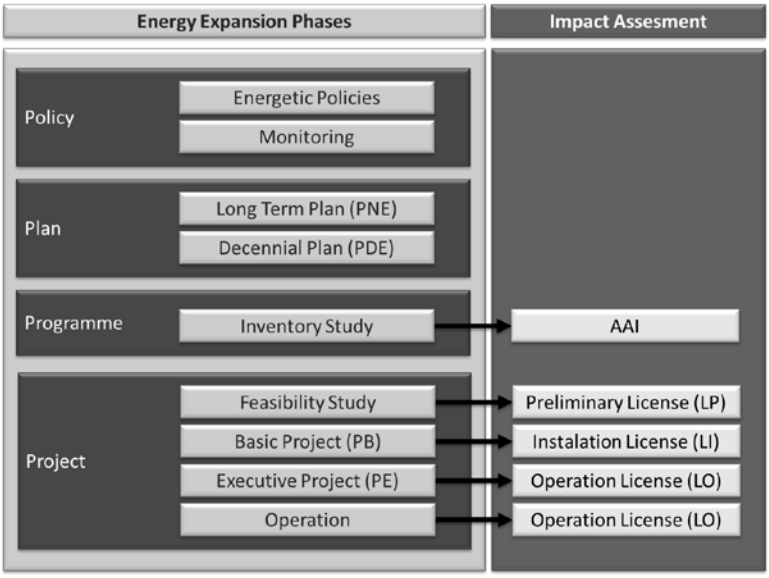

Figure 1- Integration of Environmental Aspects with Energy Expansion Process in Brazil

For the hydroelectricity expansion, the next step is the Inventory Study which investigates the optimal way to explore a specific water basin by defining new hydropower plant locations and energy generation capacities. Each new power plant must have its environmental licenses approved by the Ministry of Environment (MMA) in order to be built and operated.

The right column in Figure 1 shows how the impact assessment takes place in the current model. The consideration of environmental aspects in the Brazilian energy planning has improved through the recent insertion of Integrated Environmental Assessment (AAI) on the Inventory Study phase. However, the sector still has to face many challenges to reach a satisfactory sustainable development.

Limited participation of environmental experts in scenario analysis and strategic decision making is observed. The impact assessment mainly through licensing is extremely *reactive* as it acts just in the final stages of the expansion and its function is not contributing to a more sustainable strategic solution for the sector. The environmental licenses are limited to identifying and mitigating the environmental impacts of the energy expansion at the project level when the strategic decision is already taken and translated into individual projects. Therefore, the adoption of an energy expansion scheme predominantly relying on hydroelectric power generation in the PNE 2030 is questioned by the environmentalists, energy specialists and society for many reasons.

On the strategic front, dialogue among stakeholders should increase. Currently each Ministry makes a different plan for the same region without disseminating much information and without consulting other interested groups. The absence of integrated plans and public debate at the strategic level defers the environmental impact assessment and recommendation of mitigation measures to the project level. The environmental sector and population do not have the opportunity to make agreements with the energy sector at the strategic level. Because of that, late disputes occur and prevent each of the different sectors from achieving their targets and/or deadlines.

On the project level front, the contractors sometimes change location and/or generation capacity of the power plants after studies have been approved. This prevents the energy sector from achieving the optimal use of the water basin as defined in the Feasibility Study. The Madeira River Hydroelectric Complex is a clear example of that. After the studies were approved, Santo Antônio and Jirau plants, one upstream of the other, requested to increase their electricity generation capacity. This resulted in local conflicts and licensing delays that were longer than expected, compromising the delivery deadline of the power plants that were considered flagship development schemes of the previous governments. The construction of the dams also extinguished some fish species in the area, affecting the ecosystem, and riverside communities.

PNE 2030 has to face a number of challenges regarding the adopted energy expansion strategy as mentioned below:

- Environmental licensing: licensing for hydroelectric power plants is slower than for other types of energy production due to the high complexity of such projects and the larger impact-

ed area. Delays occur because environmental reports are usually of poor quality and sometimes changes of location and generation capacity happen during the project phase, requiring a new license.

- Regional conflicts: populations from the Amazon and environmental agencies often question the construction of the power plants in the area, not just for the potential huge impact, which is not completely mitigated or compensated, but also because most of the dams are constructed with the aim to transmit the electricity produced to distant places in Southeastern Brazil. Therefore, power plants construction work is usually interrupted by strikes, riots and judicial processes.
- Energy efficiency: electricity transportation has a separate licensing process. This may also cause delays in providing the produced energy to the target customers, mainly because the further the power plants, the more complicated the study is. Furthermore, efficient transmission is not supported by the construction of new transmission lines. Existing grids in Brazil suffer an energy loss of approximately 20% (Bergmann, 2012) due to the great distance to cover, and the lack of adequate maintenance.
- Clean and cheap energy production: an energy production system that is predominantly based on hydroelectric plants is subject to climate variations that results in a great drop in production due to reservoirs downturn. It is very common in Brazil during dry periods that the energy sector resort to emergency energy production plans to provide sufficient electricity supply. Usually thermal plants - powered by oil, gas, coal and nuclear fuel - are used to meet the demand in this case. That makes this strategic choice unsustainable, as it always falls back on highly polluting and expensive sources. Thermal electricity production from the aforesaid sources does not have a competitive price and in some cases requires raw material importation.

Besides those challenges, the hydropower potential exploitation presents a high degree of uncertainty in the achievement of the targets of MME plans under the PNE 2030. Although the Amazon area has great hydroelectric potential to be developed, it also has a large number of legal restrictions for its land use. All together, the restricted areas occupy 80% of the Amazon, which means more than 30% of the Brazilian territory (PNE 2030). Those restricted areas include: Federal Conservation Units (UC) of Full Protection, UC for Sustainable Use, and Indigenous Reserves. Considering those restrictions, PNE indicated an audacious plan for the next years (PNE 2030):

- *From 2015 to 2020, construction of hydropower plants with no interference to the restricted areas mentioned above (power plants must be at least a 10km distance from the areas to avoid eventual reservoir interference);*
- *From 2020 to 2025, a reformulation of feasibility conditions for approving hydropower plant projects is expected through changes in Federal Constitution. This may allow the construction of facilities less than a 10km distance from Indigenous Reserves and in UCs;*
- *From 2025 to 2030, the energy expansion may continue through the construction of facilities close to Indigenous Reserves and in UCs. Considering that studies for optimizing hydropower plants design may exist, and changes in legal requirements for projects may occur, the energy expansion might be complemented with the construction of hydroelectric power plants with interference to the restricted areas.*

It is assumed in the PNE 2030 that changes in constitution will allow the construction of new dams with interference to restricted areas. Those changes depend on other sectors agreement so it may not happen in the way and/or within the timespan expected by the MME, compromising the sector targets. Furthermore, even focusing on construction of power plants in areas with no legal restrictions, the current implementation phase of the PNE (from 2015 to 2020) has been ineffective as it has faced considerable delays, conflicts and numerous questions. It is expected then that future exploitations, in more vulnerable environments, will make these problems more severe, resulting in longer delays.

3. SEA AND ENERGY PLANNING IN THE NETHERLANDS

Most of the problems faced by Brazilian energy sector are due to its extremely *reactive* environmental assessment. SEA, on the other hand, proposes a more *proactive* approach. The SEA aims to support various sectors on decision making by introducing social and environmental concerns to Policies, Plans, and Programmes (PPPs). It enables each sector to have its own global target for sustainability.

The Dutch experience with SEA helps us to understand how this tool can contribute to Brazil´s efforts to overcome the challenges faced by the energy sector. In the Netherlands, the energy sector targets are coordinated with those of other sectors. They become an integral part of the National Spatial Plan in a concerted effort contributed to by all government ministries as shown in Figure 2. This plan aims to achieve the resolution of conflicts among various needs and the adoption of a balanced strategy that meets the needs of each sector. Based on the National Spatial Plan, each Province defines its spatial plan, which in turn guides the Municipalities in preparing theirs. This model came from the Netherlands need for spatial management as its territory is limited.

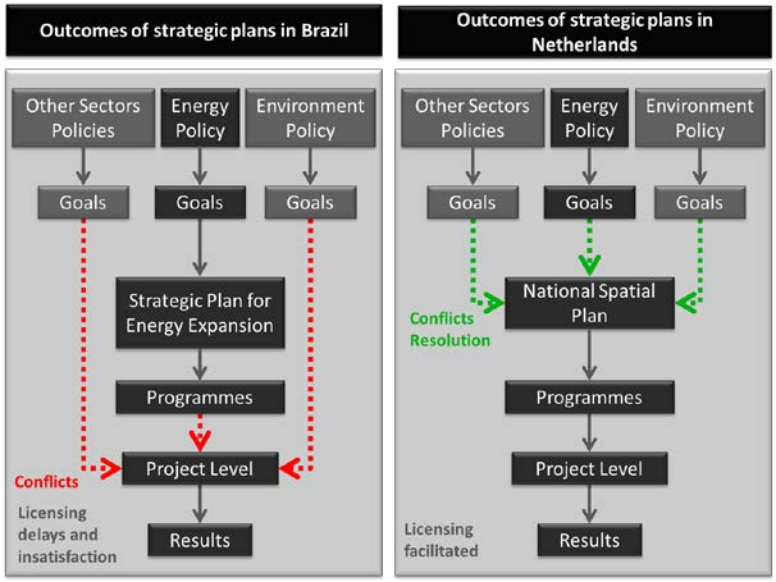

Figure 2- Comparison between Brazilian and Dutch energy expansion processes outcomes

The strategy of defining land use to meet the country demands was a solution for the achievement of different sectors' goals within the limited space available for developments in the Netherlands. Although Brazil has a huge territory, Figure 2 demonstrates how this strategy is useful to avoid the conflicts faced at energy expansion, making the SEA an important facilitator for project EIA.

SEA in the Netherlands relies on the involvement of experts, the general public, and the Netherlands Commission for Environmental Assessment (NCEA). NCEA acts as an independent consulting body responsible for the implementation of SEA. It acts in all strategic decisions (PPPs) down to the project phase, where project-EIAs are to be carried out. Despite having no decision-making power, NCEA contributes by proposing more sustainable alternatives, which may be followed by the government. Usually the advices are accepted as SEA informs decision makers to take a more conscious decision by introducing them to other viewpoints. After insistent voluntary approaches, successful experiences showed decision makers that NCEA advices could be trusted as the solutions presented have helped the achievement of goals in a more satisfactory way for the environment and society.

A proactive approach together with effective hierarchy between the planning bodies makes the Netherlands a successful example of SEA application. It enables the achievement of each sector´s global targets by the implementation of corresponding projects.

It can be concluded from the Netherlands' example that in order for the Brazilian energy sector to achieve its goals, the strategic decision of the sector must be in line with goals of other sectors.

4. CONCLUSIONS AND RECOMENDATIONS

The results indicate that the Brazilian energy sector faces many strategic challenges, not only related to sustainable development, but also to the quality of the planning itself, which leads the energy sector to resort to emergency plans to achieve its generation expansion goals. Instead of considering SEA as a barrier to economic growth, the sector should recognize this tool as a solution to more effective strategies that enable the achievement of sustainability in planning as well as the sector´s energy expansion targets.

PNE 2030 has barely began to be implemented but is already entangled in a host of conflicts, impacts and delays, which create a high level of uncertainty about its outcome, especially regarding the incorporation of environmental concerns into strategic decisions. The Netherlands, in turn, has a very structured system with a successful use of SEA as well as an effective hierarchy between planning bodies. Many elements of SEA as evidenced by the Dutch energy expansion process could help to achieve the energy targets while ensuring strategic sustainability in the Brazilian energy sector.

Although the comparison has been useful to demonstrate the importance of implementing SEA in the Brazilian Energy Planning, professional expertise and practical experience show that there is not one such approach to SEA. Professional meetings in IAIA annual conferences agree that effective SEA approaches have to be adapted to the specific context in which they should operate. According to Partidário (2013), if there is something that SEA should learn from decades of EIA experience, it is that good practice may be gained based on voluntary approaches without having to establish formal legal frameworks first. In order to encourage such voluntary practice, the adoption of guiding principles for good practice is recommended.

In this study SEA is acknowledged as an important tool that must be introduced to energy planning in Brazil. Based on the PNE 2030 energy expansion outlook, the gradual application of SEA to the energy production decisions is recommended within following timeframe:

- 2015-2020 – Strict adherence to what was defined in the Inventory Studies, not allowing changes in project phase. This could avoid unpredictable impacts, such as those occurred in the Madeira River Complex, contributing to the achievement of the global goal of sustainability while preventing unpredictable delays.
- 2020-2025 –Comparison of each Ministry's plan to define a balanced spatial planning for the Amazon region, with discussion of the best scenario for further use of resources. This analysis may consider the energy matrix diversification to define a balanced solution for all concerned stakeholders and, at the same time, ensure adequate energy supply.
- 2025-2030 –Implementation and use of the Dutch concept of independent advice, with participation of experts, society and NGOs, to enable the energy sector to meet its goals in a timely and more sustainable way while avoiding as much as possible direct interferences in Conservation Units and Indigenous Reserves**.**

These interventions could result in a more beneficial outcome for society, environment and indeed the energy sector. Moreover, these interventions could enable the construction of a "Brazilian SEA Manual" which can be used as a learning guide and improve the use of this tool over time.

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