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The Economic, Social, and Environmental Sustainability of Brazil Applied to Holding Eletrobras on Hydroelectric Power Generation Segment*

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This paper aims to present a literature review on the topic of economic, social, and environmental sustainability of Brazil in hydroelectric power generation segment. This theme is very important, given the challenges facing the energy industry to find a balance or trade-off among economic, social, and environmental dimensions, also known as triple sustainability. The hydropower industry looking for a solution to these challenges involving different stakeholders who seek to defend their interests; this solution should be able to evaluate its performance, ensure continuous improvement over the years to be applied in the future under the guidance of the holding company Eletrobras. The implementation of hydroelectric generating major impacts on ecosystems, society and the economic system, but also helps to reduce energy dependence of the country is a renewable and clean energy. The solution to these problems is to try to encourage adoption of various practices and redress mechanisms, such as the introduction of tax incentives to promote environmental responsibility in business in finding a sustainable balance. One goal of this work is to contribute to the understanding of sustainability in the hydropower industry to help promote sustainability in this industry in order to promote sustainable development in the future.

Keywords: energy, environment, public policy, social and environmental impacts, sustainable development

Nowadays, sustainability is a very controversial theme, although it is a relatively simple concept, because it is always associated with environmental issues, but it is also a complex issue in terms of treatment because it is not restricted only to issues of the environment, since it covers various areas involving economic, social environmental issues combined with the so-called sustainability tripod (Soini & Birkeland, 2014; Schrettle Hinz, Scherrer-Rathje, & Friedli, 2014; Golini, Longoni, & Cagliano, 2014).

The consequences of the degradation of natural resources that have been developing over time are now in sight (Pereira, 2011; Tollefson & Gilbert, 2012; Liu, Zuo, Sun, Zillante, & Chen, 2013). These effects manifest themselves in a catastrophic worldwide, as for example, through climate change (Rigby et al., 2013; Xu, Zaelke, Velders, & Ramanathan, 2013b; Medina, 2013).

Climate change has been causing anomalous phenomena to nature, like abundant rain in certain regions,

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long periods of drought, frost, typhoons, among others, whose consequences will worsen even more impacts on the ecosystem, mainly to the society that depends on natural resources for survival (Matthew & Nigel, 2011; Fang & Deng, 2011).

Aware of the fact that environmental degradation undermines the sustainability, civil society, governmental entities, and the hydroelectric sector, the true object of this study begin to realize the importance of adapting production practices and provision of service in order to carry out their activities in a manner less aggressive to the environment, namely, the importance of applying a management focused on social issues and the environment (Matthew & Nigel, 2011; Fang & Deng, 2011).

Consequently, in terms of organization, this paper presents beyond this introduction, the second section dedicated to exposing the problems of sustainability, the third section presents a literature review (state of art), and the fourth section ends where we leave a brief conclusion and some policy recommendations.

The Problems of Sustainability

Initial Considerations

Sustainability directly influences various distinct and correlated areas, e.g., the reproduction and survival of living beings, the participation of the government through deliberations and grants, and the aspects of environmental management that involves the analysis of the viability of the projects, for which, takes the responsibility of outlining future prospects, among other interrelated factors that are involved in the process whose main objective is to find the interaction among the contexts faced and balance needed to preserve human life (Pereira, 2011; Pascual, Garmendia, Phelps, & Ojea, 2013; Alexander & Rutherford, 2014).

These environmental principles are consolidated into concrete practices through activities developed by the companies to use stocks in an efficient and sustainable leadership and management. It is important to consider the attributions of the hydroelectric companies bearing in mind that generate benefits for all stakeholders and that while developing practices that affect the environment, still develop techniques and studies that protect the environment (Fang & Deng, 2011; Eletrobras, 2012).

Given all impacts caused by the destructive and predatory practices of man on Earth and the growing need for natural resource consumption by society, companies began to incorporate the environmental variable, through the implantation of the environmental management system, which provides the necessary mechanisms for the adequacy of company's activities toward the environment (Eletrobras, 2011; Eletrobras, 2012).

In this study, the author will examine the concerns about the economic, environmental, and social issues from the analysis of the Brazilian hydroelectric sector, in particular the Brazilian Electrical Main Central (*Centrais Elétricas Brasileiras S.A.*) or Holding Company Eletrobras, so known because it controls the Brazilian electric sector. The focus of this study lies in the follow-up to the generation of hydropower.

Commonly, companies are adopting various strategic mechanisms to deal with the environmental variables, combined with management practices, such as ecological marketing, seeking to highlight the image of the company and its products, linked to social and environmental actions, with the purpose of distinguishing the competitive market (Heinimann, 2010; Weilkiens, Weiss, & Grass, 2011; Wiengarten, Pagell, & Fynes, 2013; Koenig-Lewis, Palmer, Dermody, & Urbye, 2014; Mariadoss, Tansuhaj, & Mouri, 2011).

Hydroelectric companies of Brazil, with the support of the federal government, demonstrate openness their behavior and actions in the media as well as in other media corporations in relation to society, the environment, and its potential for expansion. These are generally politically correct statements, which help to develop

management practices within the parameters that lead to sustainable development (Eletrobras, 2010; Eletrobras, 2011).

The ecological marketing, for instance, is used by companies who claim to promote a Brazilian hydroelectric management focused on environmental sustainability (Eletrobras, 2010; Eletrobras, 2011; Eletrobras, 2012); the same media entities often feature environmental disasters, environmental management practices of the hydroelectric sector that affect or will affect the construction of reservoirs or dams; one realizes that there is an unknown regarding environmental, economic, and social sustainability to be unveiled, concerning the current problem and as well as the exposed problem (Fearnside, 2013a; Fearnside, 2013b; Sühlsen & Hisschemöller, 2014).

Presently, the guidelines are planned both within governmental, through the agreements reached in international conferences, as in the national and organizational bodies whose main purpose is to outline goals to promote studies, develop technologies, deploy legal mechanisms, and encourage projects aimed at targets in balance with nature, in accordance, moreover, with the development of the capacity of countries and regions so that they can obtain equitable social benefits, allied to the environmental balance (Rojas, 2009; United Nations Framework Convention on Climate Change [UNFCCC], 2013; Tollefson & Gilbert, 2012; Dittmar, 2014).

Facing the above, it is important to consider the historical process of the development of hydroelectric projects in Brazil, within the context of planning the hydroelectric sector, integrating technical aspects, economic, institutional, regulatory, and control of variables involving issues related to water, land, vegetation, climate, fauna and fish fauna, population and pollution, among others.

What was said shows that it is important to consider the socio-environmental analysis to understand the vulnerability of these dimensions and thus be able to propose mechanisms for redressing and protecting of the environment. When speaking of vulnerability of the environment, it is important to highlight the existing mechanism to repair and/or protect the ecosystem (Fu et al., 2014).

Various legal mechanisms have been deployed by the government of Brazil to promote environmental sustainability. Among them, we can highlight tax incentives (tax on circulation of goods and servisos—"ICMS Ecologico" income tax, eco credit, etc., among others), which intend to reach a trade-off, to stimulate the economy to promote sustainability, with the aim to monitor and verify the practices employed by productive sectors on the environment (Pires, 2012; Riva, Fonseca, & Hasenclever, 2007).

Other organizationally practices adopted are tied with environmental accounting which is an environmental information tool for managers; among the various existing methods, we can highlight the multivariate indicators that contribute to carry out the evaluation's importance for the decision-making of governmental and non-governmental organizations that evaluate holistically methods to enlarge operating performance coupled with sustainable development (Tinoco & Kraemer, 2008; Fiorini, Souza, & Mercante, 2013; Moreira, 2013; Valerrama & Moreno, 2012).

Therefore, the objective of this research is to carry out theoretical and conceptual reasons, from the state of the art point of view of the literature on the topic of sustainability focused on the Brazilian hydroelectric energy sector.

Connection of Sustainability With the Hydroelectric Sector of Brazil

The hydroelectric sector is currently considered as a good contribution to economic and social development for the society in the global world. This development should be analyzed within a sustainable

structure, and in parallel, considering that its assessment should be the focus of various aspects in relation to the human actions. These actions include professional, labor, social activities, or even economic influences, resulting activities, at the regional or national levels, but they can also form de-contextualize the concept of a sustainable development (Soito, 2011; Pang, Mörtberg, & Brown, 2014).

Large scale hydropower is a renewable energy source that is commercially viable in Brazil; its significant contribution and importance to human development is evident. Among its attributes, there is the production of negligible amounts of greenhouse gases (GHG). In the long run, the electro producer system stores large quantities of low-cost electricity that can be adjusted to meet consumer demand (Fu et al., 2014).

The first hydroelectric potentials implanted in Brazil began in the mid-nineteenth century, in 1883, where came into operation the first hydroelectric central called "*Ribeirão do Inferno*" located in the town of Diamantina in the state of Minas Gerais; the reasons for catching the interest on the implementation of such ventures in the country at the time, was the increase of turnover related to coffee (A. Souza, J. Souza, Oliveira, & Estevam, 2011b; Pinto, 2012).

The electric energy entrance propitiated the magnifying of the urban demand of the city of São Paulo that when attracting investors provided to the industrial development of the country allied to the increase of the migratory process of the people of the small urban and agricultural centers for the great centers in search of work and better conditions of life (Soito, 2011).

In the early 1970s, the great environmental impacts caused by hydroelectric power plants in Brazil and in the world were a constant due to the lack of criteria for the evaluation of projects; this period was marked by the absence of government policies directed toward the social and environmental issues, and by the absence of concerns on the part of the leaders of companies that prioritized economic-financial aspects only, using natural resources indiscriminately (Soito, 2011).

Brazil is a country with a large hydro potential, which has a large population and territorial extent, factors that contribute to the growing demand for electricity coupled with the deployment of companies to work in this sector. The power generation units are responsible for 117,134,724 kW total installed powers to meet the energy demand of Brazil; in 2011, there were 181 hydroelectric plants that contributed to 78,371,279 kW corresponding to 91% of the production potential of the country's electricity [*Agência Nacional De Energia Elétrica* (National Agency of Electrical Energy) [ANEEL], 2012].

The Eletrobras Holding controls the concessionaires and the operations in the national scope of all the enterprises power related (Eletrobras, 2012), enterprises that in a general way, are supported and financed for the *Banco Nacional de Desenvolvimento Econômico e Social* (Brazilian Development Bank) (BNDES) [*Empresa De Pesquisa Energética* (Energy Research Company) [EPE], 2011; *Banco Nacional De Desenvolvimento Econômico e Social* (Brazilian Development Bank) [BNDES], n.d.].

The Brazilian electrical Power Plants S.A.—Eletrobras, the biggest company of the energy sector of all the Latin America countries acts directly and indirectly in the whole national territory, and it controls close to 50% of the capital, considering the Itaipu Company which is the biggest electrical power producing company in the world, with 42.302 MW of installed power production capacity (Eletrobras, 2011; Eletrobras, 2012).

The hydroelectric enterprises contribute to promote better wellbeing of the human beings when satisfying its necessities of consumption, offering one better quality of life, supplying water the urban use, generation of energy, flood irrigation, recreation, and control. Also, they cooperate in the promotion of the regional development, in the generation of employment, increasing direct electricity sales. Moreover, they contribute to

ensure the energetic independence of Brazil, amongst other attributes that evidence the societal dependence of the Brazilian economy.

Review of Literature Itself: The State of the Art

Some recent contributions allow further with a quick review of the state of the art on the social and environmental impacts of hydropower, also addresses the theme mechanisms to promote economic, social, and environmental sustainability under the topic of sustainability published in international journals important in the world.

Social and Environmental Impacts of Hydroelectric

This section presents some recent contributions that serve to complement a quick review of the state of the art on the socioeconomic impacts of environmental hydropower recently published in international journals of the world; it also addresses the issue of mechanisms to promote the three pillars of sustainability—economic, social, and environmental.

Environmental impacts of hydropower plants—the hydroelectric plants tend to flood and eliminate large extensions of cultivable land such as land to pasture, as well as areas with poor nutritional status whose resources may be essential to sustain millions of human's beings, women, men, children, elderly, among others (Sharma & Rana, 2014; Polimeni, Iorgulescu, & Chandrasekara, 2014).

The processes of new colonizing generates loss of material wealth and immaterial society, in general, are inadequate because they tend to have not enough water to meet all the people's needs, therefore, generally lead to later negative results, such as the proliferation of cholera and other water related diseases or before its lack (T. Santos, L. Santos, Albuquerque, & Corrêa, 2012; Wang, Wolf, Lassoie, & Dong, 2013).

Several families displaced and resettled that those live in the vicinity of a reservoir may lose access to the water of the river and the natural wells, for various reasons, as though living in the vicinity of areas of hydroelectric plants means to have a network of supply itself (Nascimento & Silva, 2011).

The families are affected by the lack of treated (good) water which leads to supply water unfit for consumption, the effects of a planning for the transfer of water that is not revitalized from another basin but that is not suitable for human consumption or for entrepreneurial activities such as livestock (cattle) and irrigation, among others (Polimeni et al., 2014).

As an example, we may refer the cases of some villages and riverside communities in the Amazon region in Brazil that still need treated water, electric light, and proper medical care to support their economic and financial development processes; in fact, despite all the technological, social, and economic development lived there are several regions and communities of Brazil, there are still living in sub-human conditions (Polimeni et al., 2014; Silva, 2012).

The environmental impacts generated by a hydroelectric dam may occur upstream and downstream. As said by World Commission on Dams (WCD) (2000) and Finotti, Cemin, and Périco (2011), the impacts can be classified into three classes—impacts of first order or direct, impacts of second order, and impacts of third order, impacts that arise in different ways.

Changes in Thermal Regime: The temperature regulates the physical, chemical, and biological processes; likewise, the water reservoirs of hydroelectric ventures act as thermal regulators to allow only small changes in temperature between seasonal periods. The water to be retained in the reservoir tends to increase its

temperature and acquires a new standard of thermal behavior, depending on the geographic location; the water stored in deep reservoirs tends to be thermally stratified (McCartney, Sullivan, & Acreman, 2001; Fleming & Weber, 2012; Lee, Chung, Ryu, & Choi, 2013; Ferreira & Cunha, 2013; Gebre, Boissy, & Alfredsen, 2014).

Thermal changes tend to form three types of layers. One with the higher temperature and thoroughly mixed which is in contact with the surface, with features intermediate between the two extremes, and a bottom with the lowest temperature and less density (Fleming & Weber, 2012; Lee et al., 2013; Umaña-Villalobos, 2014; Gebre et al., 2014). Some methods are applied to eliminate or reduce this stratification of shells, as the cooling method of reservoir, the axial flow pumps, the mechanical mixer, the pneumatic aeration diffuser—which consists of reducing the level of the reservoir to a limit that allows circulation and mixing a large amount of water flow that allowing the elimination of stratification (Bedri, Bruen, Dowley, & Masterson, 2013; Frota et al., 2014; Liu, 2014).

Impacts by sedimentation. The excess sedimentation eventually can annul the tank capacity from fulfilling the tasks or functions for which it was established, as for example, irrigation, flood control, and electric power generation. In addition, it can also cause environmental degradation, damage the equipment, input structures, and turbines, and still cause impacts linked to the presence of polluting sediments (Souza, Medeiros, Brandini, & Knoppers, 2011a; Lana & Castro, 2011; Arias et al., 2014). The basins of the dams of hydroelectric power stations in general are affected with high levels of sedimentation (Okawa, 2010; Arias et al., 2014); in the case of a typical sedimentation, it is considered to affect the reservoir after 50 years of use of hydropower, although in certain reservoirs, after 10 years of use, it suffers the process of sedimentation (Bishwakarma, 2007).

According to WCD (2000) and International Commission On Large Dams (ICOLD) (n.d.), to solve the problems related to the erosion of the banks of a river, it is used a technology known as “piping”, so named for the resemblance to the tubular cavity generated; this process corresponds to using a powerful erosive agent that changes the main channel of the river and the secondary channels.

In storage volume recovery, the technique may be used to remove the sediments deposited, combined with the reduction at the level of the reservoir, through the utilization of siphons, excavators, especially the excavation by suction, and the application of analytical methodologies that use hydrodynamic models (ICOLD, n.d.; Bishwakarma, 2007; Luis, Sidek, Desa, & Julien, 2013; Arias et al., 2014). These methodologies were allow to take advantage of the energy charge that exists between the surface of the reservoir and the output shaft for removal of sediment inside the tank, thus nullifying the need for an external source of power, which can also vary depending on the diameter and length of pipes (Bishwakarma, 2007). These techniques have been employed successfully in hydroelectric potentials of Nepal, for example, by given companies such as “GTO Sediment AS”—using SPSS (Statistical Package for the Social Sciences) methods and SSS (Saxophone Sediment Sluice)—and by the Hydrotechnical Laboratory of Norway known as “SINTEF NHL” that also uses these methodologies (Bishwakarma, 2007).

Impacts by the proliferation of plankton[1]**.** In general, the production systems of phytoplankton are moderate, varying with the algal communities inside the river basins, the types of lakes, the speeds of water; the

[1] Plankton refers to a small community of microorganisms that live in free waters (pelagios), which presents limitations in terms of locomotion, enabling their limited or permanent fluctuation; their displacement comes from water movements; is the food chain of aquatic ecosystems and also serves as food for larger organisms. Generally, the plankton is subdivided into three types: phytoplankton (formed mainly by microscopic algae); ick-plankton (formed by larval or juvenile forms of nekton in low movement motion); and zoo-plankton (formed by animals) (Miranda & Gomes, 2013).

production of plankton is unstable and dependent on the frequency of high discharges (Netto, 2011; Bottino, 2012; Umaña-Villalobos, 2014). The proliferation of plankton in the reservoirs accelerates the production of these living beings—plants or animals both upstream and downstream the river. The process of decomposition of the substance becomes anaerobic; thus, carbon dioxide, methane, and hydrogen are released, the pH of water decreases and within the basin or reservoir there occur, since the sediment, the reactions of iron and manganese; the nutrients, including the phosphorus, are released biologically and leachate by the vegetation and soil submerged (ANEEL, 2000; Tavera & Novelo, 2011; Netto, 2011). The proliferation of plankton starts with the closure of water outlets to be able to fill the reservoir; the system is slow and therefore accelerates the production of this plant and at the same time that occurs the accelerated increase of microbes, some nutrients are released from organic matter flooded, providing an incentive for parallel development of phytoplankton to take advantage of the solar energy. Damming a river, in addition to modifying the hydraulic conditions, also provides changes in parallel processes of phytoplankton and the biomass constitution (Umaña-Villalobos, 2014).

In the reservoir of the Three Gorges in China, although the flow velocity limits the growth of a given organic production, due to high pH (above 8) of the Yangtze River, the phosphorus from the water was transformed into insoluble compound, to combine with fine sediments which in great part is removed with the discharges, thus, the concentrations of soluble phosphorus which are consumed by the algae are replaced by a low level on the reservoir that does not promote the accumulation of nutrients; for this reason, eutrophication within the reservoir of hydropower exploitation should not occur (Fu et al., 2010; Xu, Tan, Yang, Li, & Su, 2011; Xu, Tan, & Yang, 2013a; Xu et al., 2013b).

However, on the shores of the basin or sump, where the flow velocity decreases, phytoplankton can grow, and the production of eutrophication occurs. To avoid such problems, it is essential to have a control over the sump area of the hydroelectric power plant (Fu et al., 2010; Xu et al., 2011; Xu et al., 2013a; Xu et al., 2013b).

Over the years, the levels of nutrients and organic matter tend to decrease, and may reach the schemes of stability of water from 20 years. After this stage of maturation of the shell, the same may serve as reservoir of nutrients, identical to natural lakes, especially with nutrients bound to the sediments. The process of eutrophication of reservoirs can generate great influence of organic matter and nutrients (Umaña-Villalobos, 2014).

Impacts of periphyton[2]**.** Periphyton usually is formed upstream of the dam or reservoir or central basin hydropower, in layer of algae unified in material that is submerged; it can be objects or plants. The development of the site periphyton is one in which there is sunlight that penetrates the water, especially near the margin of the reservoir (Rodrigues & Hayashi, 2013; Mascarenhas, 2013; Smolar-Žvanuta & Mikošb, 2013). The nature of the substrate is determined by the type of kind, coupled with the presence or absence of aquatic macrophytes, to chemical reactions and temperature, which occur in the water, and operating procedures of the reservoir of the hydroelectric utilization; these elements are added to determine the characteristics of periphytons (Tavera & Novelo, 2011; Mascarenhas, 2013; Smolar-Žvanuta & Mikošb, 2013).

[2] "The periphyton is represented by a thin layer (biofilm) ranging in a few millimeters, which operates at the interface between the substrate and the surrounding water, are observed as green spots or brown is clinging to submerged in water objects such as rocks, logs, artificial objects (inert), and aquatic vegetation. Periphyton is defined as a complex microorganisms community (algae, bacteria, fungi, animals), organic and inorganic detritus that is attached to dead or living, organic or inorganic substrata. It is constituted as an important food for the trophic chains. Importance, perifítica community structure and dynamics in aquatic ecosystems". Retrieved from http://www.ib.usp.br/limnologia/Perspectivas/arquivo%20pdf/Capitulo%206.pdf, consulted on April 16, 2014.

Downstream, the periphyton grows in abundance near the reservoir, due to large sediment discharges, or where the slope of the canal and river speeds are smaller; but in areas downstream of the dam, they are limited by the reduction of the entrance of light, associated with the high content of suspended sediments, increasing concentrations of organic matter, and by the maters' depth (Mascarenhas, 2013; Tavera & Novelo, 2011).

Impacts of macrophytes. The presence of aquatic macrophytes is associated with degrading processes of environment contamination inducers and pollution of water in the reservoirs, which alters the natural quality of the water and compromises the quality of aquatic life (Gómez, Pérez-Blanco, & Batalla, 2013; Chappuis, Gacia, & Ballesteros, 2014). Generally speaking, the reforestation of the area around the reservoir contributes to reduce sedimentation and to improve environmental quality. Changes in reservoir water levels can affect the vegetations that are around the reservoir. Downstream of the hydroelectric utilization, the macrofitas possess characteristics of riverside communities. Some riparian plant species require aquifers in the plains of floods, which are transported during periods of flooding (Bergkamp, McCartney, Dugan, Mcneely, & Acreman, 2000; Okawa, 2010; Souza et al., 2011a).

Mechanisms to promote economic, social, and environmental sustainability. Repair of environmental damage caused by human intervention is a mechanism on the motivation that includes some important tools for the sustainable development as are the cases of the polluter-payer principle (Luppi, Parisi, & Rajagopalan, 2012; Munir, 2013; Brandt & Svendsen, 2014), the principle of protective recipient (Ribas, 2013; De-Paulo, 2013), the trade-off or "compensatory exchange" (Meensel, Lauwers, Huylenbroeck, & Passel, 2010; J. Zhang, M. Fu, Z. Zhang, Tao, & W. Fu, 2014; Blandford, Gaasland, & Vårdal, 2014; Akter, Graftonb, & Merritt, 2014) and the tax incentives, among others (Nesta, Vona, & Nicolli, 2014; Martinez-Espiñeira, García-Valiñas, & Nauges, 2014; Allan, Lecca, Mcgregor, & Swales, 2014). Other motivational mechanisms include some programs that operate as incentives, for example, taking the cable to repair environment from the obtaintion of some benefits, such as the Ecological ICMS or Tax on the Circulation of Goods and Services and the Go-Green or Income Tax, in order to benefit companies responsible and committed, not only with the preservation and maintenance, but also with the repair of the Brazilian environment (Riva et al., 2007; De-Paula, 2013). Over the decades of 80s and 90s of the last century, various public policies designed for the environment, originated various proposals for implementation with the aim of preserving the environmental areas. However, the enforcement has been problematic and the pace of deforestation has not decreased consistently or as it should (Paula, 2011).

Business awareness. Puaschunder (2012) in a study about the socially responsible investments in both qualitative and quantitative analysis on the financial market allied to social and environmental impacts, came to the conclusion that we should employ the corporate social responsibility (CSR) in planning and decisions. The non-application or the application of a limited form of financial responsibility coupled with social one can be regarded as irresponsible management in decision-making (Puaschunder, 2012; Tayşir & Pazarcık, 2013; Avram & Avasilcai, 2014; Kahreh, Babania, Tive, & Mirmehdi, 2014). The exchange of financial profits through mechanisms of repair in favor of bonuses, is a good technique to achieve the environmental objectives predefined because it can help these companies to expand their awareness and organization and simultaneously can develop appropriate procedures to cover the expansion of their profits and at the same time can contribute to the resolution of the socio-environmental issues (Blandford et al., 2014; Akter et al., 2014). The social and environmental repair mechanisms encourage the decision-makers to develop a responsible and compromised attitude and, in addition to contributing to a social and environmental education in organizational framework so that the procedures are planned and executed in a conscious and adequate manner (Fu et al., 2014).

In Brazil, the high incidence of environmental damage incurred as a result of actions that generate pollution (noise, atmospheric visual, irregular buildings, use and occupation of land in disagreement with the rules, generating environmental impact through the occupation of green areas, the deposition of manure, solid waste and toxic in water resources, among others, that directly affect the society quality of life (Hammer, Swinburn, & Neitzel, 2014; Garí, Bosch, Grimalt, & Sunyer, 2014; Wagtendonk & Vermaat, 2014; Paulino, 2014; Souza, Miziara, & Junior, 2013; He, Zhang, Mol, Wang, & Lu, 2014; Quina, Bordado, & Quinta-Ferreira, 2014). Such occurrences are expressed in national and global context that produce economic inequality continuously, as a result of the appropriations increasing natural resources, requiring more effective and immediate environmental justice. For these issues, it is important to question if the profit overrides the legal sanction imposed on offenders, as the value of the fine enforcement or punishment is applied before the importance of the dimension of enterprise or volume of business involved, the criminal coercion represents a negligible value in face of the volume of business obtained, or if it is worth breaking the law and pay the amounts stipulated by justice (Motta, 2006; Uhlmann, 2011; Souza et al., 2013). This is a question to be considered to understand the lack of environmental awareness on the part of the decision-makers as well as the overlap of the capital on the resources of nature and respect for the environment (Motta, 2006; Uhlmann, 2011; Djekic & Smigic, 2013; Souza et al., 2013).

The hydroelectric companies declare increasingly accountable to society, all their procedures and management strategies that can be verified through a management mechanism called “Eco-Marketing” exposed mainly through the sustainability reports Hydroelectric companies declare increasingly accountable to society, all its procedures and management strategies that can be verified through a management mechanism called “Eco-Marketing” exposed, primarily through the sustainability reports of the holding company Eletrobras (Koenig-Lewis et al., 2014; Mariadoss et al., 2011). Until a few decades ago, the manager had the obligation to publish the economic balance, however, currently, the governmental bodies are increasingly demanding with regard to the requirements in terms of sustainable management practices that affect the economic, social, and environmental dimensions (Wiengarten et al., 2013; Djekic & Smigic, 2013), which are subsequently declared through the Sustainability Reports drawn up on the basis of the model of the Brazilian Institute of Social and Economic Analyses (*Instituto Brasileiro de Análises Sociais e Econômicas*) (IBASE) (Correa, 2012; Perego & Kolk, 2012).

Conclusions

This study aims to assess the strengths, medium, and weaknesses in economic, environmental, and social dimensions to be able to implement or adapt actions to promote the sustainable development of Brazil’s hydraulic power production sector. To properly appraise the sustainability, it is necessary to comprehensively examine the whole, having in view that the environmental management system is the basis, despite the interconnection of social systems and economic. For this reason to occur the balance, i.e., the sustainability, it is necessary to change some of the ethical, behavioral issues and especially the decisions of people who have the responsibility to promote social equity and justice. The greatest difficulty to assess the sustainable development of hydro in Brazil is to identify an appropriate way to construct plants and produce hydroelectric power that minimize social, economic, and environmental impacts.

Although there are other sources of energy less aggressive to the environment, which makes it more independent in terms of energy, in this country, it is precisely the great quantity of available water resources,

inputs of a source of energy also considered renewable, cheap, and not so pollutant, when compared with other existing sources of energy. The hydroelectric power at the same time affecting the conservation of natural resources and the social environment, also provide a quality of life increased by the society and expand the control of natural resources through the implementation of projects that are designed to minimize its impact and effectively contribute to the expansion of the economy of the country.

The paper concludes that Brazil and the Holding Eletrobras have mechanisms to foster appropriate procedures that have to put the guidelines, the legislation, and the methods into practice, finally, all the existing tools that may arise, tools that will contribute to the promotion of sustainability in Brazil and the hydropower industry; it is shown that the major socio environmental impacts prevail over the interests of the minority (the economic sector) to the profit on the fundamental interests that protect it against the survival of life on earth.

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