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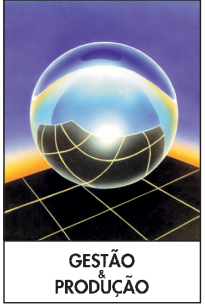

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Who they are, what they do, and how they interact: understanding stakeholders in Small Hydropower Plants

Quem são, o que fazem e como interagem: compreendendo os stakeholders em Pequenas Centrais Hidrelétricas

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Abstract: The use of energy and the different strategies of diffusion and implementation of new energy technologies involve multiple stakeholders who have distinct roles, interests, values, and beliefs. In this context, this study seeks to identify and understand how stakeholders involved in Small Hydropower Plants act and which roles they play based on an qualitative research. Primary data were collected from semi-structured interviews applied to nine representatives of different groups of stakeholders. Secondary data were collected through documentary research, observing the sector legislation, reports, edicts, and instructions available on the websites of government entities and regulatory agencies. Data on stakeholders were assessed by content analysis in three categories: a) who they are; b) what they do; and c) how they interact during the stages of implementation of a small hydropower plant. Seven stakeholder groups and nineteen members that represent them were identified. The following groups of stakeholders were identified: (1) Institutional Agents; (2) Non-governmental organizations; (3) Renewable energy investors and producers; (4) Investment banks; (5) Suppliers of the sector; (6) Associations for renewable energy development; and (7) Local stakeholders. In addition, there is a description of the five stages of implementation of renewable energy projects and how those groups interact in each of them. The results show a lack of collaboration and dialogue between the different stakeholders when deciding about resource management, as well as lack of information leading to loss of confidence of local stakeholders in the projects before their installation and throughout their life cycle. As a contribution, this study points out that, once the stages of implementation and the actors involved have been identified, new forms of communication can be proposed to increase information transparency, as well as workflow models that attempt to collaborate and dialogue with the different stakeholders.

Keywords: Stakeholders; Renewable energy; Sustainable development.

Resumo: *A utilização da energia e as diferentes estratégias de implantação e difusão das novas formas de tecnologia energética envolvem múltiplos stakeholders, com papéis, interesses, valores e crenças distintos. Diante deste contexto, este artigo identificou como atuam e quais são os papéis exercidos pelos stakeholders envolvidos em Pequenas Centrais Hidrelétricas, a partir de uma pesquisa de natureza qualitativa e exploratória. Os dados primários foram coletados a partir de um roteiro de entrevista semiestruturado, sendo entrevistados nove representantes de diferentes grupos de stakeholders. Os dados secundários foram coletados por meio de pesquisa documental, contemplando a legislação do setor, relatórios, editais e orientações disponíveis em sites eletrônicos de órgãos do governo e agências reguladoras. Para examinar os dados, foi utilizada a técnica de análise de conteúdo a partir de três categorias: a) quem são; b) o que fazem; e c) como interagem os stakeholders nas etapas de implantação de uma pequena central hidrelétrica. Foram identificados sete grupos de stakeholders: (1) Agentes Institucionais; (2) Organizações não governamentais; (3) Investidores e produtores de energias renováveis; (4) Bancos de investimento; (5) Fornecedores do setor; (6) Associações de fomento de energias renováveis; e (7) Stakeholders Locais. Além disso, foram descritas cinco etapas para implantação de empreendimentos de energias renováveis e como esses grupos interagem em cada uma delas. Os resultados apontam para a falta de colaboração e diálogo entre os diferentes stakeholders no momento de tomar a decisão sobre a gestão dos recursos, bem como para a falta de informação, o que leva à perda de confiança dos stakeholders locais no empreendimento, antes da instalação e durante todo o seu ciclo de vida. Como contribuição, este estudo verifica que, uma vez identificadas*

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as etapas na implantação e os atores envolvidos, novas formas de comunicação podem ser propostas, a fim de aumentar a transparência da informação, além de modelos de fluxo de trabalho que atentem para a colaboração e o diálogo entre os diferentes stakeholders.

Palavras-chave: *Stakeholders; Energias renováveis; Desenvolvimento sustentável.*

1 Introduction

Countless natural resources, in many different regions, may be used as main sources of renewable and sustainable energy, and those sources are considered complementary in the energy mix policy (Hosseini et al., 2013). The theme related to renewable energy is important because of the current scenario in the energy sector, in view of the need to seek alternatives that can bring efficient solutions when it comes to using resources, promoting the use of energy derived from new sources (Guedes et al., 2017; Camioto et al., 2016). Studies have been conducted under different perspectives, such as the assessment of the total systemic cost of energy generation, considering socio-economic and environmental externalities (Trapp & Rodrigues, 2016), analyses of environmental contribution by means of alteration of the energy matrix (Camioto & Rebelatto, 2014) or analysis of investments and risks on energy efficiency (Aragón et al., 2013). Thus, investigating how the implantation of renewable energy projects takes place becomes the main objective of studies from different perspectives, in our case, seeking the understanding of the stakeholders involvement. Companies in the energy sector are among those that demand greater attention from stakeholders because they present high potential for pollution and use of natural resources (Agustini et al., 2015).

The literature highlights the relevance of identifying the main influencers, called stakeholders, in aspects related to sustainability issues (Sehnem & Rossetto, 2014; Oliveira et al., 2015). The different strategies of implementation and diffusion of new forms of energy technology involve multiple stakeholders, and they have different interests, values and beliefs regarding those technologies and energy generation (Setiawan & Cuppen, 2013). Insufficient participation or consultation of important stakeholder groups may lead to a lack of management of resources and social conflicts and (or) a decrease in public support and trust (Bacher et al., 2014). However, the addressing of ecological and environmental issues, which are part of the sustainable development agenda, is complex and is usually surrounded by uncertainties and diversity of values among the actors involved, who often disagree on issues related to the objectives of a given policy, as well as on which ways to follow (Cuppen et al., 2010). In this context, the research question of this study emerges: How do the stakeholders involved in Small Hydropower Plants act, and what are their roles?

The choice of Small Hydropower Plants (SHPs), one of the types of renewable energy, as a field of research, is due to the fact that SHPs act in a significant way in exploring the potential of the country's water resources (Brasil, 2013), showing their importance in the Brazilian energy matrix. Brazil positions itself as one of the main global leaders when it comes to adopting programs and projects for clean and unconventional energy (Tiago et al., 2011) and has an energy profile with a promising technical potential for adopting specific strategies in order to use nontraditional renewable sources (Brasil, 2013). According to ANEEL (2017), there are 433 SHP projects in operation in Brazil and they have an installed power capacity of 4,957,984 kW and represent 3.23% of the energy matrix. In Rio Grande do Sul (RS) specifically, region where this study was conducted, there are 69 SHPs in operation, under construction or with uninitiated works. Based on a qualitative and exploratory research, the objective of this article was to identify who the stakeholders are, what they do and how they interact during the stages of implementation of a small hydropower plant.

This article is structured in 5 more sections. The next two sections are about stakeholders and renewable energy, respectively. Section 4 presents the methodological procedures and section 5 presents the analysis of the results. The final section presents the final considerations, contributions to theory and practice, limitations and suggestions for future research.

2 Understanding stakeholders

The role of stakeholders is a recurrent theme in the discussions of organizations and institutions and contemplates situations and aspects that encompass even complex processes of change, in which they are susceptible to influences of the various actors, either internal or external. Stakeholders are groups, people or even institutions that play an important role of power and influence on organizations (Bourne & Walker, 2005). The stakeholder approach emerged in the mid-1980s and the focus of this movement was the publication of Edward Freeman's

Strategic Management - A Stakeholder Approach, in 1984. That publication had little impact on management theories at that time, but over time, fragments of the concept of stakeholders have survived and developed within four distinct management research streams: corporate planning, systems theories, corporate social responsibility, and organization theory. Those new studies have made the stakeholder perspective crystallize as a framework for strategic management in the 1980s (Freeman & McVea, 2001). The idea of stakeholder, stakeholder management, or stakeholder perspective to strategic management suggests that managers should formulate or deploy processes that satisfy everyone, not just those groups that have a financial stake in the business. The main goal is to manage and integrate the relationships and interests of stakeholders in order to ensure the long-term success of the organization. The stakeholder approach also emphasizes active management of the business environment, the relationships between different groups, and the promotion of shared interests (Freeman & McVea, 2001).

In their day-to-day activities, organizations usually relate with a wide variety of people and interest groups, such as: shareholders, investors, customers, employees, suppliers, buyers, distributors, communities, the press, social activist groups and others (Carroll & Shabana, 2010; Mahmood & Humphrey, 2013; Preston, 1975). As a result, corporate activities generate different types of social interactions, so stakeholder relationships management can be seen as a mediating concept (Steurer et al., 2005), seeking to ease pressure and strengthen the actions focused on sustainable development. Various publics are involved with SHPs, including local communities, renewable energy investors and producers, governments, non-governmental organizations (NGOs) and local agricultural organizations and cooperatives (Del Río & Burguillo, 2009). Although such actors have different attitudes and conflicts of interest, they need to find ways to cooperate (Del Río & Burguillo, 2009). The prerequistes for cooperation include cohesion, elimination of personal interests, information and representation transparency, such as through the participation of all stakeholders in the decision-making process (Zoellner et al., 2008). In a corporate governance system, managers need to consider corporate values as well as stakeholder values, and their decisions must reflect the expectations and demands of the majority (Mahadeo et al., 2011). The development of an overview of the different stakeholder perspectives can broaden these aspects, facilitate discussion and support critical reflection on the rationality behind stated positions (Raadgever et al., 2008). In the eyes of local stakeholders, for example, decisions concerning the use of natural resources or infrastructure development have the potential to damage the region's social well-being if the results are perceived to be unfair. As a result, they can generate protests, damage relationships and divide communities, especially when decisions that benefit some sections of the community at the expense of others are made (Gross, 2007).

The literature suggests that the concepts of stakeholder, participation, social sustainability and sustainable development are closely related and can contribute to social change (Martinez & Olander, 2015). Increasingly, organizations are confronted with economic, social, and environmental demands of their stakeholders (Steurer et al., 2005). In this sense, public and private entities participating in the energy sector are invited, in parallel, to develop sustainable, economically viable and socially acceptable technologies (Stigka et al., 2014). Among the sectors with highest adherence to sustainability reporting, communication tools and transparency with stakeholders in Brazil are Energy, Energy Services and Construction sectors (Campos et al., 2013). Researchers, politicians and industrial investors in the area analyze the adoption of an agenda of renewable energy technologies and their most relevant challenges and opportunities. However, predicting the adoption of renewable energy is highly risky, mainly due to technological, economic and social uncertainties (Zhai & Williams, 2012). At the same time that the use of renewable energy plays an essential role in sustainable development, uncertainties about how SHPs are seen by different groups arise (Carrera & Mack, 2010; Onat & Bayar, 2010). Thus, the identification of stakeholder groups is necessary to understand and manage the roles, in order to minimize uncertainties in that scenario.

3 Small Hydropower Plants: hydropower as a renewable source of energy

Midilli et al. (2006) state that, in order to compensate for the energy demand, it will be possible to produce green energy from renewable sources, such as solar, wind, hydraulic, geothermal, biomass, among others. Analyzes of alternatives that contribute environmentally, through energy matrix alteration, reinforcing sustainable development, have also been discussed (Camioto & Rebelatto, 2014). According to Islam et al. (2014), hydropower is one of the most promising energy sources, since its source is regenerative and ecologically correct. This type of energy has a key role in the search for clean and renewable sources of energy generation to meet a variety of human needs (Omer, 2008). Water

resources management - including the provision of drinking water, sanitation and water for rural and food development, ecosystem and pollution levels conservation, disaster mitigation and risk management – promotes the recognition of the role of hydropower as one of the most renewable and clean energy sources. In addition, its potential should be seen in an environmentally sustainable and socially acceptable manner (Omer, 2008).

The Brazilian energy profile is making progress with the adoption of specific strategies for the use of nontraditional renewable sources. Notably, wind power plants, small hydropower plants (SHPs) and bioelectricity show their relevant role in supplying energy demands in an effort to improve the country's sustainable development (Brasil, 2013). This strategy is noticeable, since, with new projects, wind energy would begin to correspond to 10.07% of energy generation in the coming years, compared to the current 7.13%. The SHPs would go from the current 3.23% to 3.98% of generation (ANEEL, 2017). With the exception of the northeastern region of Brazil, the climate in the country is rainy, thus, helping maintain high levels of water flow. Those elements are essential for the development of a high hydropower potential and they contribute to the choice of hydropower plants as the main source of energy generation in Brazil (Souza, 2008).

The Ministry of Mines and Energy (Brasil, 2013, p. 140) argues that the SHPs act in a significant way in the exploitation of the country's water resources potential, due to its technical characteristics and its smaller area of flood. That way, its environmental impacts tend to be smaller:

> Biomass power plants, small hydropower plants and wind power plants are strategically important to the country because of the benefits they bring to the environment, since, together with hydropower plants, they are renewable energy sources. The inclusion of those sources in the national energy matrix meets the requirements defined by the federal government for the voluntary reduction in global emission estimated for 2020, as established in the Brazilian National Communication in Copenhagen and in the Law 12,187/09.

Finally, considering the role played by renewable energy in sustainable development and the participation of water resources in the Brazilian energy matrix, this study analyzes stakeholder groups and their roles in small hydropower plants (SHPs).

4 Methodological procedures

The primary data were collected from a semi-structured interview script, and its objective was to identify the actors involved, their actions and interests in the different moments related to an SHP. That instrument was submitted to be validated by two renewable energy experts and one representative of the SHP Construction Group. The secondary data were collected through documentary research, including the sector's legislation, reports, public notices and guidelines that were available on electronic websites of government entitites and regulatory agencies.

The respondents selection criteria was the fact that they were part of the SHPs interest group, based on the publics identified by Del Río & Burguillo (2009), in projects related to renewable energy, presented in Chart 1. Potential respondents were identified through research in articles and journals, as well as personal contacts, and specialists and critics of the theme were selected (Kiesler & Sproull, 1982; Daft & Weick, 1984; Isabella, 1990). Then, the snowball sampling was used: each respondent was asked to give recommendations of people who could contribute to the issues of interest, starting with the individuals who were capable of indicating new respondents (Lincoln & Guba, 1985).

The interviews were conducted with nine actors, representatives of different stakeholder groups (Chart 1). There were no interviews with only one of the stakeholders, the NGOs. There were attempts to contact the NGOs identified in the survey, several times, but none of them agreed to participate in the study. In any case, we decided to keep them in the list of stakeholders in Chart 1, since this is an indication made by Del Río & Burguillo (2009), besides that, evidences about their role were present in the speech of other respondents and document analysis.

The interviews were conducted from June 9 to October 29, 2015, registry occurred through audio recording and real-time notes. Almost all of the interviews were conducted face-to-face, only 2 interviews were conducted through telephone based on the location of the respondent, one of them with Antônio Prado's alderman and the other with CCEE's Manager. During the interviews, respondents were encouraged to speak openly and discuss all aspects that are considered important on the subject. The conducted interviews had an average duration of approximately 1 hour. The shortest interview lasted 23 minutes and the longest one lasted 1 hour and 25 minutes. All of the interviews were recorded and transcribed.

In order to analyze the data, we opted for the content analysis technique (Bardin, 1977), having as objective a deeper study on the subject and the understanding of the role played by each stakeholder. In the pre-analysis of the material, the interviews were read in full, aiming to identify common aspects and

Chart 1. Respondents by stakeholder groups.

Stakeholder groups	Respondent's organization / location
Government	1. Representive of Rio Grande do Sul Mining and Energy Bureau (SME) 2. Representative of Chamber of Commercialization of Electric Energy (CCEE)
NGOs	-
Renewable energy investors and producers	3. Representative of Avir Engeneering 4. Toniolo Busnello
Agricultural cooperatives and associations	5. Representative of Brazilian Clean Energy Generation Association (ABRAGEL) 6. Representative of Gaúcha Small Hydropower Plants Promoting Association (AGPCH) 7. Representative of Federation of Industries of Rio Grande do Sul (FIERGS) Energy Issue Group
Locals (local residents and authorities)	8. Resident of a city where an SHP is present 9. Representative of Antônio Prado Municipal Government

Source: Research data (2016).

possible emergent categories. Next, the categories defined a priori were confirmed: a) Who they are and b) What they do. In addition to those two, the third category - how stakeholders interact during the stages of implementation of a small hydropower plant. - emerged from the data. After the categorization stage, the interviews were coded and each category was analyzed separately. In the inference phase, evidence confronted the literature, and the points of convergence and those that could contribute significantly to the findings of other studies were verified.

5 Presentation and analysis of the results

With the purpose of meeting the objective of this study, which is to identify the stakeholders and their roles in SHPs, initially, the actors are analyzed and, next, the roles of each one.

5.1 Who they are

Bibliographic review showed that there are 5 stakeholder groups in renewable energy projects (Del Río & Burguillo, 2009). This study, in turn, presents two new stakeholder groups, composed of: (a) investment banks and (b) suppliers of the sector. The group initially called Government was renamed Institutional Agents, because of the extent and the different responsibilities the institutions that form this stakeholder have. In addition, the interviews did not validate agricultural cooperatives as a key stakeholder in SHP projects. Chart 2 shows the stakeholders identified in the literature (initial) and those indicated in the interviews (final), as well as the details of the main members.

5.2 What they do

Besides focusing on how project managers understand the saliencies and how managers prioritize stakeholder demands, the study by Lafreniere et al. (2013) suggests that understanding different stakeholder perspectives is equally important if management teams seek acceptance of the idea of resource management initiatives. That way, this section presents the roles and possible influences that each stakeholder group may have on SHP projects: a) institutional agents; b) NGOs; c) renewable energy investors and producers; d) investment banks; e) suppliers; f) associations; and g) local stakeholders.

Regarding the stakeholder **Institutional Agents**, the respondents cited the Federal Government as "the great granting authority" on the energy sector. The current Brazilian energy sector model, implemented in 2004, has created new institutions and changed already existing functions. The agents mentioned in the interviews as the main stakeholders of this group were: the National Electric System Operator (ONS), the Energy Research Company (EPE), the Brazilian Electricity Regulatory Agency (ANEEL), the Chamber of Electric Energy Commercialization (CCEE), the Public Prosecutor's Office (MP) and the Environmental Licensing Agencies, which, in Rio Grande do Sul, are represented by the State Environmental Protection Foundation (FEPAM). The analysis of data related to this stakeholder enabled the identification of agents acting in three main roles: a) public policies; b) regulation; supervision and authorization/licensing; and c) defense of society rights.

In relation to public policies, one of the entities mentioned as a stakeholder was the National Electric System Operator (ONS), which is responsible for coordinating and controlling the operation of energy

Chart 2. Initial and final stakeholder groups.

Initial stakeholder group	Final stakeholder groups
Government	Institutional Agents - Brazilian Electricity Regulatory Agency (ANEEL) - Chamber of Electric Energy Commercialization (CCEE) - Energy research company (EPE) - Public Prosecutor's Office (MP) - The National Electric System Operator (ONS) - Environmental Licensing Agencies
Non-governmental organizations (NGOs)	Non-governmental organizations (NOGs) – Involved with Environmental Protection - Viva Vida - Movement of People Affected by Dams (MAB)
Renewable energy investors and producers	Renewable energy investors and producers - Self-producers - Public companies - Independent producers
-	Investment Banks - Brazilian Development Bank (BNDES) - Regional Development Banks
-	Suppliers of the sector - Enviromental consulting firms - Civil construction companies - Parts and equipments manufacturers
Agricultural cooperatives and associations	Renewable energy promoting associations
Community	Local Stakeholders - Local authorities - Community - Riverside Dwellers

Source: Research data (2016).

generation and transmission facilities in the National Interconnected System (SIN), under supervision and regulation by ANEEL (ONS, 2015). The main objectives of ONS are meeting the power requirements, optimizing costs and ensuring the system's reliability. The institution also has the responsibility of defining conditions of access to the country's high-voltage transmission network (CCEE, 2015). The respondents have also mentioned the Energy Research Company (EPE), which is intended to provide services in the area of studies and research that are aimed at subsidizing the energy sector planning, such as electric power, oil and natural gas and its derivatives, coal, renewable energy sources and energy efficiency (EPE, 2015). The Chamber of Electric Energy Commercialization (CCEE), also identified in the interviews, acts as a Brazilian energy market operator, enabling a competitive, sustainable and secure trading environment. In the operational sphere, one of its main activities is to account for the purchase and sale of energy, monthly calculating the differences between the amounts contracted and those that were actually generated or consumed by market agents.

With regard to regulation, supervision and authorization/licensing, ANEEL was mentioned many times in the interviews. It is a governmental agency under special regime linked to the Ministry of Mines and Energy (MME), created to regulate the Brazilian energy sector. It began its activities in December 1997, having as main attributions (ANEEL, 2015a): a) to regulate energy production, transmission, distribution and commercialization; b) to monitor concessions, permits and energy services, directly or through agreements with state agencies; c) to implement federal government policies and directives regarding energy exploitation and the use of hydraulic potentials; d) to set fares; e) to mediate conflicts between agents and between them and consumers, in the administrative sphere; and f) by delegation of the federal government, to promote activities related to the granting of concession, permission and authorization of energy projects and services.

In the same group of institutional agents related to Environmental Licensing, the respondents frequently cited the State Environmental Protection Foundation (FEPAM). Environmental licensing is the administrative procedure carried out by the competent federal, state, or municipal environmental agency that allows installation, expansion, modification and

operation of activities and projects that use natural resources, or that are potentially polluting or that can cause environmental degradation (FEPAM, 2015). In environmental licensing, the impacts caused by the project, its potential or its capacity to generate liquid pollution (waste and effluents), solid waste, air emissions, noise and risk potential, such as explosions and fires, are evaluated. According to FEPAM (2015), the planned environmental licensing stages are: a) Prior License (LP), which approves the environmental viability of the project, without authorizing the beginning of works, and it must be requested during the planning phase of the project implementation, alteration or expansion; b) Installation License (LI), which authorizes the beginning of the works/project and is granted after the LP conditions have been met; and c) Operation License (LO), which authorizes the beginning of operation of the project/works and is granted after the conditions of LI have been met. That way, environmental licenses establish conditions so that the activity or project cause the least possible environmental impact. Therefore, there is a requirement to define impacts and compensatory measures during the licensing process.

The impression of some respondents, members of the group of associations, is that FEPAM has carried out actions that hamper the implementation and liberation of small hydropower plants. In addition, there is a divergence between the optimum exploitation of the river, from ANEEL's legal point of view, in which the maximum hydropower generation that hydraulic potential can give is sought, and the maximum use from the environmental point of view. For the latter, the optimum use would be leaving the river with its natural characteristics, without any alteration or interference. That way, those aspects can be antagonistic and generate conflict. The ideal solution would be the implementation of projects that have acceptable environmental impacts, without affecting the natural scenario (waterfalls, primary atlantic forest, buildings, structures and archaeological parks). In some interviews with associations, government support and direction for the construction of new small hydropower plants became evident as an instrument for expanding energy generation in Brazil. When analyzing the theme of defense of society rights, the Public Prosecutor's Office (MPF) was identified as an important stakeholder. The MPF's mission is to "[…] promote justice, for the good of society and in defense of the democratic state based on the rule of law" (Rio Grande do Sul, 2015). The Operational Center of Environment (CAOMA) is one of the auxiliary agencies of the Public Prosecutor's Office and its role is to guide, assist and facilitate activities by the Justice Advocates for Environmental Defense, providing them with technical and legal information, support in the relationship and meetings between MP members and environmental management agencies such as FEPAM, Department of Protected Forests, Department of Water Resources and the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA). In addition, it seeks to structure MP's institutional policies in the environmental field and centralizes the information of the Ministerial activity (Rio Grande do Sul, 2015). This study points to the MP as an inhibitor for the achievement of renewable energy projects, due to the impacts caused in the environment, especially to the ichthyofauna. In relation to social and economic aspects, it is not usually part of the impediments to the implementation of the project.

The second stakeholder group, **non-governmental organizations**, had already been cited in the literature as a fundamental part of the development of renewable energy projects (Del Río & Burguillo, 2009). In this study, that affirmation was reinforced and, in addition, it is stated that Viva Vida and the Movement of People Affected by Dams (MAB) were the NGOs that were identified. Environmental NGOs, because of their ideological characteristic, argue that, regardless of the size of the environmental impact, it causes a significant change in the initial structure. Thus, according to one of the respondents from the investor/producer group, NGOs usually organize themselves systematically and are against the implementation of renewable energy projects. It has been pointed out, in this research, in the opinion of respondents from the group of associations and investor/producer, the inhibiting position of NGOs about projects of this sphere, as well as this stakeholder often influences the local population, generating community opposition to installation of renewable energy projects.

Renewable energy investors and producers are the natural persons and legal persons or companies gathered in a consortium that receive a concession or authorization for producing energy destined to its exclusive use. The self-producer may commercialize, eventually or temporarily, its surplus energy with ANEEL's authorization (ANEEL, 2003). In the energy production segment, the implemented model covers three types of exploitation: a) public service; b) independent production; and c) self-production (ANEEL, 2003). The last two were motivated by the restructuring of the energy sector in 2004. In the public sphere, production is represented by Centrais Elétricas Brasileiras S.A. (ELETROBRÁS), a public company and a holding company of the energy generation and transmission concessionaires owned by the Federal Government, operating throughout the national territory through its subsidiaries (Eletrobras, 2015). One of the respondents, from the Government group, pointed

out difficulties in the development of self-produced energy in Brazil, such as the ICMS collection by some Brazilian states that insist on maintaining that tax. There is an emphasis on a favorable position in relation to ICMS exempt, since SHPs bring new resources, income, investment, production and job creation to the local community. Also, market openness, which is a consequence of the SHP installation, draws the attention of companies from other sectors to invest in the energy sector.

Most of SHP projects need to be financed with long-term resources. Therefore, investors end up going after official government lines of credit offered through resources, such as those from the Brazilian Development Bank (BNDES). It is clear that **investment banks** are also important stakeholders when it comes to encouraging those projects. Other regional financing agencies have also been pointed out in this study, such as the Southernmost Region Development Bank (BRDE) and BADESUL Development – Development Agency/RS, which have specific financing lines for this type of investment. It is important to point out that stakeholder was not mentioned in the literature and it emerged from research data.

Energy **suppliers** also appear, in the interviews, as key stakeholders. They perform crucial functions throughout the life cycle of an SHP. Among the suppliers identified are civil construction companies, parts and equipment manufacturers and enviromental consulting firms.

The **associations** related to the sources of green (and renewable) energy generation usually have the mission of promoting and developing those sources in the country, and they are another group of stakeholders that was verified. This happens through the union of energy producers, companies, entities and other associations interested in the market, and also by the representation of its associates before public authorities, agencies and national and international institutions.

Residents and authorities are also considered important **local stakeholders** for the success of an SHP, since local authorities will be directly impacted by its creation, in operational terms, involving the entire construction process, as well as the management of taxes that are generated.

Some respondents from the producer/investor and association groups believe that the municipal government of regions that host SHPs of this size are favorable to their implementation. This is due to the understanding that an SHP can bring a very positive return, since, besides the taxes collected during construction, it generates jobs, income and improvements for the region. In addition, the environmental licensing process of this SHP requires the provision of a Municipal Government Certificate stating that the location and type of SHP or activity comply with the applicable law of land use and occupation, and informing whether the SHP is in an urban or rural area and the imposed restrictions (FEPAM, 2015).

According to one of the respondents from the group of associations, "[...] *local authorities support to the implementation of an SHP also depends on the community's perception concerning the project*", since the community will be directly impacted by the benefits (and harms) that such project causes in the region. The public hearing and the visits to residents are common instruments used by investors to promote the local community's understanding about the impacts that an SHP can generate. The National Environmental Council (CONAMA) Resolution No. 09, from December 3, 1987 (Brasil, 1987), provides exactly the procedure for conducting Public Hearings, which aim at showing the interested ones the content of the product in analysis and its Environmental Impact Report (RIMA), solving doubts and collecting criticisms and suggestions about the subject from the people that are present.

The respondents of this study point out that, normally, most of the local population is for the installation of an SHP, because they understand the benefits and needs it meets and that the compensations, when necessary, will be fairly carried out. However, there are also oppositions, especially in the speech of people who will have their lands flooded by the dam construction. In addition, another reason for resistance is the uncertainty of financial compensation, motivated by the lack of knowledge that there are regulations that ensure that owners are not harmed. Riverside dwellers are, in the opinion of respondents from the groups of associations and local residents, the most impacted ones with the construction of an SHP project.

Nowadays, the licensing process is much more participatory, since it is necessary to carry out a study on the environmental impacts, as well as public audiences with affected populations. The municipal government expression of interest is also fundamental to, then, initiate the process through the request of environmental licensing. However, the study by Martinez & Olander (2015) suggests that in order to achieve sustainable development, acceptance, collaboration and participation, it is necessary to create new forms of work among different stakeholders. It is important to observe, for example, the need to bring the local population for a dialogue in the early phases of a new project, and not only in the later phases. Respondents from the producer/investor and the associations groups themselves argue that much of the resistance

against the implementation of an SHP is due to the lack of knowledge about the real environmental impacts caused and their dimensions, as well as about the investors' compensatory responsibilities to minimize those impacts. In order to reverse this lack of knowledge, this study reiterates the need to create a set of coordinated actions among investors and associations of the sector, aiming at a greater involvement of the population and the dissemination of the role of the SHP, its impacts and environmental programs it is a part of.

Dialogue improvement and diffusion of the results of the SHPs, in a very transparent way, explaining in detail what was built, what the impacts were and what compensations were made, are other means we observed in the study to develop support from local communities and environmental organizations

5.3 Stages of an SPH project implementation and how stakeholders interact

The Government, great granting authority, is responsible for the definition of public and energy policies, through the competent agencies for the environmental licensing issuance and grantings of concession, permission and authorization for construction and operation of SHP.

The SHP construction process begins with Hydropower Inventory Studies, following the procedures described in Normative Resolution No. 672/2015 and identifying the river basin's hydropower use or set of uses, with a unit capacity of over 3,000 kW, that presents the best energy production price. For that purpose, the socioeconomic and environmental context of the moment and the provisions of § 2 and 3 of Article 5 in Law 9.074, of July 7th, 1995 are considered. The hydropower inventory of a river basin (or sub-basin) aims to identify existing hydropower potential in rivers (creeks and brooks) and, although ANEEL claims that during this stage environmental issues are considered, here, the energy potentials - how many MWs can be generated on each point of the river (Goiás, 2008) - are favored.

Each river should have only one registry to elaborate hydropower inventory studies. That is why it is important that the applicants check in advance whether the river on which the generation potential is located has not been inventoried yet. The holder of the registry of the approved inventory studies has the right of pre-emption to exploit the inventoried potential, within the limits defined in Article 11 of Normative Resolution No. 672/2015.

Those interested in the construction of SHPs must also comply with the stages set forth in Normative Resolution No. 343/2008, in order to get from ANEEL the approval of a basic project and the authorization to use of hydropower potential with SHP characteristics. Often, companies that develop the basic projects are not interested in building an SHP, since many of them, after getting the approval, sell them to third parties (Goiás, 2008). That way, different companies can take part in the various stages of the process: hydropower inventory and application for the approval of basic project and effective construction.

The analysis of basic projects submitted to ANEEL takes into account criteria such as: technical project quality (engineering); power generation; reservoir storage capacity; cartographic, geological, geothermal, hydrometeorological, sedimentological, environmental and energy-economical studies; civil works; mechanical equipment; among others (ANEEL, 2015b). The final approval of the basic project will depend on the presentation of pertinent environmental license and water availability reserve declaration, or equivalent acts, issued by the competent agencies, which must be compatible with the project.

After having approved the basic projects, ANEEL begins the authorization granting procedures. With the environmental licensing agencies, those interested in the construction of an SHP will have to complete the steps to get Prior License (LP), Installation License (LI) and Operation License (LO). There is, therefore, a great interrelationship between the processes of environmental licensing and concession or authorization for exploring electric energy service.

Local stakeholders participate in the planning stages, especially during the licensing process, through the provision of the local Municipal Government Certificate and the holding of public hearings, and will be directly impacted during the construction and operation phases of a small hydropower plant.

Energy investors and producers that are authorized to operate will be responsible for the construction, operation and management of the SHP. The construction phase of these SHPs involves raising funds from investment banks and the search for technologies, products and services from suppliers of the sector. Finally, associations have the role of representing the companies of the sector, especially when relating with public agencies, while environmental NGOs are responsible for protecting the environment and influencing the population.

Figure 1 presents a visual representation of participation and roles played by different stakeholder groups in SHPs.

In order to achieve an effective result, there is a need for involvement, participation and interaction of, preferably, all stakeholders interested in the decision-making process (Martinez & Olander,

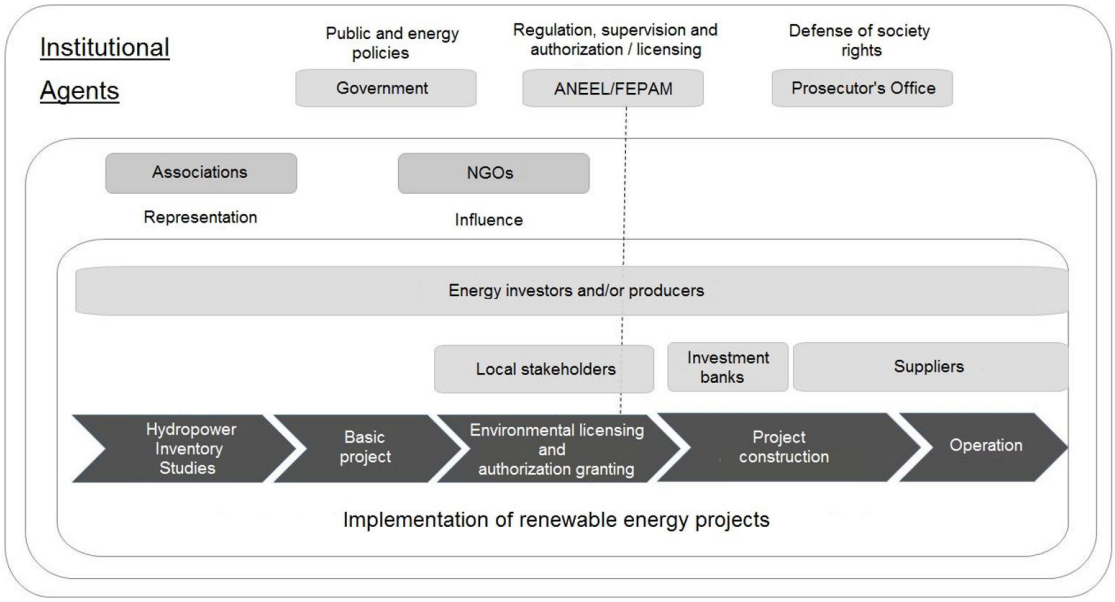

Figure 1. Stakeholders macro participation in SHPs. Source: Research data (2016).

2015). It is possible to observe, however, that the construction process of a new SHP project does not come from a joint mapping or construction. The interviews conducted lead to the identification of a fixed process, performed by each one of the stakeholder groups involved separately.

It should be emphasized that the analyses carried out in this study did not aim at exhausting the reflection about the relationships of the different stakeholder groups and their members, but at presenting them, indicating the roles played in the installation project of an SHP.

6 Final considerations

The objective of this study was to understand the role of stakeholders involved in an SHP. With this study, it was possible to verify 7 stakeholder groups and 19 members representing them (Chart 2). The groups in question were: (1) Institutional Agents; (2) Non-governmental organizations (NGOs); (3) Renewable energy producers and investors; (4) Investment banks; (5) Suppliers of the sector; (6) Associations for renewable energies development; and (7) Local Stakeholders. The role of each group is described and, in addition, there is the identification of 5 stages for the implementation of renewable energy projects and how stakeholder groups interact with them.

Based on the analyses, it was possible to observe that the group of local stakeholders, composed of local residents and local authorities, plays an important role in the process by environmental licensing of an SHP, through the provision of the Municipal Government Certificate and the holding of public hearings.

It is worth emphasizing that the prerequisites for cooperation among stakeholder groups include cohesion, elimination of personal interests, transparency of information and representation, through the participation of all of those involved in the decision-making process (Zoellner et al., 2008). The existence of different perceptions among the identified stakeholder groups refers to the observations made by the respondents, which highlight the relevance of the dialogue and a greater diffusion of the results of the SHP, with a focus on transparency, explaining what was constructed and what impacts were caused and what compensations were made. Those results are supported in the literature, since those responsible for SHP construction and the government should inform the population about all the effects, such as economic, social and environmental development, caused by SHP (Arabatzis & Myronidis, 2011), bearing in mind that the "subjective conflicts" between the different stakeholders emerge, precisely, from communication gaps or misunderstanding (Mahmood & Humphrey, 2013). The analyzes indicate that the mechanisms that promote stakeholder participation are restricted to the stages prior to project approval, focusing on the environmental licensing and granting of authorization. The lack of collaboration and dialogue between the different stakeholders when making a decision on resource management at the project construction stage and the lack of information about the counterparts agreed before the project approval,

during the operation stage, make local stakeholders lose confidence in the project.

With the identification of the stakeholders and the roles they play, it is reinforced that it is important that the investors' project management team, during the development stage, procedes with the identification of those that can affect the SHP. That way, different demands can be managed through good communication from the initial stages of the project, since with each major decision to be made in a new phase of the project, an analysis of how each decision can affect the different stakeholders is necessary, in order to act proactively in the stakeholder management process (Olander & Landin, 2005).

As theoretical contribution, the identification of the stakeholders that can affect an SHP project, as well as the role of each one in this project, will allow the conception of models that facilitate managing their different demands, observing the interests of each stakeholder and their perceptions in relation to the positive and negative impacts of renewable energy projects. Once the stages of implementantation and the actors involved have been defined, communication frameworks can be proposed to increase information transparency and workflow models, aiming at collaboration and dialogue between the different stakeholders.

As a practical contribution, it is hoped to give more fluidity to the implementation process of an SHP, providing a good communication from the initial stages of the implementation until the operation.

As limitations of the study, we can indicate the absence of representatives of a stakeholder group: the NGOs. Several contacts were made with the NGOs presented in the study, however, none were willing to participate. What could explain such unavailability? According to Todt (2011), some participatory exercises show that certain stakeholder groups may choose not to participate in the decision-making process, even when they have the opportunity. For the author, the main reason for this is the lack of confidence in the process, especially due to negative experiences related to participatory activities, which reinforces the role of local leaderships during the period of negotiation and implementation of SHP. Whether this is the explanation or not, it is believed that, because of the important role of NGOs in alerting that even renewable energy projects can cause some kind of environmental impact, studies like these can be a vehicle for giving voice to those issues.

For future studies, the suggestion is to identify which stakeholders have more influence and power in their relationship and also to investigate the perception of each stakeholder group in relation to the impacts of an SHP Project.

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