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Xingó Hydroelectric Power Plant: Social participation in public hearings in Brazil

Luan Corrent[1]; Adriane Aparecida Souza[1]; Larissa Souza Amaral[2*] and Tirzah Moreira Siqueira[3]

[1]*Department of Sanitary and Environmental Engineering, State University Midwest, Paraná, Brazil*
[*2]*Department of Environmental Engineering, State University of Amapá, Amapá, Brazil*
[3]*Engineering Center, Federal University of Pelotas, Rio Grande do Sul, Brazil*
Corresponding Author: larissa.bioengenharia@alumni.usp.br

Abstract
This paper analyzed social participation in public hearings held by IBAMA (Brazilian Institute for the Environment) in the federal environmental licensing of the Xingó Hydroelectric Power Plant (Xingó HPP). Xingó HPP is located in the São Francisco hydrographic region, covering the municipalities of Piranhas (state of Alagoas, Brazil) and Canindé of São Francisco (state of Sergipe, Brazil) as the axis of the dam. The project is materialized in the Brazilian administrative process N°. 40650.002018/88-11, with reservoir polygons under coordinates 037º 49' 59.9'' W (Longitude) and 09º 34' 59.9'' S (Latitude) and Installed Power of 3000 MW, which places it on the list of the largest generating units in Brazil. The Xingó Hydroelectric Power Plant is operated by Hydroelectric Company of the São Francisco River and its first generator set began operations in 1994 and is responsible for approximately 30% of the electricity generated in the Northeast Region. Through the case study, we identified the participants of the public hearings of the Xingó Hydroelectric Power Plant project, which are the questions formulated and the themes of the questions that were directed to the participants of the hearings. We observed that there was a total record of 185 participants in the public hearings that took place in the cities of Canindé of São Francisco (SE), Propriá (SE) and Penedo (AL). Among the participants, we observed the presence of representatives of civil society entities, members of councils, representatives of the legislature and bodies of public entities and individuals. Participants were seeking clarification on the enterprise, understanding and understanding of the negative and positive aspects, seeking to resolve doubts and suggesting alternatives or problem solving. The subject most discussed at the public hearing was related to fauna and flora and the impacts that involve it as a result of the search for licensing the enterprise. On the other hand, the least discussed subject in the public hearing was related to job creation, the availability of courses and how the economic sector would remain, as a result of the implementation of the enterprise. We conclude that public hearings, with broad participation of the diverse population in various sectors, open paths to obtain clarification, understanding, debates and elucidations about their general characteristics and impacts (negative and positive) as a result of the enterprise. In addition, through popular voice, public hearings guide the fate of the enterprise, as a rule, subject to the elaboration of studies and reports of environmental impacts.

Keywords: *Xingó Hydroelectric Power Plant, public hearing, Brazilian environmental licensing.*

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I. INTRODUCTION

As a result of economic, industrial, and urban growth, there was the emergence of debates worldwide about the impacts they were causing on the environment. Consequently, some countries engaged in environmental causes began to establish goals and actions to reduce the environmental effects [ECYCLE, 2018].

There was the idealization of a technical instrument that would help this demand in this sense. Thus, the NEPA (National Environmental Policy Act) was born in the North American legislation, and from it, the Environmental Impact Assessment (EIA) and the Environmental Impact Study (EIS) outlining that country's environmental policy [RIBEIRO; VASCONCELLOS JUNIOR, 2020].

In Brazil, Environmental Licensing emerged in 1975, with regulation at the state level (more precisely in Rio de Janeiro and Minas Gerais states) to control pollution from previously defined sources. However, at the federal level, regulation took place only in 1983, through Decree (Nº 88351/1983), in which the National Environmental Policy (NEP) became a normative instrument used by the government for environmental control, with the aim of a device for the prevention and mitigation of environmental impacts and environmental

licensing, composed of the following documents based on the project's planning: Environmental Control Report (ECR), Environmental Control Plan (ECP), Preliminary Environmental Report (PER), Impact Study Environment (ISE), resulting in challenges for entrepreneurs at the time [GADELHA, 2019; ANDRADE, 2017].

The Environmental Impact Assessment (EIA) was established by the resolution of the National Council for the Environment (CONAMA) N° 1/1986, which provides for the essential criteria of the general guidelines for EIA in Brazil. According to the resolution, environmental impacts are changes in physical, chemical, and biological properties in the environment caused by any form of matter or energy resulting from human activities, which directly or indirectly affect health, safety, and property. -being of the population; social and economic activities; the biota; the aesthetic and sanitary conditions of the environment; the quality of environmental resources [GADELHA, 2019; MARTINS; CARMO JUNIOR, 2018].

However, the Environmental Licensing linked to the Environmental Impact Assessment (EIA) did not occur spontaneously. Likewise, it was not driven by the spirit of environmental preservation; on the contrary, international funding bodies were required to encourage such measures [RIBEIRO; VASCONCELLOS JUNIOR, 2020; ANDRADE, 2017].

All over the world, most entrepreneurs are required to go through the environmental impact assessment process for approval by licensing agencies and thus start the execution and construction of their projects [ATHAYDE *et al*., 2022]. In this sense, the Environmental Impact Assessment (EIA) is essential to prevent, reduce and mitigate the environmental problems caused by the projects [SAFFARI *et al*., 2019].

Although Brazilian environmental legislation has advanced over the years, there is still much to improve [GARVÃO; BAIA, 2018]. From the point of view of scientists, environmental activists, and environmental legislators, licensing presents several problems, the main complaint of entrepreneurs being the slowness of the licensing process [ARAÚJO; ALMEIDA, 2017].

The Hydroelectric Power Plants (Xingó HPP) are projects that need to go through the environmental licensing process, being applicable and similar to other projects of the same amplitude. However, many problems presented in the environmental licensing procedures are systemic. In the environmental licensing processes of hydroelectric plants, there are many specificities in the face of the potential for environmental degradation of this enterprise. The process has its characteristics and exclusive implications. In addition, normative instruments for conflict resolution are limited [FONTES; GIUDICE, 2021].

However, electric energy is fundamental for the country's development since it produces energy for cities, industries, and agricultural land. In Brazil, hydroelectric plants are considered a clean and cheap energy source compared to other energy sources. However, most hydroelectric plants have already reached their maximum productive potential, and thus, there is a demand in the country for the development of new hydroelectric plants, which, with the growth of energy demand, increases the energy supply [MARGUTTI; ISLA; CARDOSO, 2021].

About 65% of the energy produced in Brazil comes from natural resources. Worldwide, about 14% of the energy produced comes from hydroelectric plants [PAGLIOCHI *et al*., 2019; JOHNSON, 2021; MARGUTTI; ISLA; CARDOSO, 2021].

Thus, hydroelectric plants are seen as public utility projects since they provide a service to society, serving the community's interest [MARGUTTI; ISLA; CARDOSO, 2021; MARGUTTI, 2017]. However, the bidding process for hydroelectric plants presents significant problems for the population and communities directly affected by the project [PAGLIOCHI *et al*., 2019].

The implementation of hydroelectric plants mainly affects riverside people and fishing activities, changing the way of life of this population since fishing is a way of obtaining income and food [COELHO *et al*., 2020]. Among the impacts caused on the environment, there are changes in the watercourse of rivers, flooding of forest areas, and loss of habitats and biodiversity (LOPES; BRITO, 2021). The socio-environmental impacts generated by the construction of hydroelectric plants and other projects are not democratic since different social groups are affected in different ways. The burden caused by environmental degradation is on vulnerable social classes [SOUZA JUNIOR; TEIXEIRA, 2019].

In light of the above, public hearings become fundamental in decision-making regarding implementing hydroelectric plants and any undertaking that causes environmental degradation [LIMA; PINTO, 2017]. Faced with the difficulties faced in resolving conflicts, public consultation is a fundamental instrument for society to participate in and contribute to the licensing process. Public consultation through public hearings allows citizens to dialogue with decision makers, exposing their points of view and opinions regarding the impacts of the enterprise's implementation [SOUSA; OLIVEIRA, 2020].

It is noteworthy that this instrument has several criticisms regarding its effectiveness. This instrument may become compliant with a "formality" and execution of a protocol only to issue the environmental license as soon as possible; therefore, social participation may not affect the environmental licensing process [SOUSA; OLIVEIRA, 2020].

Therefore, this research sought to establish relationships between the environmental impacts caused by the Xingó Hydroelectric Power Plant, based on the analysis of the participation of society/representatives of individuals, public bodies/entities, NGOs (Non-Governmental Organizations), and private institutions/companies in the public hearings. Therefore, we seek to answer the following guiding questions: How many people participated in the public hearings? Who are the participants in public hearings? What are the main characteristics of the participants' speeches? What are the themes presented in the speeches of the participants?

We intend to study, understand and answer these questions through quantitative and qualitative analyzes of public hearings at the Xingó Hydroelectric Power Plant (XINGÓ HPP). We measured the population's participation in public hearings, attributing different analytical approaches. The quantification of participants, the speech indicators of the members, the profile, the characteristics of the participants' expositions, and the delimitation of the theme and nature of the arguments listed during the public hearing were fundamental indicators addressed in this study.

II. METHODOLOGY

For methodology, the interpretative description was adopted, through documentary and content investigation [SOUZA, 2019], of the federal environmental licensing process of the undertaking called XINGÓ HPP (Hydroelectric Power Plant) of Xingó, with the opening of the process on the 07th (seventh) of June 1988 (one thousand nine hundred and eighty-eight) and materialized in administrative process N° 40650.002018/88-11.

2.1 Study Area

The project called XINGÓ HPP (Hydroelectric Power Plant) Xingó (Sergipe state, Brazil) is located (Figure 1) between the states of Alagoas (AL) and Sergipe (SE), Brazil. Situated 65 km downstream from the Paulo Afonso Waterfall, to take advantage of the geological extension site for the implementation of its lake [CHESF, 2022].

The Xingó HPP is located on the São Francisco River, Brazil (Figure 2), specifically in the lower course, inserting itself in the cascade of hydroelectric plants that apply the force of the flow of its waters to generate electricity [CHESF, 2022]. The São Francisco River Basin has a drainage area of 639.219 km², with an extension of 2.700 km, has its source in Serra da Canastra (Minas Gerais – MG state, Brazil) and its mouth is notorious between the states of Sergipe (SE) and Alagoas (AL), extending its flow through the states of Pernambuco, Bahia, Alagoas, Sergipe, Minas Gerais, Goiás and the Federal District. The watershed represents 9% of the total municipalities in the country, as it has seven federation units, being proportionally high in the state of Bahia (BA), about 48.2%, followed by the corresponding state of Minas Gerais (MG) in 36.8%, Pernambuco (10.9%), Alagoas (2.2%), Sergipe (1.2%), Goiás (0.5%), and Federal District (0.2%) [MDR, 2019].

The Xingó Hydroelectric Power Plant is located between the states of Alagoas and Sergipe (Figure 1), 12 km from the municipality of Piranhas (AL) and 10.4 km from the municipality of Canindé do São Francisco (SE state). It is also positioned about the São Francisco at approximately 65 km downstream from the Paulo Afonso Complex, constituting its reservoir [CHESF, 2022].

The Xingó HPP started its works in March 1987, with a period of interruption due to the economic and financial crisis. Operations began in December 1994, with a total reservoir volume of 3.800x106 m³ and a length of 60 km [BARBOZA, 2019].

The Xingó dam comprises the following structures: a rockfill dam with a concrete face upstream with a maximum height of about 140 m; on the left bank (AL) is the slope-type surface spillway with two chutes and twelve segment-type gates with a discharge capacity of 33.000 m^3/s; on the right bank (SE) are located the walls, water intake, exposed penstocks, semi-sheltered powerhouse, restitution channel, and mixed earth-rocker section dikes, totaling the length of the crest at 3.623,00 m. The generating plant comprises six units with 527.000 kW of nominal unit power, totaling 3.162,000 kW of installed capacity [CHESF, 2022].

The current installed capacity of the Xingó HPP places it on the list of the largest generating units in Brazil. The hydroelectric plant is operated by SFHC (São Francisco River Hydroelectric Company) and is responsible for about 30% of the electricity generated in the Northeast Region [SOUSA, 2019].

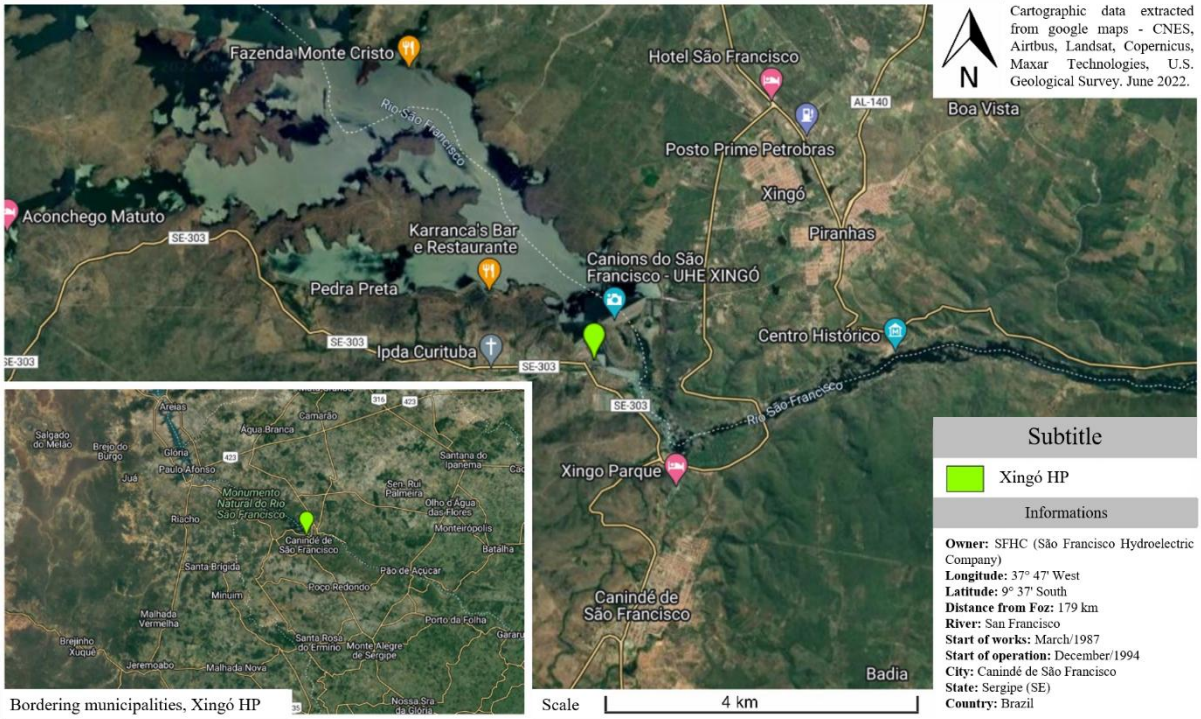

Figure 1: Location of the study area [Source: Adapted from Google Maps and SFHC - São Francisco River Hydroelectric Company, 2022.]

Figure 2: Object of study – Xingó HPP [Source: PORTAL G1 SERGIPE. Xingó Hydroelectric Power Plant expands flow to 2.000 cubic meters starting this Saturday. https://g1.globo.com/se/sergipe/noticia/2022/04/23/hidreletrica-de-xingo-amplia-vazao-para-2-mil-metros-cubicos-a-partir-deste-sabado.html. Accessed on: 01 Jun. 2022]

I It is noteworthy that the licensing of the enterprise was under the tutelage of state environmental agencies, when the work was already in progress. In this case, IBAMA took over the licensing with the advent

of CONAMA Resolution Nº 237/1997 (Provides for concepts, subjection, and procedure for obtaining Environmental Licensing, and other measures) in the LO (Operation License) renewal phase [IBAMA, 2022].

The Xingó Hydroelectric Power Plant received special license nº 001/2004, of January 16, 2004, valid for 150 days, authorizing an emergency reduction in the flow of the São Francisco River from the Sobradinho, Paulo Afonso Hydroelectric Complex and Xingó HPP, for 1.100 m³/s [IBAMA, 2022].

Currently, Xingó HPP has LO (Operation License) Nº. 147/2001, with four corrections, the 2nd renewal being valid until May 12, 2026. The Environmental License issued by IBAMA provides specific conditions for its validity, among them, the holding of Public Meetings on the environmental licensing process of the Xingó HPP in the cities of Canindé of São Francisco, Propriá, and Penedo, as established in the Official Letter N°. 02001.002724/2016-89 DILIC/IBAM [IBAMA, 2022].

2.2 Data Collection

In the first phase of the research, a quantitative approach was carried out, indicating the number of participants, the number of suggestions and questions made during the hearings at the Xingó HPP, and the definition of who formulated the questions and the respective themes indicated in the demonstrations. In the second phase, a qualitative approach was carried out, with a classification of the nature of the questions to understand whether the questions and suggestions made during the public hearings materialize with the dimensions of sustainable development.

The methodology chosen to analyze the minutes is content analysis, widely used for document analysis. Content analysis presents itself as a relevant option when the main objective is to analyze data from communications, seeking to understand the meanings and meanings of messages, which go beyond a common reading, that is, the minutes of public hearings are focused on intratextual elements [CARDOSO, OLIVEIRA, GHELLI, 2021]. The mapping of text units was carried out in order to identify the participants and which groups they belong to, and the topics addressed in their speeches.

Furthermore, based on the analysis of the minutes of public hearings, an attempt was made to map and characterize the participating actors and the topics addressed by them, correlating them with the main environmental issues mentioned in the EIS (Environmental Impact Study) and in the REI (Report of Environmental Impact), both are documents aimed at sustainability, aiming to assess and specify the intensity and dimension of the impact on the environment [AZEVEDO, 2022].

In administrative process N° 40650.002018/88-11, which characterizes the Xingó HPP project, 185 participants were registered, according to the distribution of groups presented in the results [IBAMA, 2022]. As shortcomings of the research stand out, the minutes do not necessarily present all the speeches or expose extratextual elements (emotions, revolts, silences, or uproar), constituting a synthesis of the most important themes. The research focuses only on the public hearing, not considering other forms of participation that may have occurred.

III. RESULTS AND DISCUSSION

The minutes of the public hearings at Xingó HPP were prepared and written by the environmental licensing board of IBAMA (Brazilian Institute for the Environment and Renewable Natural Resources); they mention the name of the participant, the institution to which the participant belongs, and email and signature thereof. In consultation with IBAMA's database, three hearings were identified from June 14 to June 16, 2016 (Figure 3), in the cities of Canindé of São Francisco (SE), Propriá (SE), and Penedo (AL), recording a total of 185 participants in the hearings. The holding of Public Meetings on the environmental licensing process of the Xingó HPP in the cities of Canindé of São Francisco, Propriá, and Penedo is established in Official Letter N° 02001.002724/2016-89 DILIC/IBAM (issued on May 12, 2016) as a condition for the 2nd renewal of the Operating License (LO). [IBAMA, 2022].

Figure 3: Location of public hearings at Xingó HPP [Source: Adapted from Google Maps and IBAMA - Brazilian Institute for the Environment and Renewable Natural Resources, 2022].

According to Figure 4, the number of participants in the first hearing held in Canindé of São Francisco (SE) on June 14, 2016, at 2:30 pm at the Municipal Department of Agriculture, Water, and Environment was observed. With 42 participants, corresponding to 22.70% of the participants of the three hearings held.

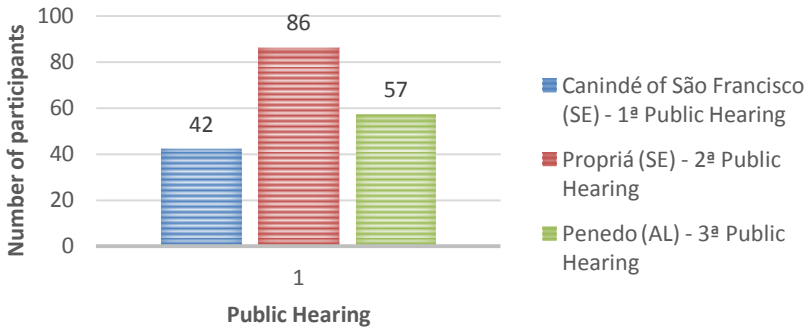

Figure 4: Number of participants in the Public Hearings of Xingó HPP [Source: Authors, 2022].

The second public hearing took place in the municipality of Propriá (SE), on June 15, 2016, at 2:30 pm in the Municipality of Propriá, with 86 participants, about 46.49% of the total participants. The last public meeting (3rd hearing) for the environmental licensing of the Xingó HPP was held in the city of Penedo (AL), on June 16, 2016, at 2:40 pm at Casa da Aposentadoria, with a total of 57 participants, equivalent to 30.81% of participants in all public hearings at Xingó HPP.

Public participation in the meeting held in Propriá (SE) stands out, about 182 km away from the project. In the location closest to the project, there was less public participation. It is believed that there was greater public participation in the second meeting due to the instigation and popular encouragement that took place in the first hearing, highlighting the importance of public involvement in legitimizing and improving the decisions made by public administrators. As for the characterization of the participants in the public hearing, the distribution of the six identified groups is shown in the graphs below.

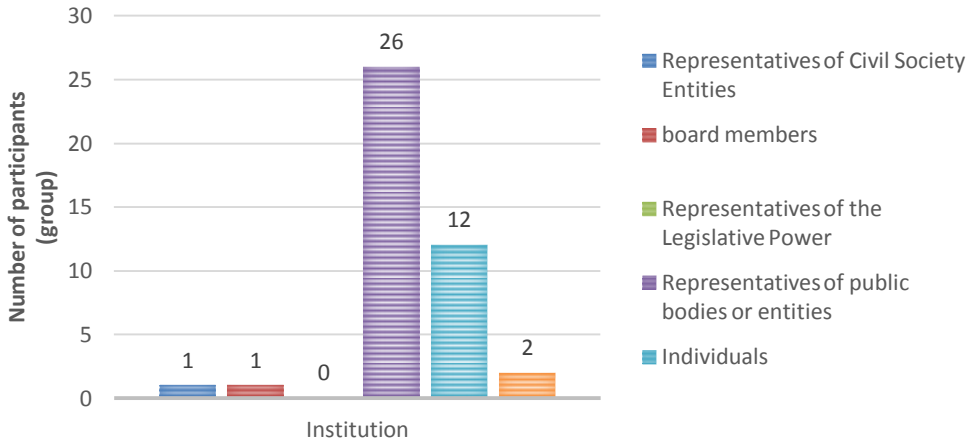

Figure 5: Number and groups of participants of the 1st public hearing in Canindé of São Francisco (SE) - June 14, 2016 [Source: Authors, 2022].

Figure 5 shows the number of participants in the 1st hearing, held in Canindé of São Francisco (SE). In this place, there was significant participation of representatives of public bodies or entities, such as IBAMA, São Francisco Hydroelectric Company (CHESF), Chico Mendes Institute for Biodiversity Conservation (ICMBio), Municipality of Canindé, Agricultural Development Company of Sergipe (Emdagro), Piranhas City Hall and the Sergipe Water Resources and Irrigation Development Company (Cohidro). The participation of public bodies or entities corresponds to 61.90% of the audience members. In addition, the minority participation of representatives of civil society entities, and council members, was identified, indicating 2.38% of each group. The involvement of individuals stands out, among them residents of the region of São Marcelo, Altos Verdes, Centro, and Colônias Z-21 and Z-15, which reflect 28.57% of public participation. Among the participation of representatives of private companies, the involvement of the company Agrosig Engineering and Environment and of the private communication company, Community Radio Amanhecer FM, corresponds to 4.77% of the participants. There were no participants from the legislature.

In the second public hearing (Figure 6), the high public participation of individuals is observed, corresponding to 56.98% of the participants. Furthermore, the participation of representatives of public bodies or entities is significant, at approximately 33.71%. As observed in the first hearing, there is a low number of participants representing civil society entities (4.65%), representatives of the legislative branch (2.33%), and representatives of private companies (2.33%). Unlike the other hearings, it is pointed out the participation of the legislative power, represented by two councilors of the Municipality of Propriá. There was no participation of board members.

At the meeting held in the city of Penedo (Figure 7), an expressive number of representatives of public bodies or entities was identified, around 59.65%. Among them, there is a varied presence of institutions, namely, San Francisco Hydroelectric Company (CHESF), Institute of the Environment of Alagoas (IMA), Official Expert of Alagoas, IBAMA, Municipality of Penedo, State Administration of the Environment of Sergipe (ADEMA), the São Francisco and Parnaíba Valley Development Company (Codevasf) and the São Francisco River Basin Committee (CBHSF).

In the case of representatives of individuals, a more significant number of colonies is identified. Colony Z-34, Z-27, Z-12, Z-19, Z-30, and Z-20 represent approximately 33.34% of participants. In this meeting, there was no presence of members of councils and the legislature, and also a low number of representatives of civil society entities (5.26%) and representatives of private companies (1.75%). The presence was null concerning the participation of council members and legislative power.

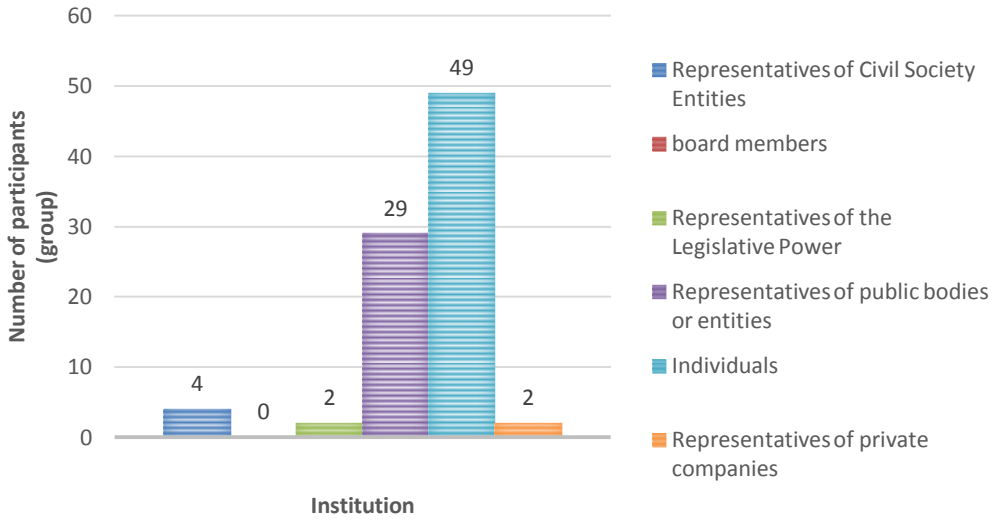

Figure 6: Number and groups of participants of the 2nd public hearing in Propriá (AL) - June 15, 2016 [Source: Authors, 2022].

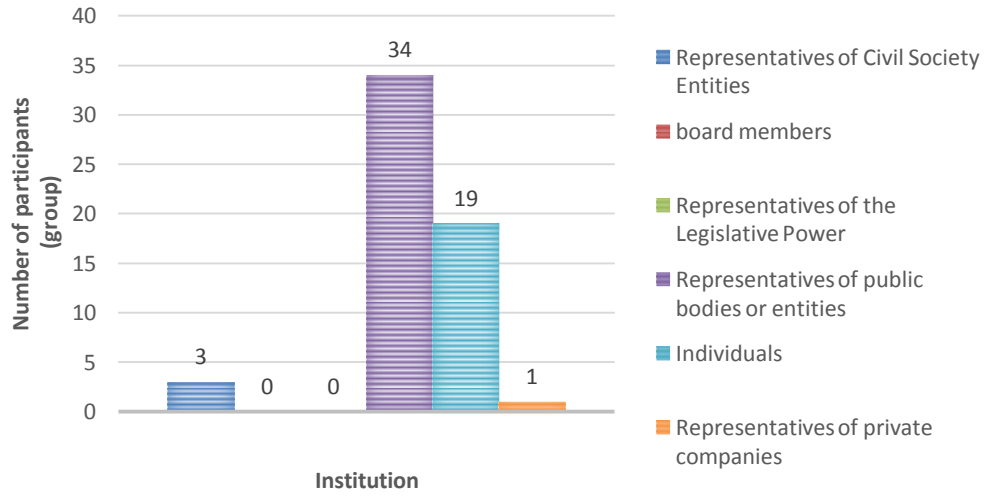

Figure 7: Number and groups of participants of the 3rd public hearing in Penedo (AL) - June 16, 2016 [Source: Authors, 2022].

The high number of representatives of public bodies or entities is in line with the duty that public bodies have to society and public interests. Therefore, the State is responsible for promoting discussion in hearings in a democratic way, making society heard, and that its opinion weighs decision-making [SOUZA JÚNIOR; TEIXEIRA; 2019; LIMA; PINTO, 2017].

Public hearings provide a democratic debate where society, public bodies, councils, foundations, and unions can express their opinions. However, community participation is inefficient since public hearings are not always widely publicized and known to the population. The lack of involvement makes public consultation ineffective since the purpose of public hearings ends up not fulfilling their objective, which is to be an instrument for discussion and debate of opinions. In addition, there is still a lack of confidence among the population because participation can achieve some objective.

Identifying the number of speeches by audience participants (Figure 8), it is observed that in the first audience, there were nine speeches. There was a predominance of speech by representatives of public bodies or entities, about 55.55% of the number of speeches. Because of the above, the high number is due to the questions made by individuals (33.34%) and explained by representatives of public agencies to integrate the population in decision-making. In this act, there is a manifestation of board members (11.11%), represented by Ms. Marise Campos, a Canindé of São Francisco (SE) Environment Council member.

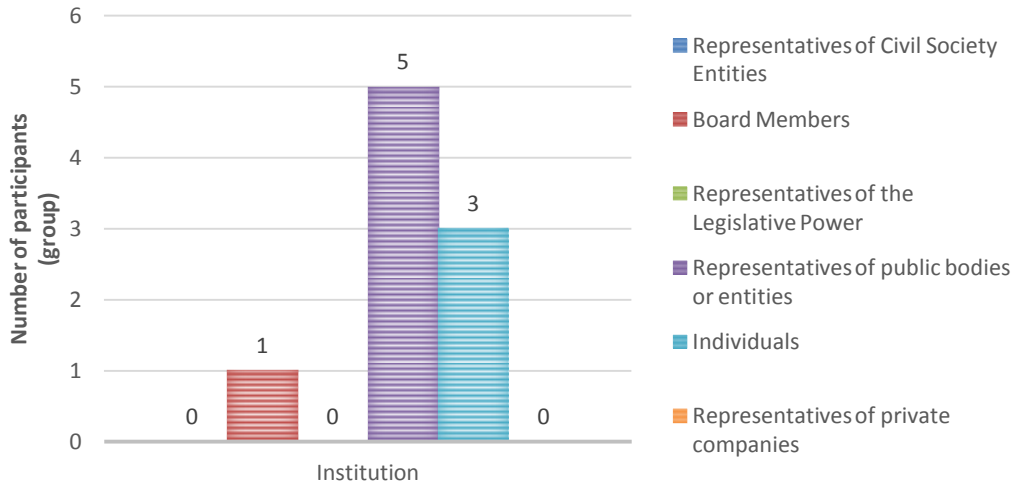

Figure 8: Number of speeches by groups of participants of the 1st public hearing in Canindé of São Francisco (SE) - June 14, 2016 [Source: Authors, 2022].

In the second public hearing held in Propriá (Figure 9), despite the high number of participants, there were only 18 speeches. As in the first hearing, there was a predominance of speech by representatives of public bodies or entities, about 55.55% of the number of speeches. However, the manifestation of individuals presented at a higher rate than in the previous audience, approximately 44.45% of the total speeches.

The absence of manifestation of four institutions is surprising: representatives of civil society entities, members of the council, representatives of the executive power, and representatives of private companies, characterizing a democracy without manifestations, opinions, suggestions, and public participation.

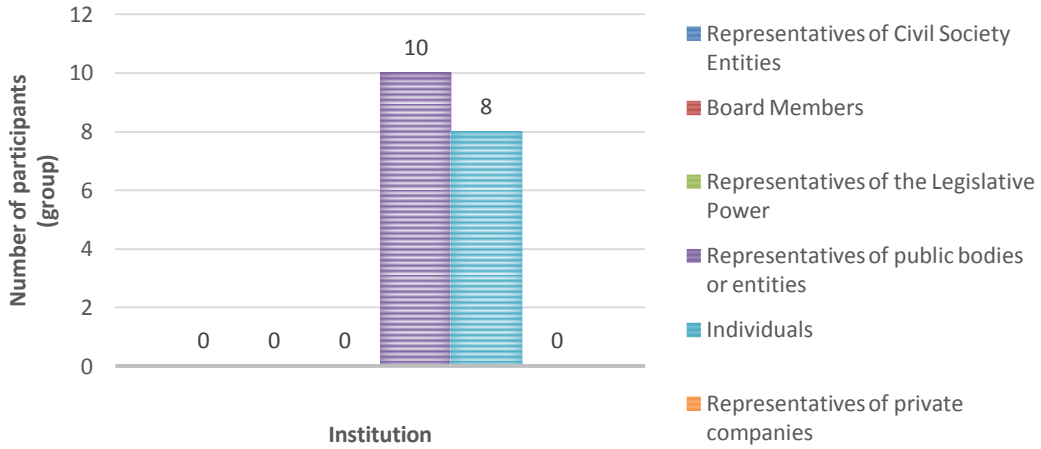

Figure 9: Number of speeches by groups of participants of the 2nd public hearing and Propriá (AL) - June 15, 2016 [Source: Authors, 2022].

In the hearing held in Penedo (Figure 10), comparing the others, there was greater participation of representatives of civil society entities and representatives of the legislature. As in the other hearings, there was high participation of representatives of public bodies or entities, indicated in 58.62% of the speeches. Next, the number of speeches by representatives of civil society entities and individuals is very close. The speeches of the first group represent approximately 17.24%, and the second group appears with 20.68% of the manifestations in the third hearing. As in the previous hearings, the group of representatives of board members and private companies did not comment.

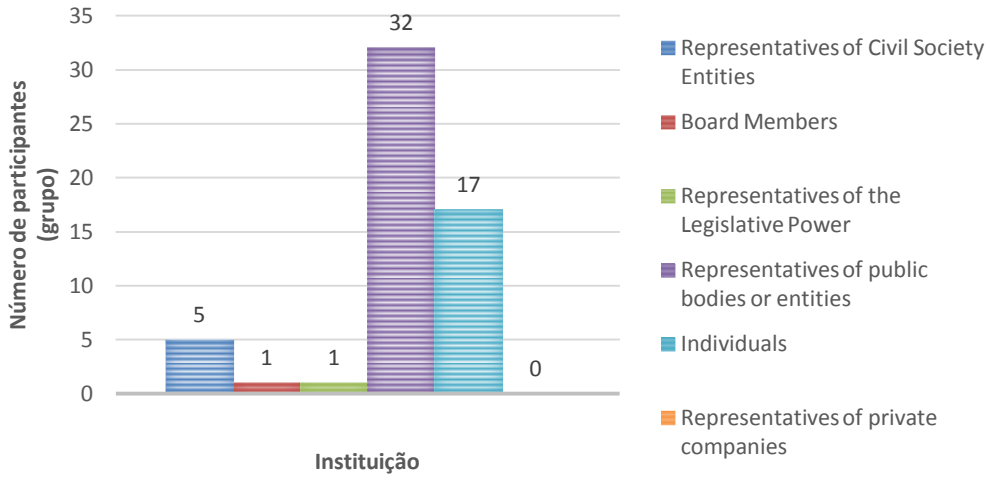

Figure 10: Number of speeches by groups of participants of the 3rd public hearing in Penedo (AL) - June 16, 2016 [Source: Authors, 2022].

In Figure 11, it is possible to identify the approval and rejection of the enterprise. The survey for the elaboration of the graph followed according to the fifty-six manifestations identified in the three hearings, which its participants, regardless of the group, demonstrated through speech, being favorable to the already installed enterprise or unfavorable to the operation of the Xingó HPP. Thus, the opposition and total disapproval (100.00%) of the enterprise by council members, representatives of the legislature, and individuals are elucidated. On the other hand, the representatives of civil society entities are unanimously (100.00%) in favor of the operation of Xingó HPP.

Evaluating the objective of the speeches to analyze the approval or disapproval of the enterprise, it is emphasized in the group of representatives of agencies or public entities, which, manifested itself by the opposition and disapproval in about 10.81% of the speeches, demonstrating the approval superior, being in this group, approximately 89.19% of the manifestations favorable to the operation of the hydroelectric plant. Analyzing the positioning of the speeches of all groups regarding the operation of the enterprise, the approval and acceptance is shown by the percentage of 62.50%. In contrast, the rate reached by the opposition and disapproval of the enterprise is 37.50%.

Mention is made of the high approval by representatives of public bodies or entities due to the operation of HPP Xingó, which became the responsibility of IBAMA when the enterprise was already in operation, previously under the tutelage of state environmental bodies. The environmental and social impacts generated by the implementation of the hydroelectric project include the relocation of families and changes in the lifestyle of these communities, flooding of extractive areas, livestock, cultivation sites, and loss of ecosystems and biodiversity. However, it is important to note that the relocation of affected populations often occurs unfavorably for human resettlement, with the lack of basic conditions for relocation [MARGUTTI, 2017].

The population's rejection of hydroelectric projects is related to disrupting local productive activities, causing populations to seek other ways to survive. Furthermore, the population of the local area where the hydroelectric dams are located benefits little from the project since in these places, the energy supply is precarious, so what we have is a use of the benefits of the hydroelectric project by industries and city halls located in and nearby municipalities [MARGUTTI, 2017].

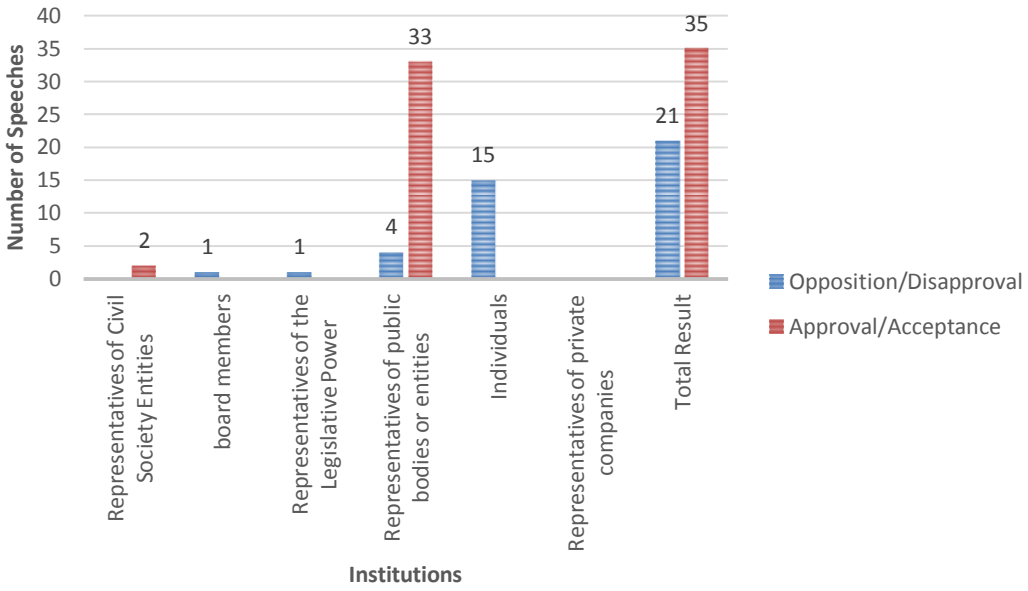

Figure 11: Purpose of the speeches of the participants by group of participants, regarding the opposition or acceptance of the enterprise (in number of speeches) - XINGÓ HPP Xingó (SE) [Source: Authors, 2022].

In the Figure 12, the objective of the participants' speeches is represented. It is noted that half of the statements (50%) were aimed at clarifications and affirmations since the enterprise is in operation and clarifications arise regarding mitigation measures, environmental programs, and environmental compensation. It is not only the failure to comply with the conditions imposed by IBAMA, but the precarious inspection by IBAMA (Brazilian Institute for the Environment and Renewable Natural Resources) that worries fishermen, individuals and residents of colonies belonging to the area of influence of the enterprise, demonstrated in negative aspects of HPP Xingó, represented in about 21.42% of the number of speeches in the hearings. In the same way, the lack of cooperation between the spheres of the Executive makes the works of improvement in the cities involved slow and the investments in the colonies that live along the São Francisco River. Also, the questions and doubts are represented by 17.86% of the participants. It is noteworthy that the positive aspects presented by the participants' speeches were described by a percentage of only 5.36%, followed by the group of suggestions (5.36%).

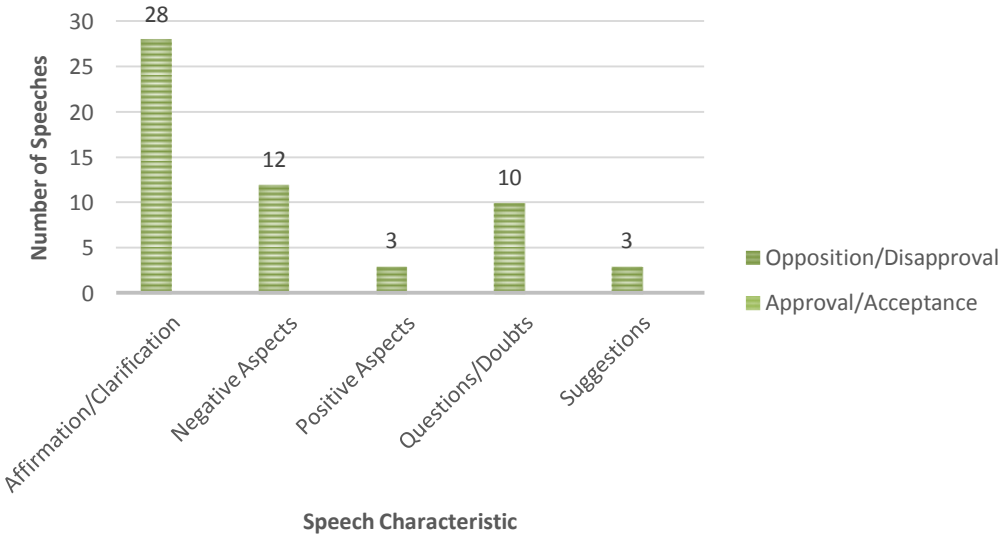

Figure 12: Purpose of the speeches of the participants in the public hearings of Xingó HPP, [Source: Authors, 2022).

In the Figure 13, the arguments of the participants classified according to the theme are represented. The fauna and flora group were the ones that presented a percentage of 17.85%, therefore, the most talked about and discussed topic in the audiences. In this context, the participants mentioned the difficulty of fish reproduction, navigation difficulties due to low flow, the existence of invasive fish species, the lack of native fish species in the region, deforestation on the banks of rivers and, finally, the need to improve the springs.

The broad discussion about these groups is of great relevance to society [MARGUTTI, 2017]. Hydroelectric plants are one of the enterprises that most cause deforestation of tropical forests, generating environmental degradation, impacting fauna and flora, in addition, hydroelectric plants cause an increase in the level of rivers, streams and streams [COELHO *et al.*, 2020].

One of the topics presented at the hearings was environmental programs to reduce and mitigate environmental impacts, water quality/water resources, inspection and others, presented the same percentage of 14.2%. Water quality can be affected due to the period of time in which water retention occurs, flooding of extensive vegetated areas, eutrophication process and the accumulation of sediments and nutrients, in this sense, this group presented one of the highest percentages due to its importance to local and regional level [COURA, 2020].

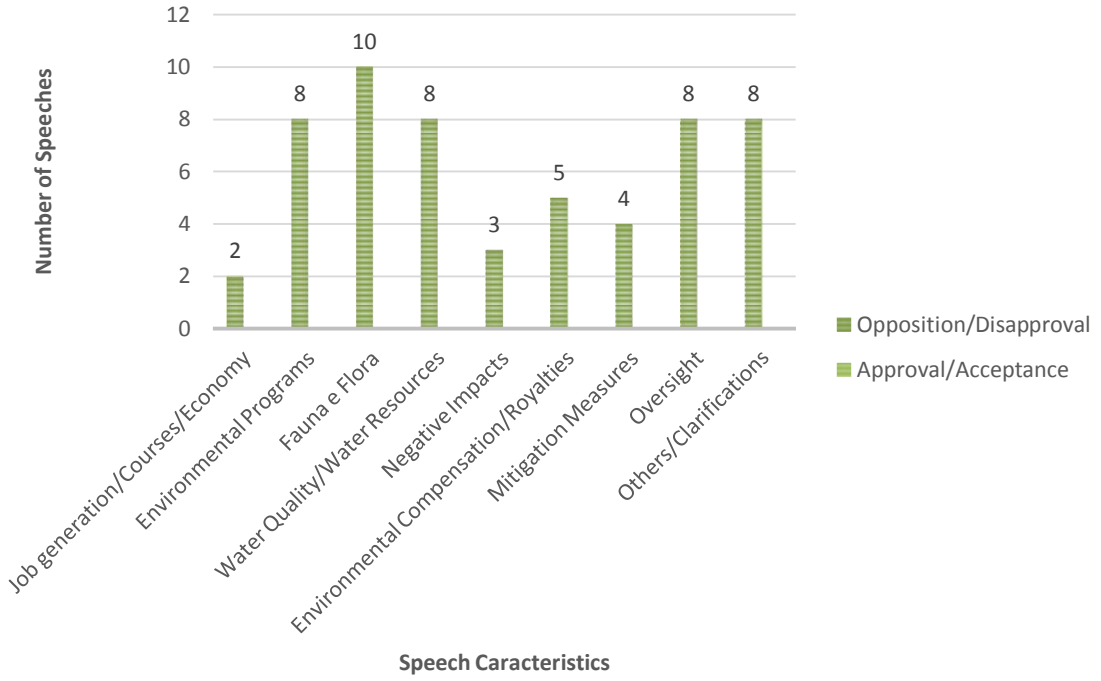

Figure 13: Themes and nature of the arguments presented by the participants (in number of speeches) of the public hearings at Xingó HPP, [Source: Authors, 2022].

Another topic that stands out due to its degree of social importance is the group with speeches and manifestations related to environmental compensation, mitigation measures, negative impacts, employment generation, and economy, where they presented the respective percentages, 8.9%, 7, 14%, 5.35%, 3.57%, a percentage below the previous ones, even though they are important issues for the life of society and those directly affected by the enterprise. Among the manifestations carried out, there is a significant presence of surveys of mitigation actions carried out by San Francisco Hydroelectric Company, responsible for the operation of Xingó HPP, however, so far, not been carried out.

IV. CONCLUSION

The construction of hydroelectric plants causes negative environmental impacts on the environment and society. These damages are often irreparable and irreversible, generating many uncertainties about the future of biodiversity, ecosystems, population, and society in general. On the other hand, hydropower plants are fundamental for economic development since it is one of the primary sources of energy in Brazil and the world [COELHO *et al.*, 2020]. Public hearings are of paramount importance to discuss and debate the main concerns of the community, however, it is believed that the procedure only allows access to already established information without presenting concrete actions for society [COELHO *et al.*, 2020].

In this study We observed that there was a total record of 185 participants in the public hearings that took place in the cities of Canindé of São Francisco (SE), Propriá (SE) and Penedo (AL). Among the participants, we observed the presence of representatives of civil society entities, members of councils, representatives of the legislature and bodies of public entities and individuals. Participants were seeking clarification on the enterprise, understanding and understanding of the negative and positive aspects, seeking to resolve doubts and suggesting alternatives or problem solving. The subject most discussed at the public hearing was related to fauna and flora and the impacts that involve it as a result of the search for licensing the enterprise. On the other hand, the least discussed subject in the public hearing was related to job creation, the availability of courses and how the economic sector would remain, as a result of the implementation of the enterprise. We conclude that public hearings, with broad participation of the diverse population in various sectors, open paths to obtain clarification, understanding, debates and elucidations about their general characteristics and impacts (negative and positive) as a result of the enterprise. In addition, through popular voice, public hearings guide the fate of the enterprise, as a rule, subject to the elaboration of studies and reports of environmental impacts.

According to the view presented the public bodies should make it possible for the population to be heard and ensure that their wishes weight decision-making, making the process democratic and not just the fulfillment of a formality [LIMA; PINTO, 2017; SOUZA JUNIOR; TEIXEIRA, 2019]. However, public hearings do not present a decision-making power in the environmental licensing process. Still, they are an essential instrument, limited only to consultative management, thus being considered a formality and an administrative obligation. However, there are still exceptional cases where public hearing consultations can interfere in decision-making. In this sense, environmental licensing must occur democratically, taking into account society's opinion in a practical way, so it is necessary to find ways for the population to have a voice and decision-making power and thus contribute to sustainable development. In this sense, it is essential that environmental licensing occurs in a democratic way, taking into account the opinion of society in an effective way, so it is necessary to find ways for the population to have a voice and decision-making power, and thus can contribute to development. sustainable.

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