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Perception of family farmers on the socio-environmental impacts caused by Açu Port in São João da Barra, Rio de Janeiro, Brazil

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Abstract

Ground was first broken in 2007 for the Açu Port, one of the largest port projects in the state of Rio de Janeiro, in the Fifth District of São João da Barra. Construction of its megastructures involved the clearing of extensive areas of restinga and the execution of a broad process of family-owned farmland expropriation by the Rio de Janeiro government. The objective of this study is to evaluate local family farmers' perceptions of change as a means to understand their interrelationship with the environment before and after the installation of the Açu Port. Data was collected using a semi-structured questionnaire that was designed to identify the positive and negative interventions related to the Açu Port in the Fifth District and local family farming systems. Two locations were selected for the sampling: Água Preta and Mato Escuro. Questionnaires were applied between May and August 2019 and a total of 105 farmers (65 in Água Preta and 40 in Mato Escuro) were enrolled in the study. The results show that local farmers believed the installation of the Açu Port directly interfered in their social, economic and environmental well-being. The main environmental and economic impacts listed by the farmers were: salinization of water used for irrigation of their plantations and the process of expropriation of their lands. The results obtained demonstrate that in addition to affecting the dynamics of São João da Barra coastal ecosystems, including the restinga and lagoons, the economic development model adopted by the Açu Port has affected the quality of life of these farmers, interfered with their agricultural areas and directly affected their social reproduction.

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INTRODUCTION

The economic development model adopted in Brazil during the Colonial period resulted in the consolidation of an exclusionary land ownership structure that concentrated wealth in the hands of a few. In the 1990s, family farming gained political and social visibility during the country's process of rural development due to its importance in domestic food supply. This resulted in the creation and implementation of public policies previously dedicated to medium and large properties (LIMA; SILVA; IWATA, 2019).

The concept of family farming has been debated and established in recent decades by various sectors, such as public institutions, academia and social movements. In Brazil, however, due to the complex regional, social (e.g. ethnicities and rural communities) and economic (e.g. productive conditions and agricultural and non-agricultural forms of work) heterogeneity of the country and Brazilian farmers, disagreement regarding the overarching, precise and operational definition of this concept remains (SPANEVELLO, 2008).

According to Tedesco (2001), although the characterization of family farming in the literature has been based on some common assumptions (e.g. the family as owner and producer), it is necessary to consider the lack of linearity among farmers. Lamarche (1993) emphasizes that the main features in family establishments relate to cultural, social and economic diversity. For Abramovay (1998), family farming should not be considered a compact and uniform activity, since it is characterized by internal differences and subject to different influences in terms of public policies, investments and financing. His definition of family farming is based on three features: management, ownership and family work. Additionally, Lamarche (1993) states that family farming is characterized by small properties in which rural activities are performed by workers who have kinship relations, reside in the productive units and transmit their knowledge, traditions and skills to the next generation. Thus, in addition to preserving and enhancing several important practices and technologies that foster agricultural sustainability and the conservation of natural resources, family farming also creates jobs, provides income and contributes to the diversification of local economies with the production,

commercialization and consumption of their agricultural products.

In Brazil, family farming is one of the productive segments that drives the Gross Domestic Product (GDP) and the Gross Value of Agricultural Production (GVP). Brazilian family farming is the 8th largest food producer in the world, with annual revenues of US\$ 55.2 billion, which correspond to 10% of the GDP and 38% of GVP, as reported by the Ministério da Agricultura, Pecuária e Abastecimento – MAPA (2018) (federal agency responsible for managing Brazilian agriculture and livestock resources). Family farming comprises the economic base for approximately 90% of the Brazilian municipalities with up to 20 thousand inhabitants. Forty percent of the economically active population and 70% of Brazilians employed in the countryside obtain their income from this activity, with 84% of rural establishments belonging to family farmers, totaling 5 million families and 14 million workers (IBGE, 2017).

Despite the significance of these numbers, most Brazilian family farmers live in extreme poverty, especially in the Northeast region, where the long-term sustainability of 72% of family farmers is threatened by insufficient profits (DELGADO; BERGAMASCO, 2017). According to Plein (2011), Brazilian family farmers are affected by economic and socio-environmental impacts related to alterations in social relations and the private appropriation of natural resources. For Brumer and Santos (2006), such impact has mainly affected marginalized social groups who lack economic power and capital. This results in local conflicts and an acute asymmetry of power among the various social actors. Complex, unequal and antagonistic struggles for the control, access and use of territory play out, and dominant social actors are able to enact strategies preventing, for example, the forced removal of neo-extractive projects, such as hydroelectric plants, pipelines and ports, once they are established.

Several studies have directly or indirectly addressed the transformations that have taken place in the municipality of São João da Barra resulting from the creation and operation of the Açú Port, ranging from investigations of the environmental licensing process (LATINI, 2016; PEDLOWSKI, 2017) to the conflicts and socio-environmental and economic impact that this mega port project generated (PIRES, 2009; ALVARENGA, 2013; DITTY and REZENDE, 2014; BURLA et al., 2015). However, no research has sought to verify whether the

benefits and expectations promoted by the Açú Port during its planning phase were, in fact, achieved, or if efforts at socio-environmental mitigation were performed, especially those aimed at family farmers in the Fifth District who live and work within the Area of Direct Influence (ADI) and Area of Indirect Influence (AII). While the socioeconomic and environmental networks were altered by a direct cause and effect relationship in the ADI impact occurred at lower less intensity in the AII.

It is important to verify whether the port's outcomes were closely aligned with the promises made by its promoters in order to understand the perceptions of this social group regarding socio-environmental impact and local biodiversity loss. Such information may assist in making environmental management decisions that guarantee the integrity of local human and biological communities and minimize interference in agricultural-livestock practices. Such decisions may lead to improvements in the quality of life and socioeconomic survival of key social groups while effectively protecting natural resources.

Paula, Silva and Gorayeb (2014) have maintained that studies of environmental perception can provide important data for the elaboration of projects that recognize the needs of local communities affected by development projects and that promote their engagement in the management and conservation of environmental resources. In Brazil, however, few studies on the perceptions of social groups affected by the implementation and operation of port projects have been carried out. Therefore, collecting data from the point of view of the family farmers affected by the Açú Port and understanding the socioeconomic and

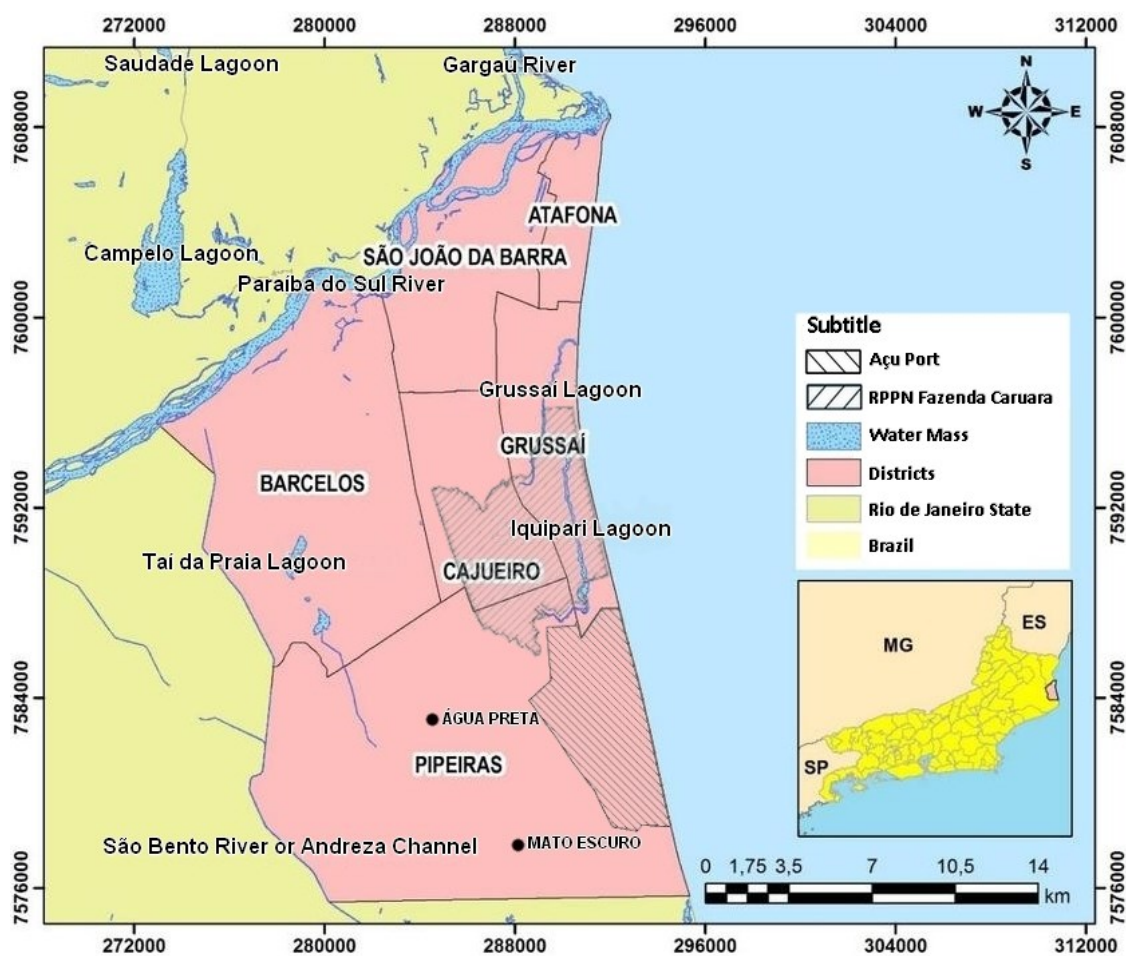
ecological changes that have taken place in the region should be a priority in order to allow public and private managers working in São João da Barra to direct and prioritize investments in local agriculture and implement effective measures to mitigate the negative impact of port activities on natural ecosystems.

Given the fact that the traditional social groups inhabiting the territory where the Açú Port was installed were not consulted, this article aims to present the results of an assessment of the perception of family farmers from the Fifth District of São João da Barra regarding the impact port activities caused to local actors' forms of production and social reproduction as well as to the centuries-long relationship that has existed between the local population and natural ecosystems.

MATERIALS AND METHODS

The municipality of São João da Barra is located in the lowest part of the Goitacá plain at an average altitude of six meters above sea level. It occupies an area of 453,390 km², which corresponds to 4.7% of the entire North Fluminense region. According to the IBGE (2020) Census, the municipal population is 35,000, out of which 20% live in rural areas. The municipal territory is divided into six Districts: Sede (First District), Atafona (Second), Grussaí (Third), Cajueiro (Fourth), Pipeiras (Fifth) and Barcelos (Sixth). São João da Barra is the home to very important biomes (e.g. saltmarsh and mangroves) and is located near the delta of the Paraíba do Sul River, the second largest delta in Brazil (Figure 1).

Figure 1 - Situation and geographic location of the municipality of São João da Barra, the study areas, the RPPN Fazenda Caruara, the main aquatic ecosystems and the Açú Port.



Source: Adapted from Ecologus (2011).

The implementation of the Açú Port in the Fifth District of São João da Barra began in 2007. Since its inception, the project has been promoted as a means to expand the operational capacity of the national transport and logistics infrastructure, and is one of the largest public/private investments in Brazil.

For Benevides-Guimarães, Pedlowski and Terra (2019), the Açú Port, as well as other mega-projects (e.g. hydroelectric, mining) characterized by complex logistics and significant socio-environmental footprints, was conceived under the aegis of Neodevelopmentalism and Neoextractivism paradigms. The Neodevelopment paradigm involves actions implemented by the state to enable high rates of economic growth achieved by increases in productive investments and the growth of commodity access to global markets. Meanwhile, Neoextractivism refers to the adoption of a development model focused on the accumulation of minerals and fuels in which natural resources are appropriated to foster export activities. Neoextractivism is usually

associated with geographic enclaves coordinated by national and multinational corporations that achieve economic growth in direct alliance with the state, which provides institutional and financial support (MILANEZ AND SANTOS, 2013). Therefore, these two capitalist models adopted to achieve economic growth in strategic territories simultaneously cause socioeconomic and ecological degradation, externalizing negative impact on traditional communities in the host areas, as in the case of farmers in the Fifth District of São João da Barra.

The expropriation of land (the compulsory transfer of private property rights) in the Fifth District should be viewed as an example of the direct impact of the model adopted by the Açú Port. This process was based on State Decree nº 25.455/1999, in which the government of the State of Rio de Janeiro declared 90 km² as an area slated for industrial development, and carried out by the EBX Group and the Industrial Development Company of the State of Rio de Janeiro (CODIN). This expropriation

of land resulted in intense agrarian conflict, as the forced removal of hundreds of family farmers was marked by violence, the use of police authority, illegality and the failure to deliver the financial compensation required for the affected social group (MONIÉ, 2016).

Various companies employing about four thousand workers are active in the Industrial Port Zone (IPZ) of the Açú Port. The port

complex consists of various large facilities, such as two terminals (TX1 and TX2), an area of 90 km² adjacent to the port, breakwaters, an onshore navigation channel and several hydraulic landfills in which dredged sea sediment was deposited for the construction of the navigation channel, including along the shores of Iquipari Lagoon (Figure 2).

Figure 2 – The Açú Port facilities: A (terminals TX1 and TX2), B (breakwater at TX2), C (companies installed along the navigation channel), D (hydraulic landfill built near the restinga area).



Source: Prefeitura Municipal de São João da Barra (2019).

The present study made use of a “mixed methods” experimental design that integrates qualitative and quantitative data to obtain a greater understanding of the investigated problem (JICK, 1979). According to Volpato (2013), while qualitative research enables a deeper understanding of social phenomena through the acquisition of data from questionnaires and/or interviews, quantitative research collects information that is quantifiable and requires the use of statistical methods and techniques. These, therefore, are distinct approaches that can complement each other and contribute to a better understanding of a given phenomenon.

Interviews with family farmers were conducted between May and August 2019 in Água Preta and Mato Escuro. A standardized questionnaire containing closed questions (in which the respondent had to choose between the alternatives offered) and open questions (which allowed the respondent to freely answer the questions) was applied synchronously, which ensured that the same questionnaire was applied to all participants in the sample,

allowing the comparison of information obtained from family farmers with data available in the literature (GOLDENBERG, 1999). The data collection process was initiated with the help of key informants (initially expropriated farmers who still resided in the Fifth District), who allowed the first family farmers to be identified, and the recruitment of the remaining farmers enrolled in the study was performed by applying the snowball technique.

Three criteria were established for the selection of farmers who would participate in the sample: (i) being a family farmer; (ii) having agriculture as a primary economic activity; and (iii) practicing agriculture and animal raising in the Fifth District. A minimum number of farmers to be interviewed was not initially established. However, as the visits were randomly held in homes and properties at the two previously mentioned locations, the sampling grid gradually declined to the point where no farmer fit the established criteria or was willing to participate in the survey. Nevertheless, because studies on the

perception and behavior of social groups have reported that sample sizes of 30 to 60 participants are sufficient to meet research objectives and conduct the analysis and interpretation of results, the 105 interviews performed in the present study was considered sufficient. Above this value, a saturation process characterized by a repetition of collected information that does not provide additional insight into the phenomenon studied would have occurred (BERNARD, 2000; MASON, 2010).

All the information collected from the questionnaires was organized in a database and separated into categories according to the sections into which the instrument was divided. Data were processed and analyzed using descriptive statistics of central tendency. Closed questions (objective) were treated quantitatively (simple frequency analysis), while open questions (descriptive or subjective) were treated qualitatively after being grouped into response categories. The questions that had more than one answer by the interviewees were analyzed by the relative frequency of occurrence (%) of each of the items mentioned.

RESULTS AND DISCUSSION

A total of 105 family farmers were interviewed, and the distribution between the two studied locations was 65 in Água Preta and 40 in Mato Escuro. Males were predominant, representing 84% and 92% of interviewees, respectively. The demographic profile of respondents was similar in both areas. In Água Preta, 95% of the farmers were born in São João da Barra, with a time of residence at this location ranging from 4 to 92 years. 77% of them were married, there was an average age of 48 years and respondents had a low level of education, with only two farmers having completed high school. Regarding the time living at this location, 62% of men and 80% of women had lived in Água Preta for more than 40 years. Similar results were obtained for Mato Escuro, as all the interviewees were from São João da Barra, there was an average age of 53 years, 83% had not completed elementary school and the majority had lived at the location for more than 40 years.

This demographic profile is similar to that described in studies carried out in the same region (PIRES 2009, ALVARENGA, 2013, BURLA et al., 2015, PAES and ZAPPES, 2016). According to Oliveira et al. (2019), gender

inequality and low levels of schooling are common social characteristics among family farmers. According to those authors, the subordination of women in the countryside and prejudice against them in rural areas related to multigenerational cultural patterns have been decreasing, and women are beginning to assume leadership roles in family farming, not only as active laborers, but also as caretakers of the environment stemming from social, political, cultural and economic convictions. For Tedesco (2001), low levels of schooling make socialization difficult for rural populations whose main form of socio-economic survival is agriculture. In addition, a low level of education tends to interfere negatively in the capacity for social reproduction and self-organization, as well as reducing the number of farmers organized in class associations and unions, which tends to reduce their ability to participate in the political process. However, the interviewees' low level of education and family income were not factors that influenced their perceptions. And although the collected sample indicates the presence of young people in rural economic activities, the low number of young farmers working at both locations may indicate that the process of generational succession in local family farming is taking place at a sub-replacement level. Spanevello (2008) points to two main reasons for this to occur: (i) a perceived lack of career growth opportunity among farm family children for future agricultural-livestock activities, resulting in a growing rural exodus; and (ii) a level and range of economic and social conditions offered by the farmers that fail to offer their children, mostly men, a compelling reason for choosing the activity.

One of the most significant outcomes of the implementation of the Açú Port for the farmers residing in its immediate surroundings was the land expropriation process commanded by CODIN. In this regard, the results show that 51% of the interviewed farmers from Água Preta and 30% from Mato Escuro had land expropriated by CODIN. These expropriations took place between 2009 and 2018, with 45% of the cases taking place between 2010 and 2011 in Água Preta, and 50% during the same period in Mato Escuro. In both locations, properties had an average of 11 ha, while the expropriated area sizes ranged from 0.05 ha to 155 ha.

In Água Preta, in addition to a greater number of expropriations, the expropriated properties were larger (7.16 ± 8.35 ha) than those located in Mato Escuro (5.11 ± 5.22 ha). Of the 45 farmers who had their land

expropriated in Água Preta and Mato Escuro, none were previously informed or notified by CODIN that their lands would be expropriated. In both locations, all the farmers who were expropriated said that they wanted to have continued possession of their land and that they did not want to sell or lose their land or be removed.

Over the last 15 years, São João da Barra has been experiencing a marked process of territorial reorganization. This reorganization was influenced by public and private interests and financed by national and international capital with the clear objective of making the Açu Port the epicenter of regional economic development and provided justification for the processes of expropriation and environmental alteration caused by the mega-project. For Pedlowski (2017), notwithstanding the official discourse, the controllers of the Açu Port never aimed to meet the collective interest of the communities affected by the project. Instead, what happened was an explicit effort to exclude traditional inhabitants from accessing natural resources and from using and occupying the land, and impeding the adoption of an efficient development model that would inevitably

generate conflict among the territory's social actors.

Agricultural and livestock activities were the main sources of income for the interviewees before the expropriations, and they continue to be so today. Before the expropriations in Água Preta and Mato Escuro, 78% of farmers depended exclusively on the income obtained from their plantations and animal production for their livelihoods. Currently, these values are 83% and 80%, respectively. Before the expropriations, the income of the interviewed farmers was higher. In Água Preta, 66% of the farmers had an average monthly income of up to one minimum wage, and in Mato Escuro 60% of the interviewees claimed to earn the same income. After the expropriations, there was a decrease in the economic income of the interviewees, as 69% and 65% of the farmers had an average income of up to one salary in Água Preta and Mato Escuro, respectively. However, the results indicate that most farmers in Mato Escuro believe that the Açu Port brought more positive outcomes (e.g. job opportunities in port activities and improvements to their lives, more money for the municipality) than negative ones (Table 1).

Table 1 - Água Preta and Mato Escuro Farmer's opinions on the benefits and disadvantages brought about by the Açu Port for the Fifth District and family farming.

Category		Classes	Água Preta	Mato Escuro
BENEFITS	Fifth District	More jobs	59%	42%
		More urbanization	10%	24%
		More development	14%	12%
		Real estate valuation	7%	15%
		Greater environmental protection	7%	3%
		More schools and better education	3%	3%
		Total	100%	100%
	Family farming	More investment in agriculture	33%	20%
		Improvement in life quality	33%	20%
		Increase in income	17%	20%
		Increase in agricultural production	17%	20%
		Total	100%	100%
DISADVANTAGE	Fifth District	Land expropriation	25%	15%
		Increase in violence	19%	20%
		Worsening health of residents	17%	12%
		Lack of investment in the region	14%	18%
		Lack or loss of job	10%	10%
		Worsening quality of public health	8%	7%
		Environmental pollution	1%	10%
		Difficulty fishing in Iquipari	4%	6%
		Car and people traffic rise	2%	2%

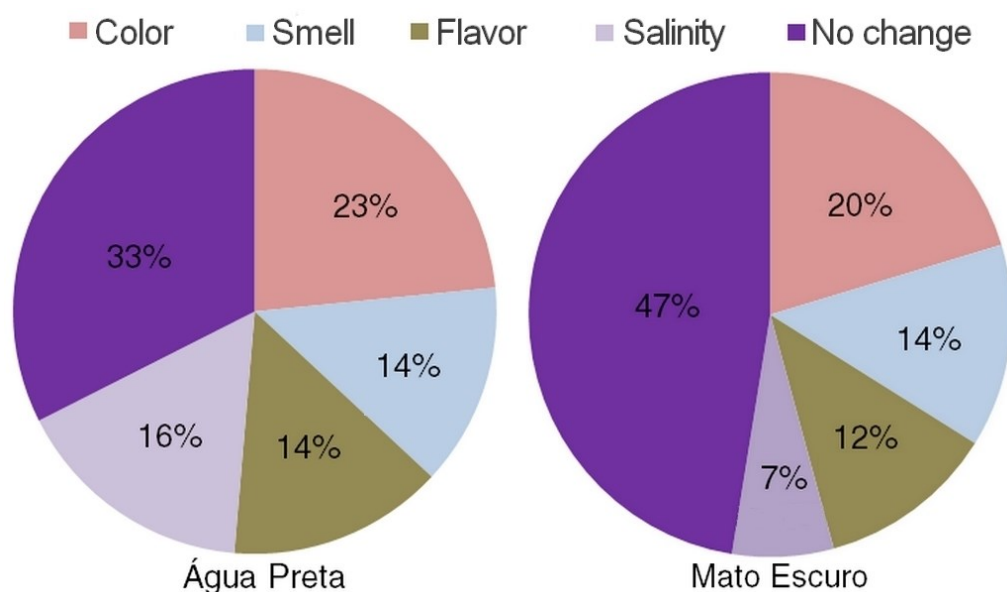
Family farming	Total	100%	100%
	Reduction of income	23%	25%
	Decrease in sales	16%	19%
	Decrease in harvest	19%	14%
	Worsening in life quality	19%	14%
	Less investment in agriculture	10%	19%
	Land loss	13%	9%
	Total	100%	100%

Source: The authors (2021).

With respect to the environmental changes potentially caused by the implementation of the Açu Port, an alteration in water quality was number one, since 45% of the farmers in Água Preta and 30% in Mato Escuro pointed to the occurrence of changes in the quality of water obtained from their drilled groundwater wells.

The main changes reported were related to color, which became more yellowish or rust-colored, as well as to alterations in smell and taste, since before it had been possible to drink and consume this water (Figure 3).

Figure 3 - Principal changes in the quality of farmers' well water in Água Preta and Mato Escuro after the implementation of the Açu Port.



Source: The authors (2021).

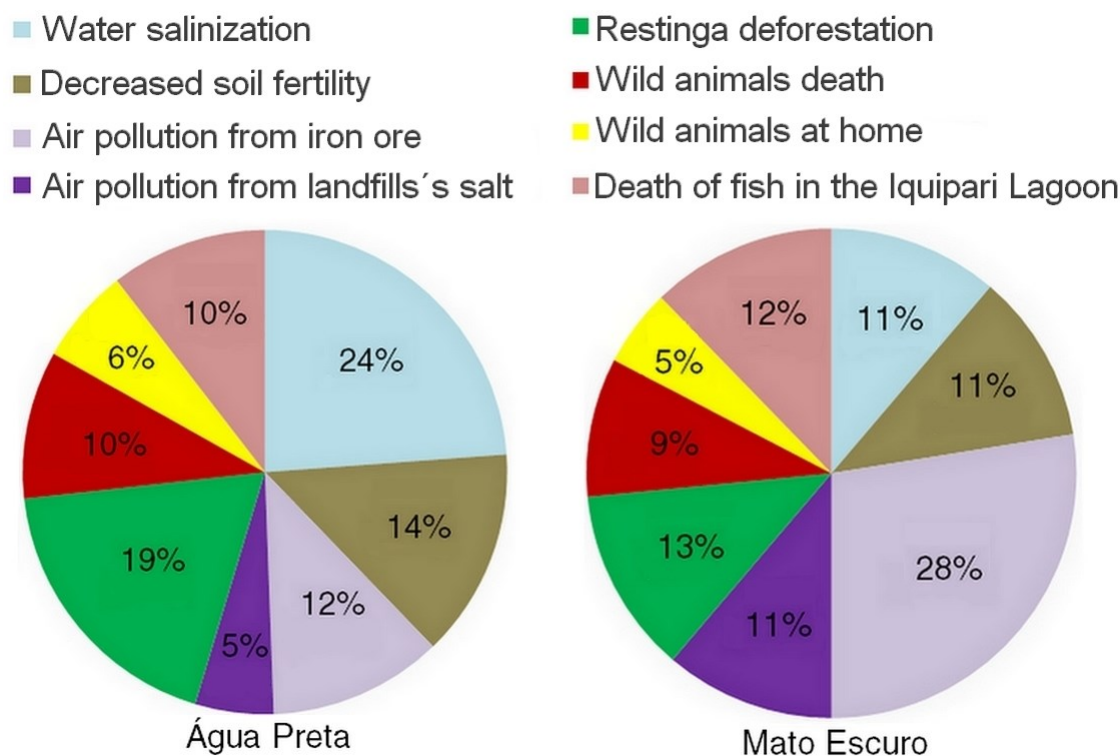
With the arrival of the Açu Port, 92% of the farmers in Água Preta and 88% in Mato Escuro blame this project for the loss of their land and increases in violence. When asked about the future of family farming in the Fifth District, 48% of farmers in Água Preta and 33% of those in Mato Escuro predicted that the activity would become unfeasible. In addition, in Água Preta, 65% of farmers stated that the negative changes (e.g. loss of land, environmental impact, increase in violence) brought about by the implementation of the Açu Port will not be reversed in the future. In Mato Escuro, 58% believe they will be.

Among the farmers interviewed in Água Preta and Mato Escuro, 94% and 93%, respectively, believe that the Açu Pot has not brought improvements in environmental conservation. Only four farmers from Água Preta and three from Mato Escuro reported an improvement in environmental conservation after the implementation of the Açu Port, all citing reforestation in the Reserva Particular do Patrimônio Natural – RPPN Fazenda Caruara (conservation unit), created in 2012 by the Açu Port, which contains 3,844.73 ha and whose location is adjacent to the Third, Fourth and Fifth Districts. In Água Preta, for 24% of

the farmers, there was environmental impact related to the saline contamination of groundwater wells and the Quitungute Channel used for irrigation. For 19%, there was deforestation of vegetation, and for 14% there was a loss of soil fertility. Meanwhile, in Mato Escuro, the increase in air pollution from the emission of iron ore dust and the presence of wild animals in their homes was cited by 28%

and 5% of the farmers, respectively (Figure 4). It is noteworthy that despite the distance from the seabed dredged landfills, farmers from both locations reported that the salt contained in the sands used to comprise the landfills is transported by winds to their plantations, resulting in alterations ranging from morphological changes to total crop loss.

Figure 4 – Farmers' views on local environmental impacts.



Source: The authors (2021).

As with several other mega-projects of different industrial sectors (e.g. mining, hydroelectric, oil), the negative impacts of port megastructures are inherent to their construction and operational processes. However, these can be avoided, minimized and/or even eradicated as long as there is: (i) commitment to the elaboration of high-quality environmental studies; (ii) a search for low-impact alternative solutions, irrespective of cost; (iii) compliance with all the conditions imposed by environmental agencies; (iv) transparency of information regarding operational processes and resulting impacts; (v) investment in monitoring actions and effective socio-environmental projects; and (vi) dialog with and respect for traditional communities in the surrounding areas that will be affected. This was not the case with the Açu Port and probably will continue not to be the case, as there have been no signs of a change in the

position of the facility's national and international planners and financiers. Palma et al. (2018) also found this change of opinion and dissatisfaction of the citizens about the Açu Port in reference to the environmental, health, safety and employment sectors.

FINAL CONSIDERATIONS

Mega-projects installed in Brazil have had a similar narrative, from initially generating expectations and hope in the local population (e.g. job offers, income increases) to later causing greater socio-economic and environmental damage than the benefits that materialized throughout their planning, installation and operational phases. In the case of the Açu Port, this is the prevailing scenario, since at the same time that it stifled negative

media coverage (e.g. land expropriated from family farmers, the salinization of freshwater that farmers use to irrigate their plantations) and the area surrounding the project remains in a situation of vulnerability with little chance for development in the short or long terms, it has proved a source of profits for the public and private sectors.

Thus, the perception of the majority of farmers who live in the areas adjacent to the Açú Port that this mega-project, which ended up becoming an enclave controlled by large multinational companies, brought more disadvantages than benefits to both the Fifth District and family farming should come as no surprise. In particular, this perception relates mainly to the degradation of the environment, the expropriation of land and the reduction in the quality of life and demonstrates that farmers have a clear-eyed view of the socio-environmental and economic problems they have faced since the arrival of this mega-project. It is important to note that there is a certain difference in assessment between the two studied locations, because in Água Preta farmers had a more pessimistic view of the Açú Port, probably due to the fact that most of the expropriations carried out by the government of Rio de Janeiro were located within its area of influence.

The current expansion of the port and commercial and industrial activities in the Fifth District are significantly affecting the community of family farmers as follows: (i) negative socio-environmental and economic impacts, many of which could have been minimized, mitigated and even avoided; (ii) lack of regulation, inspection and punishment by the government regarding the illegal and violent process of land expropriations; (iii) asymmetry of power and conflicting political and economic interests between the State, private companies and the São João da Barra population regarding the appropriation of local natural resources and use of the territory; (iv) dominance of individual interests to the detriment of the collective interest; and (v) unfulfilled promises of regional economic development resulting from the establishment of the Açú Port.

Finally, a highly relevant aspect revealed by the results of the present work relates to the development and planning model adopted by the controllers of the Açú Port, insofar as it generated risks and impacts that have threatened the sustainability of both local farm families, as well as areas of high ecological relevance in need of better preservation. This

result shows the existence of a clear imbalance regarding the priorities given to the economic development process, culminating in negative outcomes for the traditional inhabitants of the Fifth District as well as the ecological carrying capacity of the natural ecosystems on which it has depended to ensure its social reproduction.

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AUTHORS' CONTRIBUTION

José Luiz Pontes da Silva Júnior conceived the study, collected, texted the data and wrote it. Marcos Antonio Pedlowski analyzed the data and wrote the text.



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