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## ZABUMBÃO DAM: HYDRIC POTENTIAL FROM THE PERSPECTIVE OF ENVIRONMENTAL IMPACTS AND WATER MANAGEMENT

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### ABSTRACT

Water is essential for the maintenance of life on the planet because it is responsible for human and animal survival and the conservation of biodiversity. Its presence or absence describes the historical trajectory of peoples, the occupation of territories, determines habits, cultures, and the future of generations. This article sought to investigate the hydric potential of the Zabumbão dam from the perspective of socio-environmental impacts and water management in the Paramirim-BA region. The present study was carried out based on theoretical and empirical contributions, through a review of systemic literature on websites, documents, such as the National Plan of Water Resources – (Act no. 9433/1997), as well as an on-site visit. Thus, it is understood as a priority to define the functionality of water resources management in the cities supplied by the Zabumbão dam, in addition to public policies that contemplate the rational use of water in the region. This measure ensures the multiple applications in a sustainable way, in addition to the insertion of inspection measures by the competent agencies. In the absence of urgent measures or technical studies by the constituted powers to minimize the problems hereinabove mentioned, the Zabumbão dam takes the risk of compromising the object for which the dam was conceived: human supply, irrigated agriculture, and animal quench.

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### INTRODUCTION

The history of the Municipality of Paramirim occurred because of the colonization and exploitation of the mines of the Contas River; when Brazilians and Portuguese, following the banks of the Brumado River, managed to reach the gold mines of Morro do Fogo, near the Paramirim Valley. The name Paramirim was derived from State Act no. 736, of June 26, 1909, which means "small river" in the Tupi-Guarani language (IBGE, 2019). The economic development of the Municipality of Paramirim has always been associated with water resources, contributing to the generation of employment and activities connected to the use of its waters in subsistence agriculture, irrigation, animal quench, and human supply carried out by Bahia Water and Sanitation Company – EMBASA (CBHSF, 2019). Even though Brazil is considered the country of waters, the intensive use of these resources has caused its scarcity. The General Assembly of the United Nations proclaimed the decade 2018-2028 as the *International Decade for Action: Water for Sustainable Development*, emphasizing sustainable

development and the integrated management of water resources, crucial to achieving social, economic and environmental objectives. The focus is on the implementation of "ensuring the availability and sustainable management of water and sanitation for all" (UN, 2019). In this dimension, the correct management of natural resources is required so that it can lead to the reflection of socio-environmental policies that have to do with rights and guarantees. Social practices are factors that cause changes (positive or negative) in the quality of the environment (Berté, 2009). This study sought to investigate the historical context and water potential of the Zabumbão dam, within the perspective of environmental impacts and water management in Paramirim and region.

### MATERIAL AND METHODS

The Municipality of Paramirim is located in the Central South region of Bahia, and the so-called "Drought Polygon" fully covers its territory. It is located in the southwest part of the State of Bahia.

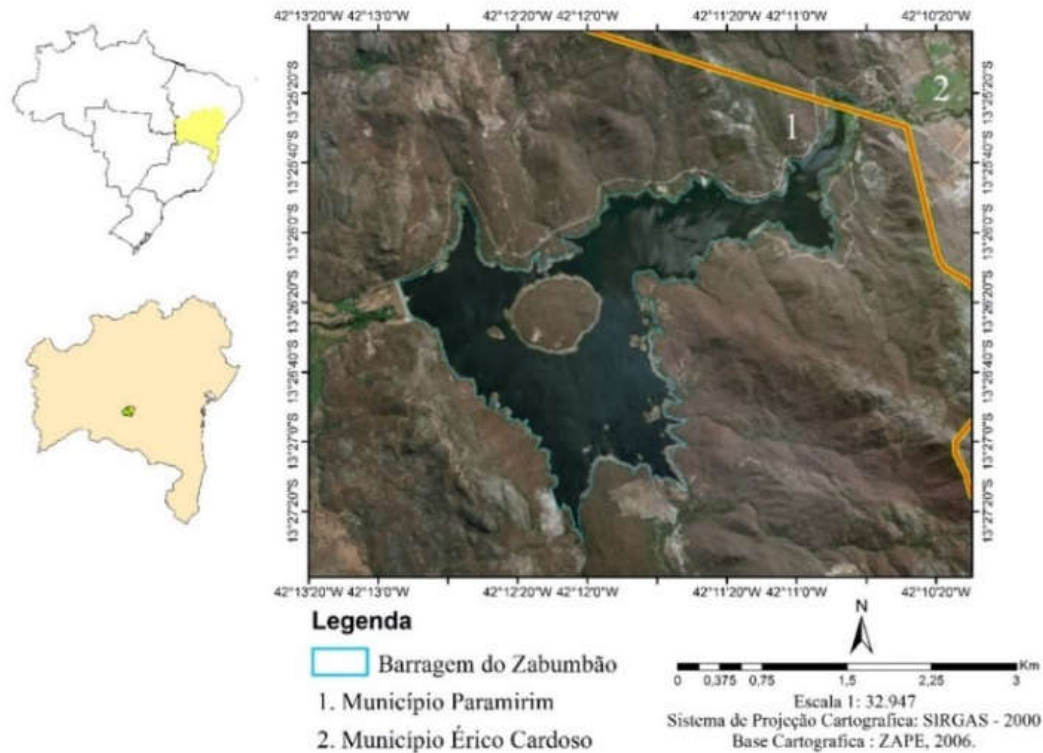


Figure 1. Location of the Zabumbão Dam (Google Earth, 2019)

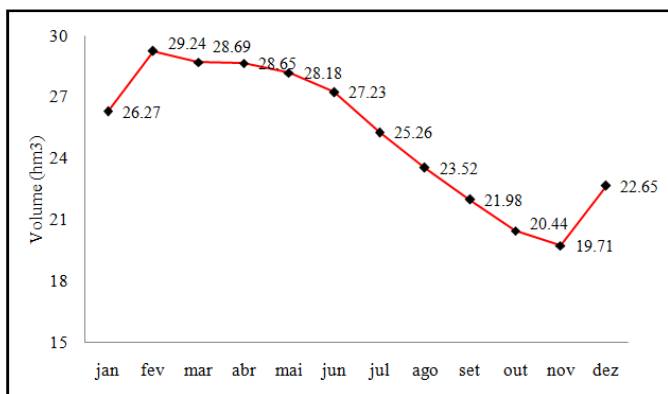
It is part of the São Francisco River watershed, being the Paramirim River, one of the largest and most important tributaries on the right bank of this River (IBGE, 2019). The Paramirim River originates in mountain ranges located in the municipalities of Érico Cardoso, Caturama and Paramirim (Figure 1), including Serra das Almas, considered a region of relevant ecological interest for sheltering mammal species, birds, reptiles and amphibian (CBHSF, 2019). The development of this deductive approach study is based on secondary data, using as research technique the indirect sources such as bibliographical and documentary from the National Plan for Water Resources, established through the Act no. 9433/1997. Readings of the minutes of the Paramirim and Santo Onofre River Hydrographic Basin Committee (CHBPASO) were also carried out in addition to searches in official sites, such as the National Water Agency – ANA, and the São Francisco River Hydrographic Basin Committee – CBHSF. The consultations to newspapers have been made in the databases of Google Scholar; Scielo published from 2010 to 2019. For better understanding, visits have been made to detect the study area to gather impressions and update information on the Zabumbão dam.

## RESULTS AND DISCUSSION

The Zabumbão Dam was built on the Paramirim River in the 90s by the Development Company of the São Francisco and Parnaíba River's Valley – CODEVASF. Its operation began in 1998, with an accumulation volume of 60.85 hm<sup>3</sup>, dead volume of 5.0 hm<sup>3</sup> and drains a basin of approximately 100 km<sup>2</sup>, regulating a flow of 1.28 m<sup>3</sup>/s (CBHSF, 2019). Based on the history of the dam, it can be considered that the primary or most important conflict in Zabumbão, mainly involving the residents of Paramirim, was the proposal for the construction of a water pipeline supply by the Government of the State of Bahia, in the context of the clash between the different economic interests and conflicts generated by the power

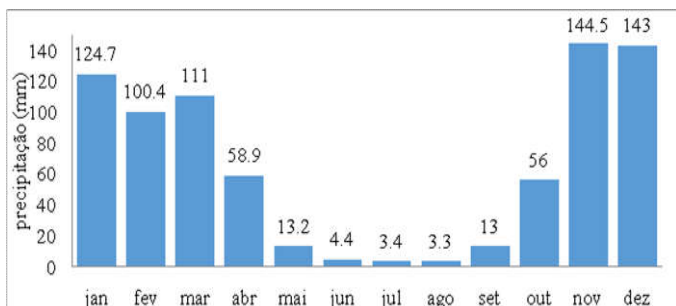
relations that permeate the multiple forms of water appropriation (ROSSI AND SANTOS, 2018). In January 2015, the State Government requested the Secretariat of Institutional Relations (SERIN) to resume studies of the Zabumbão integrated system. In the government's proposal, the pipeline would supply the cities of Rio do Pires, Macaúbas, Ibipitanga, and Boquira, in addition to the cities already served (Paramirim, Tanque Novo, Botuporã and Caturama) (CBHPASO, 2019). According to documents presented in the request for the opening of the conflict, the maximum storage capacity of the Zabumbão dam is 610.32 mh<sup>3</sup>, with a minimum quota of 15.0 mh<sup>3</sup>. At the opening of the water use conflict process, CBHPASO presents an opinion from the National Water Agency (ANA), and it is stated that the minimum quota to supply the population of approximately one hundred and fifty thousand inhabitants, and the minimum storage capacity of the dam would increase from 15.0 mh<sup>3</sup> to 40.0 m<sup>3</sup>. In Figure 2, it can be observed that the average volume of water accumulated over the years between 2013 and 2017, taking as reference the last evaluation of the month, is below the proposed. From the data, it is observed that in the history of storage capacity in the period, there is a downward line in the accumulation of water between May and October, a period in which the supply system could collapse, considering only the human supply. Besides, economic impacts should be considered, especially on the irrigated area (according to documents attached by CBHPASO to the process, there are 800 hectares under irrigation with subsistence agriculture) (CBHRSF, 2019). Conflict of Use Resolution Procedure no. 002/2015. The construction of the pipeline (Zabumbão) in the Paramirim River basin based on article 38, item II, of Law no. 9433/1994, which gives the Basin Committee the power to assign in the first administrative instance the establishment of possible conflicts to which they are alleged for the following reasons: the annual water quota of 662.2 m, corresponding to volume 31.967,000m<sup>3</sup>, the ANA with technical data stipulates a new alert quota if it serves these new municipalities, which

could harm family subsistence agriculture and how the prospect of rainfall is unreliable (CBHRSF, 2019).



**Figure 2. The average volume of water accumulated at the Zabumbão Dam (2013/2018). Data compiled from the National Water Agency**

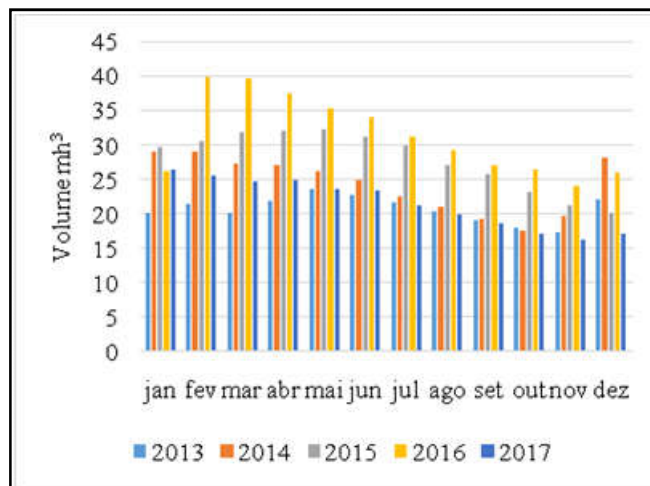
With the drought of recent years in the Northeast, attention should be redoubled, because the lack of constant rainfall compromises the situation of the reservoir and mainly because there is no strategic planning to guide the population on the risk of collapse in supply if the rains do not increase the water reserve of the dam. The average monthly rainfall of the Paramirim River basin characterizes two seasons: the rainy season and the dry season. The lowest precipitation occurs between May and September (rainfall less than 15 mm) and the highest in the months from September to April, with the highest concentrations in the months from November to January, with rainfall rates greater than 100 mm (Figure 3).



**Figure 3. Average monthly rainfall of the Paramirim River basin - BA, compiled by Rodrigues and Santos (2012)**

Knowing the behavior of precipitation makes it possible to analyze the implications of the conditions presented in a given area and subsidizes the planning of actions, mainly by the public authorities, in the regions that show water deficit, as is the case in the Northeast of Brazil. This characteristic is essential for the population living in the area covered by the basin, since, in this period; there is a recharge of the affluent rivers of the Paramirim River and of itself. It is also essential for the practice of “rainfed” type agriculture, which takes advantage of the rainy regime for the development of agriculture, without the use of irrigation and focused mainly on the subsistence of families living in the basin area (RODRIGUES AND SOUZA, 2012). Figure 4 shows the volume of water accumulated over the years between 2013 and 2017, taking as reference the last evaluation of the months. Thus, there is an oscillation in water reserves in the period - less than 40.0 mh3. In the same figure, it is observed that even in 2016, when there is more considerable accumulation of

water in the period, it did not reach the minimum quota expected to supply the municipalities proposed in the new Zabumbão pipeline, which would compromise the water supply of the population foreseen in the proposal of the Zabumbão pipeline company. Although there are many speculations regarding the supply of the Zabumbão pipeline, it is known that one of the aggravating factors is irrigation by flow, which generates waste of water. In a situation of water scarcity, especially in adequate quantity standards, it is essential to have a management of this resource to take care of its appropriation.



**Figure 4. Average monthly volume of water accumulated in the years 2013 to 2017, at the Zabumbão dam, Parnamirim BA. Data compiled from the National Water Agency**

However, the use of water in Brazil, and especially in dams in the semi-arid region, has generated controversy concerning the principles of the Water Resources Policy, since the use of such a useful and scarce natural resource involves the different regional availability, water management, and environmental contamination. In addition to low rainfall, high evaporation, and irrigation utilizing inferior efficiency methods, sewage discharged directly into reservoirs or springs that supply them, thus compromising the quality of water. Based on the assumption that water is widespread and indispensable to all, it is seen as necessary to co-participate and engage concerning the care of natural resources. Therefore, the primacy of nature must be a reflection of moral and ethical values. Consequently, the human being needs to be aware that his behavior and actions can generate impacts on society and the environment.

**Conclusions**

The Zabumbão dam contributes to the supply and growth of the region. However, it is necessary to implement public policies aimed at prioritizing water management, water security, environmental preservation, and natural resources. Measures are needed to mitigate environmental impacts and the operability of water resources. It is necessary to ensure the multiple uses of water-based on rational and sustainable management. However, to achieve a new conception of anthropic relations, the empowerment of the population involved must occur. This fact requires changes in attitudes based on interest in socio-environmental issues.

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