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Regionalization and indicators of basic sanitation services in Alto Piranhas: an analysis of the transition to the new legal framework

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ABSTRACT

This research presents the systematization of the regional indicators of Alto Piranhas, by comparing the indices of the municipalities that belong to the Metropolitan Area around the city of Sousa, in the state of Paraíba, Brazil, with a focus on the transition to the new legal framework. Methodologically, this study is a document research. For quantitative indicators of water supply and sewage in the municipalities that belong to the Metropolitan Area of the city of Sousa, searches were conducted in five databases: the National Information System on Sanitation (SNIS, *Sistema Nacional de Informações sobre Saneamento*, in Portuguese), the Getúlio Vargas Foundation (FGV-DATASAN, *Fundação Getúlio Vargas*, in Portuguese), the Brazilian Institute of Geography and Statistics (IBGE, *Instituto Brasileiro de Geografia e Estatística*, in Portuguese), the National Forum of Metropolitan Entities (FNEM, *Fórum Nacional de Entidades Metropolitanas*, in Portuguese), and the Brazil Sanitation Panel (*Painel Saneamento Brasil*, in Portuguese) of the Trata Brasil Institute (*Instituto Trata Brasil*, in Portuguese). The results showed that CAGEPA is the public agency for basic sanitation in the cities of Aparecida, Nazarezinho, Santa Cruz, São Francisco, São José da Lagoa Tapada, Marizópolis, Lastro, and Vieirópolis; it is responsible for planning, executing and operating basic sanitation services, which includes collecting, adducting, treating and distributing water plus collecting, treating and finally disposing of sewage. In the case of DAESA, the study identified organizational and structural issues regarding the availability of data on basic sanitation in the city of Sousa, which hinders an in-depth analysis of that municipality's supply profile. This considered, we concluded that having access to the indicators of basic sanitation services in the Metropolitan Area of Sousa leads to setting more objective goals towards optimizing the sanitation services in the region.

KEYWORDS: Water supply. Sewage. New Legal Framework for Basic Sanitation.

1 INTRODUCTION

In Brazilian Public Administration, the strategic, tactical and operational management of processes relies on the legislation. In a broad sense, legal provisions play a functional role and authorize or veto actions and policies of national, regional or local governments. Loureiro (2009) mentions the *autarquias*[1] responsible for providing services related to water supply and sewage, such as: the Autonomous Water and Sewage Services (Saae, *Serviços Autônomos de Água e Esgoto*, in Portuguese), which can be called Superintendencies of Water and Sewage (SAE, *Superintendências de Água e Esgoto*, in Portuguese), and Municipal Water and Sewage Services (Semae, *Serviços Municipais de Água e Esgoto*, in Portuguese). These *autarquias* have legal, administrative and financial autonomy and they are responsible for all activities related to the administration, operation, maintenance and expansion of water and sewage services.

Then, the New Legal Framework for Basic Sanitation is set to universalize and improve the provision of services in this field. According to Valadão and Neves-Silva (2022), Brazil is still far from achieving the universalization of water supply and sanitation services. Recent data show that in Brazil 86% of households have access to safe water, 13.5% have basic access while 0.5% still have unsafe access. Meanwhile, only 48.7% of households have safe access to sewage, 41% have basic access, 10% have unsafe access while 0.3% defecate in the open. This shows the importance of expanding such services as soon as possible since the poor service offer is directly

[1] According to Article 4 of Decree Law no 200/1967, Brazil's Federal Administration may rely on Direct Administration, represented by the services bound to the administrative structure of the Presidency of the Republic and the Ministries, and; Indirect Administration, which includes entities with their own legal personality, among which are the *autarquias.* Item I of Article 5 defines *autarquia* as an autonomous service, created by law, with its own legal personality and own assets and revenue set up to provide typical Public Administration activities, which require, for its best functioning, decentralized administrative and financial management. The original term in Portuguese will be used throughout this text.

and indirectly responsible for thousands of deaths and hospitalizations every year. In this scenario and with the argument of achieving universal access more quickly, the new legal framework for sanitation Law 14.026/2020 (BRASIL, 2020) was sanctioned in July 2020 to encourage the entry of private capital into the sector.

The concern with the scarcity of fresh water becomes the objective of numerous discussions and considerations. Silva *et al.* (2018) explain that it is necessary to establish joint and integrated actions, public policies regarding territorial management, planning, and control that act to guarantee that fresh water is available in appropriate conditions for both the present and future generations.

Souza and Pertel (2020) explain that choosing a particular river basin as a planning unit leads to areas that must be appropriate for the application of the legislation. By selecting one river basin, it is possible to compare what is available and the existing demands, which is essential for achieving water balance. Then, organizing the structure of water resources in Brazil will only be viable with the effective participation of the Government, clients and communities, that is, of the actors directly involved and interested in water management (RIBEIRO; REZENDE, 2022).

Silva et al. (2019) highlight that Brazil's Northeast region is the most arid in the country; about 30% of Brazil's population live in that region with only 5% of the fresh water available in the country. High population density, pollution, agriculture, industry, and deforestation lead to a decrease in available water and more scarcity. According to Silva et al. (2019), only 33.2% of households in rural areas are connected to water supply networks, of which 29.7% have internal plumbing and 3.6% have no internal plumbing. Most of the rural population (66.8%) collects water from alternative sources, mostly unsuitable for human consumption.

Brazil's Northeast region consists of nine states over an area of 1,554,257 km²; despite what is established by Brazil's 1988 Federal Constitution, more than a third of the Northeastern population has no reliable access to drinking water. In the Draught Polygon (*Polígono das Secas*, in Portuguese), located in the *sertão* area of Brazil's Northeast region, rainfall is extremely irregular, which causes numerous barriers to socioeconomic development and the subsistence of the population (GONZAGA; ALBUQUERQUE JUNIOR; TORRE, 2020; FREIRIA; ARAUJO; PAULA SILVA, 2022).

That said, the metropolitan area of Sousa, located in the *Sertão* area of the state of Paraíba, in Brazil's Northeast region, was defined as the field to be explored in this study, since this territorial area is predominantly affected by semi-arid conditions, very low annual rainfall; in addition, according to IBGE (2021), the chosen area has a fragile hydrography that is insufficient for keeping rivers flowing in long periods of no rain. In the Metropolitan Area of Sousa, the resident population is 117,083 people and the estimated population is 118,110 inhabitants, according to the latest data provided by IBGE (2021).

This shows the importance of a good municipal and regional management, designing and implementing public policies that ensure environmental preservation and good water resources management, especially in the Brazilian semi-arid region, which faces long periods of drought, high temperatures, rugged terrain, partial or total removal of native vegetation for planting, animal husbandry, constructing buildings, roads and dams/inadequate water storage, invasion of permanent preservation areas (APP, initials in Portuguese), which ends up

aggravating the levels of degradation of natural resources, making it impossible to guarantee the necessary means of survival to the population (ARAÚJO; DAMASCENO, 2016; FERREIRA; ARAÚJO DANTAS, 2021).

Then, the research question is the following: What do the regional indicators of Alto Piranhas and of the municipalities that are part of this territory reveal about their adequacy to the objectives of the new legal framework for sanitation?

2 OBJECTIVES

The general objective of this study is to present the systematization of the regional indicators of Alto Piranhas and to compare the indices of the municipalities that belong to the Metropolitan Area of Sousa, state of Paraíba, with a focus on the transition to the new legal framework.

Regarding its specific objectives, this research seeks to understand how the New Legal Framework for Basic Sanitation affects the public supply services of drinking water and how the region intends to meet the universalization deadlines set for December 31, 2033; to identify the scenario related to sewage and waste management, and; to identify the roles of each federated entity operating in the macro-region of Sousa, in relation to the management of the public supply services of drinking water.

3 METHODOLOGY

This study is a document research. For the quantitative indicators of water supply and sewage in the municipalities that belong to the Metropolitan Area around the city of Sousa, we conducted searches in the National Information System on Sanitation (SNIS, *Sistema Nacional de Informações sobre Saneamento*, in Portuguese), the Getúlio Vargas Foundation (FGV-DATASAN, Fundação Getúlio Vargas, in Portuguese), the Brazilian Institute of Geography and Statistics (IBGE, *Instituto Brasileiro de Geografia e Estatística*, in Portuguese), the National Forum of Metropolitan Entities (FNEM, *Fórum Nacional de Entidades Metropolitanas*, in Portuguese), and the Brazil Sanitation Panel (*Painel Saneamento Brasil*, in Portuguese) of the Trata Brasil Institute (*Instituto Trata Brasil*, in Portuguese).

As we proceeded with the document analysis, we surveyed the main events regarding the process of creation and approval of a state law to regionalize sanitation in the state of Paraíba and we accessed the general scenario of CAGEPA, and the laws and decrees responsible for the New Legal Framework for Sanitation. In addition, we learned the way the management of water supply occurs in the state of Paraíba, the Semiarid Region, and Brazil's Northeast region.

4 RESULTS

4.1 Document analysis

As we conducted the document analysis to build scenarios of the Water and Sewage Company of Paraíba (CAGEPA, *Companhia de Água e Esgotos da Paraíba*, in Portuguese) and the

ISSN 1980-0827 – Volume 20, Number 2, Year 2024

Department of Water, Sewage and Environmental Sanitation of Sousa (DAESA, *Departamento de Água, Esgotos e Saneamento Ambiental de Sousa*, in Portuguese), we found that the Department of Water, Sewage and Environmental Sanitation of Sousa does not have a sanitation plan for the city, while the Water and Sewage Company of Paraíba annually issues a Management and Sustainability Report; the 2021 version of the Report was used in this analysis. For this, it is necessary to discuss the preferred alternatives within the universalization model, the Water Universalization Plan by 2033, with a focus on the obstacles to effective universalization and the roles of the Water and Sewage Company of Paraíba (*Companhia de Água e Esgotos da Paraíba*, in Portuguese) and the Department of Water, Sewage and Environmental Sanitation of Sousa (*Departamento de Água, Esgotos e Saneamento Ambiental de Sousa*).

Concerning the characteristics of the Metropolitan Area of Sousa, It is necessary to present an overview of Brazil's Northeast Region and the state of Paraíba, its general population and population with no access to water or sewage, plus total hospitalizations and deaths caused by water-borne diseases.

Table 1 - Sanitation and health indicators panel

	Population	Population with no access to water		Population with no sewage		Hospitalizations due to water-borne contamination	Deaths by water-borne contamination
	Inhabitants	Inhabitants	%	Inhabitants	%	Cases	Cases
Brazil's Northeast Region	57,667,842	14,203,166	25.3%	39,218,474	69.8%	59,002	583
Paraíba	4,059,905	933,080	23.9%	2,388,643	61.1%	2,872	32

Source: Painel Saneamento Brasil (2023).

The Metropolitan Area of Sousa has a resident population of 117,083 people and it consists of nine municipalities: Aparecida, Lastro, Marizópolis, Nazarezinho, Santa Cruz, São Francisco, São José da Lagoa Tapada, Sousa, and Vieirópolis (IBGE, 2021). To better understand this region, next we present the indicators regarding water supply, sewage and solid waste.

Table 2 - Water supply in the Metropolitan Area of Sousa

Cities in the Metropolitan Area of Sousa	Water supply				Source
	Population served with water (inh.)	Urban Area	Rural Area	Population with no water	
Aparecida	5,213	4,020	1,193	3,269	IAS (2020a)
Lastro	4,500	2,000	2,500	920	IAS (2020l)
Marizópolis	6,586	5,805	781	103	IAS (2020m)
Nazarezinho	4,722	3,180	1,542	2,549	IAS (2020n)
Santa Cruz	4,292	3,038	1,254	2,287	IAS (2020c)
São Francisco	1,477	1,368	109	1,900	IAS (2020f)
São José da Lagoa Tapada	3,466	3,340	126	4,156	IAS (2020j)
Vieirópolis	1,020	1,020	0	4,375	IAS (2020v)

Source: prepared by the authors based on data from the Instituto Água e Saneamento IAS (2024).

Specifically on the water supply of the city of Sousa - PB, the data from the Getúlio Vargas Foundation (*Fundação Getúlio Vargas*, in Portuguese) show the percentage of the total population served with water and the urban water service in the municipality. However, figures of the rural area are not available (FGVDATASAN, 2020).

Periódico Eletrônico "Fórum Ambiental da Alta Paulista"
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ISSN 1980-0827 – Volume 20, Number 2, Year 2024

Table 3 - Water supply in the city of Sousa - PB

Municipality	Water supply	
	Total urban water service index	Urban water service index
Sousa	70.7%	93.3%

Source: Adapted from FGVDATASAN (2020).

Regarding sewage in the Metropolitan Area of Sousa, Table 4 presents information on the total population with sewage in the rural and urban areas plus the population with no sewage.

Table 4 - Sewage in the Metropolitan Area of Sousa

Cities in the Metropolitan Area of Sousa	Sewage				Source
	Population served with sewage (inh.)	Urban Area	Rural Area	Population with no sewage	
Aparecida	4,500	2,000	2,500	3,982	IAS (2020a)
Lastro	No information	No information	No information	No information	IAS (2020l)
Marizópolis	No information	No information	No information	No information	IAS (2020m)
Nazarezinho	1,320	1,320	0	5,951	IAS (2020n)
Santa Cruz	3,700	2,410	1,290	2,879	IAS (2020c)
São Francisco	1,000	1,000	0	2,377	IAS (2020f)
São José da Lagoa Tapada	No information	No information	No information	No information	IAS (2020j)
Vieirópolis	No information	No information	No information	No information	IAS (2020v)

Source: prepared by the authors based on data from the Instituto Água e Saneamento IAS (2024).

There was no information available on Sewage in the cities of Lastro, Marizópolis, São José da Lagoa Tapada, and Vieirópolis. With regard to the city of Sousa, the figures referring to sewage are available from the Getúlio Vargas Foundation (*Fundação Getúlio Vargas*, in Portuguese), as can be seen in Table 5.

Table 5 - Sewage in the city of Sousa - PB

Municipality	Sewage		
	Total sewer service index	Sewage treatment index	Sewage collection index
Sousa	28.9%	4.6%	18.4%

Source: Adapted from FGVDATASAN (2020).

According to Pereira and Lima (2022), the structure in operation to collect sewage in the city of Sousa is not enough to meet all municipal demand, consequently, entire districts have no access to sewage. Poor service in districts where there is no sewage collection network causes waste to be released in various ways, for example, septic tanks, in the open, or in ditches, streams, rivers and even the drainage channel that crosses the entire city, however, in an illegal manner. Table 6 shows the information regarding the management of urban solid waste in the Metropolitan Area of Sousa.

ISSN 1980-0827 – Volume 20, Number 2, Year 2024

Table 6 - Urban Solid Waste Management in the Metropolitan Area of Sousa

Cities in the Metropolitan Area of Sousa	Solid Waste				Source
	Population served by household waste collection (inhabitants)	Urban Area	Rural Area	Population with no garbage collection	
Aparecida	4,208	3,989	219	4,274	IAS (2020a)
Lastro	1,268	1,268	0	1,430	IAS (2020l)
Marizópolis	No information	No information	No information	No information	IAS (2020m)
Nazarezinho	3,180	3,180	0	4,091	IAS (2020n)
Santa Cruz	4,569	2,941	1,628	2,010	IAS (2020c)
São Francisco	1,800	1,200	600	1,577	IAS (2020f)
São José da Lagoa Tapada	No information	No information	No information	No information	IAS (2020j)
Sousa	No information	No information	No information	No information	IAS (2020s)
Vieirópolis	1,065	1,065	0	4,330	IAS (2020v)

Source: prepared by the authors based on data from the Instituto Água e Saneamento IAS (2024).

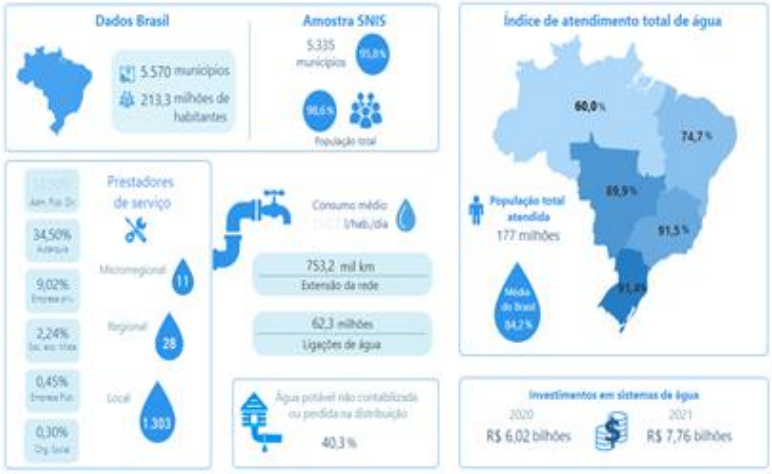
The cities of Marizópolis, São José da Lagoa Tapada, and Sousa did not provide information regarding their Urban Solid Waste Management.

Concerning this discussion, we present the overview of Basic Sanitation in Brazil as of the New Legal Framework, considering the characteristics of Brazil's Northeast region, the Semi-Arid Region, the state of Paraíba, the city of Sousa and the other municipalities in the Metropolitan Area of Sousa.

4.2 Overview of Basic Sanitation as of the New Legal Framework

The Brazilian population is estimated at 213.3 million in 5,570 municipalities; 177 million is the total population served. Regarding the total water service Index, Brazil's Southeast Region serves 91.5% of its population, followed by the South Region serving 91.4%; the Central-East Region serving 89.9; the Northeast region serving 74.7%, while the North Region serves 60.0%, as shown in Figure 1 (SNIS, 2021).

Figure 1 - National Sanitation Information System (*Sistema Nacional de Informação sobre Saneamento*, in Portuguese)



Source: SNIS (2021).

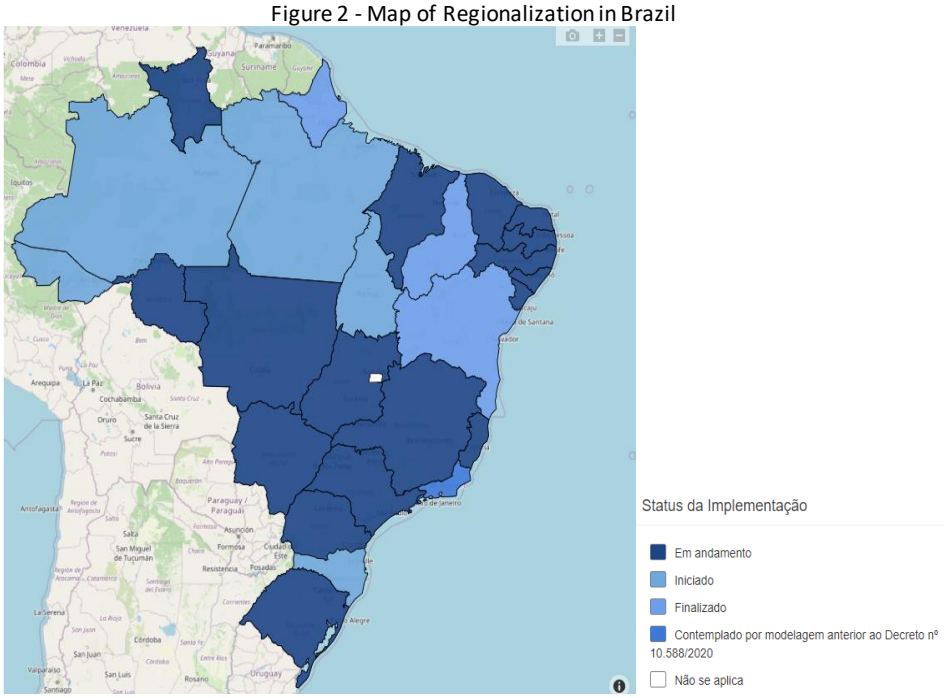
In Brazil, 4,624 municipalities are supplied by isolated systems; a population of approximately 96 million people (52% of the total) is served. Of the total, 2,126 cities use exclusively underground water sources, while 1,707 use only surface sources (ANA, 2021).

4.3 Basic Sanitation in Brazil's Northeast region

The Panel of the Regionalization of Basic Sanitation Services in Brazil (*Painel de Regionalização dos Serviços de Saneamento Básico no Brasil*, in Portuguese) is an initiative of the Ministry of Regional Development (MDR, *Ministério do Desenvolvimento Regional*, in Portuguese), operationalized by the National Sanitation Authority (SNS, *Secretaria Nacional de Saneamento*, in Portuguese), responsible for monitoring the implementation of the New Legal Framework for Sanitation. In this sense, Indicators of Water Supply and Sewage by State and by Sanitation Region are presented (SNIS, 2021).

In the context of Brazil's Northeast Region, the State Capitals, Existing Pipelines, Recommended Infrastructure, Potential Infrastructure upon Complementary Study, *Canal do Trabalhador, Canal do Sertão Alagoano, Eixão das Águas*, *Eixo Leste* – existing, *Eixo Norte* – existing, *Ramal do Agreste*, *Ramal do Piancó* – Planned, *Cinturão das Águas do Ceará*, Hydrography, Water Bodies, Recommended Infrastructure, Potential Infrastructure upon Complementary Study, Infrastructure that Requires Study of Alternatives – New Water Sources, Infrastructure that Requires Study of Alternatives – System Expansion and No Need for Infrastructure.

Figure 2 - Map of Regionalization in Brazil



Source: SNIS (2021).

Regarding the types of operators, 86% of the service is provided by State Companies, 11% by *Autarquias* and 3% by Concessionaires. Most of the sources are Superficial (57%),

ISSN 1980-0827 – Volume 20, Number 2, Year 2024

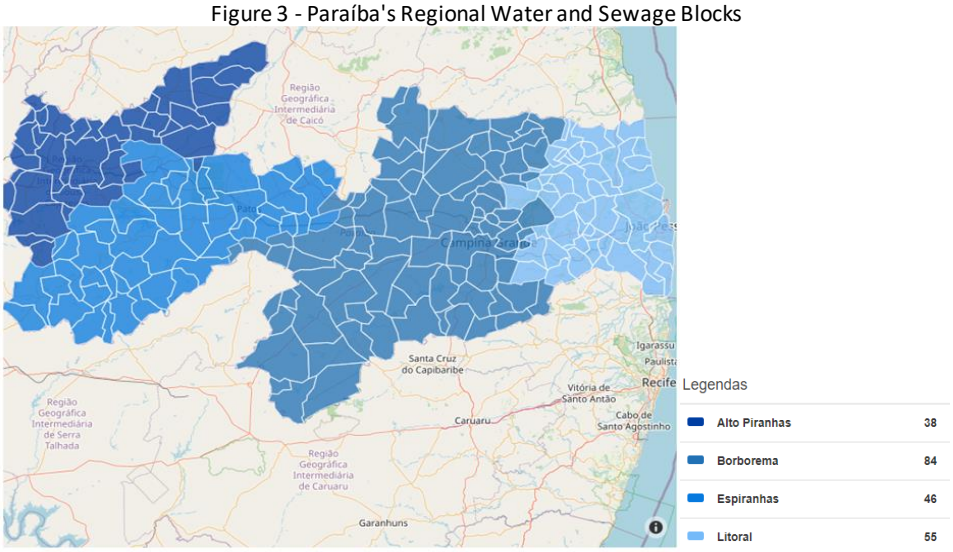
followed by 22% Mixed Sources (predominantly superficial), 18% Underground Sources, and 2.5% Mixed Sources (predominantly underground). The most reported type of system is the Integrated System (56%), while the Isolated system corresponds to 44%. Finally, the coverage of the Distribution System is greater than 97% for 44% of the population; 35% have a distribution coverage between 70% and 89.9%; 9% have a coverage between 90% and 96.9%; 8% have a coverage that ranges from 50% and 69.9%, and 4% have a coverage below 50% (SNIS, 2021).

4.4 Basic sanitation in Paraiba and in the Metropolitan Area of Sousa

The Ministry of National Integration acknowledges that the Semi-arid region of the state of Paraíba covers 170 out of the state's 223 municipalities, which represents 90% of the state territory. The estimated population of the region is 2.1 million people, about 56% of the total population of the state. The municipalities that are part of this area are located in three of the four mesoregions of the state (Sertão, Borborema, and Agreste).

Paraíba is divided into 223 municipalities, with a total population estimated by the SNIS, in 2021, at 4.0 million inhabitants and an Urban Population of around 3.1 million inhabitants; Regionalization was defined by Complementary Law no. 168/2021 and four Regional Water and Sewage Blocks: Alto Piranhas (38 cities, including the Metropolitan Area of Sousa), Borborema (84 cities), Espinharas (46 cities) and Litoral (55 cities) (SNIS, 2021).

Figure 3 - Paraíba's Regional Water and Sewage Blocks



Source: SNIS (2021).

Concerning the Alto Piranhas region, the total water service index is 70.5%; specifically on the municipality of Sousa and the other cities that make up its Metropolitan Area (Aparecida, Lastro, Marizópolis, Nazarezinho, Santa Cruz, São Francisco, São José da Lagoa Tapada, and Vieirópolis), the following information will be presented: population, whether or not the municipalities have a Municipal Plan, the percentage of the population with access to water, sewage and garbage collection, and the percentage of households subject to flooding (IAS, 2020).

ISSN 1980-0827 – Volume 20, Number 2, Year 2024

Figure 4 - Service rates for each Sanitation component

MUNICÍPIO Total de 223 municípios	UF	POPULAÇÃO	POSSUI PLANO MUNICIPAL	POPULAÇÃO SEM ÁGUA	POPULAÇÃO SEM ESGOTO	POPULAÇÃO SEM COLETA DE LIXO	DOMICÍLIOS SUJEITOS À INUNDAÇÕES
Aparecida	PB	8.482	Não	38,54%	46,95%	50,39%	18,7%
Lastro	PB	2.698	Em elaboração	34,1%	--	53%	Não há
Marizópolis	PB	6.689	Sim	1,54%	--	--	--
Santa Cruz	PB	6.579	Não	34,76%	43,76%	30,55%	Não há
São Francisco	PB	3.377	Não	56,26%	70,39%	46,7%	--
São José da Lagoa Tapada	PB	7.622	Sim	54,53%	--	--	1,2%
Sousa	PB	69.997	Não	--	--	--	--
Vieirópolis	PB	5.395	Não	81,09%	--	80,26%	--

Source: Adapted from Instituto de Água e Saneamento (IAS, 2021).

According to the IAS – Water and Sewage Institute (*Instituto de Água e Saneamento*, in Portuguese) (2020a), the city of Aparecida has a population of 8,482 but it does not have a Municipal Plan; 38.54% of the population have no direct access to water, 46.95% have no sewage, 50.39% are not served by garbage collection, while 18.7% of households are subject to flooding. Lastro has 2,698 inhabitants, its Municipal Plan is in preparation, and 34.1% have no direct access to water. The data for sewage were not presented. Fifty-three percent of the population have no garbage collection, and it has been informed that no households are subject to flooding. Marizópolis has 6,689 inhabitants, it has a Municipal Plan, and 1.54% of the population have no access to water; no data on sewage, garbage collection and households subject to flooding were provided.

Santa Cruz has a population of 6,579 people, it has no Municipal Plan, and 34.76% have no direct access to water, while 43.76% have no access to sewage, and there are no households subject to flooding. São Francisco has a population of 3,377, it has no Municipal Plan; 56.26% of the people have no direct access to water, 70.39% have no access to sewage, and 46.7% have no garbage collection. Data on households subject to flooding were not provided. São José da Lagoa Tapada has 7,622 inhabitants, it has a Municipal Plan, and 54.53% have no water. Information regarding sewage and garbage collection was not provided; 1.2% of households are subject to flooding (IAS, 2020c).

Sousa is the largest and major city in its metropolitan area, with a population of 69,997 people; however, the SNIS (where it appears as defaulter) and the Water and Sewage Institute (*Instituto de Água e Saneamento*, in Portuguese) hold no record about its Municipal Plan. Also, there is no information about its population with no water, no sewage, no garbage collection, or households subject to flooding.

In addition, we turned to the Getúlio Vargas Foundation (*Fundação Getúlio Vargas*, in Portuguese) (FGVDATASAN, 2020) to search for information on water supply and sewage in the city of Sousa, and we identified that 70.7% of the population have access to water supply while

ISSN 1980-0827 – Volume 20, Number 2, Year 2024

93.3% of the population in the urban area are served with water supply services. Regarding sewage, only 28.9% of the population are served, while only 4.6% of the sewage is effectively treated.

Vieirópolis has 5,395 inhabitants and it has no Municipal Plan; 81.1% of the population have no direct access to water, 80.3% have no garbage collection, and data on sewage and households subject to flooding were not reported (IAS, 2020v).

To synthesize the general information of the main topics herein analyzed and discussed, Chart 1 below presents a general summary. Our background was the pertinent legislation while the results were the reality we found.

Chart 1 - General Summary

Data processing	Pertinent legislation	Results found in DAESA
Legal Nature	*Autarquia* Law no. 031/2004	Atypical entity; it sometimes acts as an *autarquia*, sometimes as a Department
Sanitation plan	Law no. 11.445/07 Mandatory	Non-existent
Regulatory Agency	Law no. 11.445/07 Mandatory	Non-existent
Administrative and financial autonomy	Law no. 031/2004 Mandatory	Non-existent
Solid Waste Management	Law no. 11.445/07 It is part of the basic sanitation services	Competence was transferred to the State Infrastructure Authority
Charging for services	Law no. 11.445/07 Tariff	Tariff
Social tariff	Law no. 11.445/07 and Law no. 031/2004 Mandatory, price is to be compatible with the economic conditions of the low-income population.	Social tariff, there is no charge, low-income population, water consumption up to 10 m³.
Tariff structure	Law no. 031/2004 Consumer category	According to the legislation
Tariff Raise	Tariff raised at a minimum interval of 12 (twelve) months	No raise since 2009
Average tariff price	In Paraíba, R$2.71 (two Brazilian Reais and seventy-one cents)	R$1.65 (one Brazilian Real and sixty-five cents) m³
Service cut due to non-payment	Federal Decree No. 7.217 of June 2010 Allowed provided that the debtor consumer is previously warned	Municipal legislation does not allow cutting due to non-payment
Sewage	Law no. 11.445/07 Collection and treatment and final disposal	Collecting, dumping into the rainwater drain channel, open air, there is no treatment, dumped directly into the *Rio do Peixe* River
Water rationing	In special situations	Existing
Financial economic balance	Preferably Law no. 11.445/07	Non-existent
Profitability	-	Loss-making

Source: Andrade (2017, p.106-107).

To understand how DAESA was implemented, Oliveira (2015) explains that, until 2006, CAGEPA was responsible for providing water supply and sanitation in the city of Sousa. That is, it

did the water collection, elevation, adduction, treatment, and storage in reservoirs, distribution to consumers, and it was also responsible for the maintenance of water and sewage networks. Therefore, it charged for the services provided. However, in May 2004, the Sousa city administration notified CAGEPA that DAESA had been created by Municipal Law no. 31/2004, which, by decree, would immediately become responsible for exploring water, sewage and sanitation services in that Municipality.

Based on Municipal Law no. 31/2004, DAESA notified CAGEPA; CAGEPA objected to the respective decision, filing Injunction no. 037.2004.005061-1, whose main rationale was the allegation that the municipality had no competence to act; it succeeded at first. The municipality appealed, mainly claiming public health, since it declared that CAGEPA's pipes used asbestos, which has carcinogenic substances; it also indicated CAGEPA's lack of criterion towards universalizing its services, since many districts in the city were not served (SOUSA, 2019).

4.5 Water Supply Management in Paraíba

The Water and Sewage Company of Paraíba (*Companhia de Água e Esgotos da Paraíba*, in Portuguese) is an open-stock private-public company, with authorized capital, operating under State Law no. 3.459 of December 31, 1966, amended by State Law no. 3.702 of December 11, 1972, bound to the State Infrastructure, Water Resources and Environment Authority (SEIRHMA, *Secretaria de Estado da Infraestrutura, dos Recursos Hídricos e do Meio Ambiente*, in Portuguese), with headquarters and forum in the city of João Pessoa, capital of the state of Paraíba. The Company has 200 offices in different cities and another 24 districts or towns across the State of Paraíba, totaling 224 locations served (CAGEPA, 2021).

According to Barreto *et al.* (2021), CAGEPA is responsible for capturing raw water from sources, treating it to ensure that it meets the standards for drinking water required by regulations, and distributing it for the treated water to reach households served by the supply system. As to local providers, sanitation services is under local governance, whether by direct public administration of the City Administration or by an *Autarquia*.

4.5.1. Regionalization of Sanitation in Paraíba as of the New Legal Framework Law no. 14.026/2020 (BRASIL, 2020).

When addressing the Regionalization of Sanitation in Paraíba as of the New Legal Framework, it is relevant to present the results of a survey of the main events in the process of drafting and passing the state law on the regionalization of sanitation, including the hearings, public consultations, the submission of the bill, debates in the State Council, and the date of approval (IAS, 2021).

ISSN 1980-0827 – Volume 20, Number 2, Year 2024

Chart 2 - Timeline of Regionalization of Sanitation in Paraíba

Period	Type of event	Actions taken
April 25, 2021	News	Federal Government announces funding for sanitation works in Paraíba worth R$2.55 million.
April 30, 2021	Public Consultation	Process to discuss the creation of Water and Sewage Microregions in the State of Paraíba is open.
May 18, 2021	Public Hearing	Water and sewage Microregions in Paraíba are created.
May 30, 2021	Draft law	Annex V - Questions Answered, Consultation and Public Hearing
May 30, 2021	Draft law	Annex IV - Technical Study on Regionalization
June 14, 2021	Bill	Draft of the Supplementary Law - Version 2
June 14, 2021	News	News: Social and Economic Development Bank (*Banco de Desenvolvimento Econômico e Social*, in Portuguese) - BNDES will conduct studies to expand sanitation in Paraíba
June 16, 2021	Bill	Complementary bill 31/2021 filed in the Paraíba State Council, which establishes the Water and Sewage Microregions of Alto Piranhas, Espinharas, Borborema, and Litoral and their respective governance structures.
June 17, 2021	Bill	Complementary Bill no. 168/2021 passed; it establishes the Water and Sewage Microregions of Alto Piranhas, Espinharas, Borborema, and Litoral and their respective governance structures, in the state of Paraíba.
June 22, 2021	Promulgation	Complementary Law no. 168/2021 promulgated; it establishes the Water and Sewage Microregions of Alto Piranhas, Espinharas, Borborema, and Litoral and their respective governance structures, in the state of Paraíba.
June 30, 2021	Article	ONDAS-Privaqua | The regionalization of sanitation in Paraíba: democratic and social participation deficit
June 30, 2021	Article	ONDAS-Privaqua | The regionalization of sanitation in Paraíba: contradictions of Complementary Law 168/2021
December 01, 2021	Decree	Decree no. 41.980/2021, establishing the Provisional Internal Regulations of the Litoral Water and Sewage Microregion.
December 01, 2021	Decree	Decree no. 41.981/2021, establishing the Provisional Internal Regulations of the Borborema Water and Sewage Microregion.
December 01, 2021	Decree	Decree no. 41.982/2021, establishing the Provisional Internal Regulations of the Alto Piranhas Water and Sewage Microregion.
December 01, 2021	Decree	Decree no. 41.983/2021, establishing the Provisional Internal Regulations of the Espinharas Water and Sewage Microregion.

Source: Adapted from IAS (2021, n. p.). Prepared by the authors (2024).

The regionalization (regional division) of basic sanitation as a planning instrument towards providing public services is an aspect of territorial management widely debated in the political field and in the scientific literature of Economics, Urban Planning, and Public Management. Then, in one perspective, local actors advocate for regionalization for demands to be met and for both projects and actions to be operationalized in a more efficient way. However, in another perspective, federal governments want to achieve a spatial scale, between the city and the state, which is more territorially appropriate to ensure the viability of policy planning, such as in the provision of public services (FUNDACE, 2021).

4.5.2 An overview of CAGEPA

The chart below will display an overview of CAGEPA's Business Plan to briefly introduce its history, businesses, organizational identity, main actors, the concession of public services, considering the Legal Framework for Sanitation and the Company's Governance structure, and its strategies.

ISSN 1980-0827 – Volume 20, Number 2, Year 2024

Chart 3 - An overview of CAGEPA

CAGEPA's History
The Water and Sewage Company of Paraíba - CAGEPA (*Companhia de Água e Esgotos da Paraíba*, in Portuguese) is an open-stock private-public company, with authorized capital, operating under State Law no. 3.459 of December 31, 1966, amended by State Law no. 3.702 of December 11, 1972, linked to the State Infrastructure, Water Resources and Environment Authority – SEIRHMA (*Secretaria de Estado da Infraestrutura, dos Recursos Hídricos, do Meio Ambiente*, in Portuguese) seated in the city of João Pessoa, State of Paraíba, with jurisdiction throughout the state, with an indefinite duration, which is governed by the Brazilian Business Corporation Act, no. 6.404/76, of December 15, 1976, which was amended by Law no. 11.638, of December 28, 2007, Law 13.303, of June 30, 2016, and its Statute. The total capital is distributed into Common stocks (with voting rights) and Preferred stocks (without voting rights); 99.98% of the common stocks belong to the Government of the State of Paraíba and 0.02% are owned by 471 individual and legal-entity shareholders.
Business description
The company plans, executes and operates basic sanitation services throughout the territory of the State of Paraíba, including water collection, adduction, treatment and distribution, and sewage collection, treatment and final disposal; the company markets these services and the benefits that directly or indirectly arise from its enterprises, and any other related activities or the like, and it participates in other companies of which the government, directly or indirectly, is a shareholder. CAGEPA operates in 200 municipalities and 24 districts in the State of Paraíba, totaling 224 locations served throughout the state. There is a total of 06 Regional Units: Litoral, based in João Pessoa; Brejo, headquartered in Guarabira; Borborema, headquartered in Campina Grande; Espinharas, headquartered in Patos; Rio do Peixe, headquartered in Sousa; Alto Piranhas, headquartered in Cajazeiras, which act in line with their Administrative Headquarter in João Pessoa, with the objective of ensuring quality and timely service to the population.
Organizational Identity
▪ Mission: to promote public health and quality of life by universalizing basic sanitation in a sustainable way. ▪ Vision: to be recognized by 2025 for its excellence in the provision of services, with a focus on customer satisfaction. ▪ CAGEPA believes in and values customer focus; innovation with simplicity; financial, environmental, social and cultural sustainability; transparency and ethics; valuing human capital, and; commitment to investors.
Main Stakeholders
CAGEPA's main stakeholders are: The Shareholders, the Company's Board of Directors and Fiscal Council, Clients and citizens, employees and collaborators, suppliers, the press, neighborhood associations, sanitation entities, research institutes, non-governmental organizations, the Regulatory Agency of the state of Paraíba (ARPB, *Agência de Regulação do Estado da Paraíba*, in Portuguese), the Brazilian Institute of Environment and Natural Resources (IBAMA, *Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais*, in Portuguese), the Audit Court of the State of Paraíba (TCE-PB, *Tribunal de Contas do Estado da Paraíba*, in Portuguese), the Federal Government (Ministry of Development, Health and National Health Foundation (FUNASA, *Ministério do Desenvolvimento, da Saúde e Fundação Nacional de Saúde*, in Portuguese), the National Water Agency (ANA, *Agencia Nacional de Águas*, in Portuguese), funding agents, the State Government and the Association of State Sanitation Companies (AESBE, *Associação das Empresas Estaduais de Saneamento*, in Portuguese).
Concession of Public Services - Legal Framework for Sanitation
The principles of regularity, continuity, efficiency, security, timeliness, generality, tariff reasonability, rational use of water resources, and universalization of services (Article 4-A, § 3, I, Law no. 9.984/2000). ANA's regulatory competence was added as the Legal Framework for Sanitation was updated, by amending reference standards focused on the regulation of the provision of public basic sanitation services (Article 25-A, Law no. 11.445/2007), a procedure in which it is essential to guarantee the concurrent provision of water supply and sewage services (Article 4-a, § 3, VIII). Finally, on December 24, 2020, the Federal Government issued Decree no. 10.588/2020, which regulates certain provisions of Law no. 14.026/2020, known as the "New Regulatory Framework for Basic Sanitation". The Decree lays out the conditions for the technical and financial support that the Federal Government will grant for states and municipalities to adjust basic sanitation services to the new law. In general, the measures provided for in the Decree seek to promote regionalization and adherence to the guidelines laid out by the National Water and Basic Sanitation Agency (ANA, *Agência Nacional de Águas e Saneamento Básico*, in Portuguese), as a regulatory agency in the sector.
Governance
Committed to the guidelines on best management and conduct, Cagepa continuously works to improve good governance practices and processes to ensure the evolution of its business. With the advent of Law 13.303, of June

ISSN 1980-0827 – Volume 20, Number 2, Year 2024

30, 2016, which addresses the Legal Status of public companies, mixed economy companies and their subsidiaries, several changes have been and will be made.

Source: CAGEPA (2021, p. 4).

The Litoral Regional Unit belongs to the João Pessoa region; the Brejo Region is headquartered in Guarabira; the Borborema Region is located in Campina Grande; the Espinharas Region is in Patos; the Rio do Peixe Region is in Sousa; and the Alto Piranhas Region is headquartered in the city of Cajazeiras.

Currently, CAGEPA's Corporate Governance consists of: General Assembly, Fiscal Council, Board of Directors, Internal Audit; as a support, there are also the Eligibility, Conduct and Integrity Committee, and the Statutory Audit Committee.

5 CONCLUSION

Regarding the roles of each federated entity that operates in the management of public drinking water supply services in this region, CAGEPA and DAESA stand out. The public agencies responsible for basic sanitation management that operate in the Metropolitan Area of Sousa have their own characteristics, since CAGEPA serves the whole state while DAESA serves the city of Sousa alone.

CAGEPA is the public agency responsible for basic sanitation in the cities of Aparecida, Nazarezinho, Santa Cruz, São Francisco, São José da Lagoa Tapada, Marizópolis, Lastro, and Vieirópolis; it plans, executes and operates basic sanitation services, from water collection, adduction, treatment, and distribution, to sewage collection, treatment and final disposal. However, of the eight municipalities to which CAGEPA is the main provider of water supply services, in three of them (Lastro, Marizópolis, and Santa Cruz) the contracts were expired at the moment this study was conducted, which may compromise the water service to the population.

In the case of DAESA, the study identified organizational and structural issues regarding the availability of data on basic sanitation in the city of Sousa, which hinders an in-depth analysis of that municipality's supply profile. In addition, its structure does not satisfactorily cover the problems inherent in the basic sanitation found in Sousa, as is the case of *Canal de Estreito,* whose primary purpose is channeling urban drainage. However, part of the sewage collected in Sousa is released into *Canal de Estreito*, and it will eventually be released into the *Rio do Peixe* River, with no previous treatment, which causes serious environmental problems.

In this scenario, it is pertinent to highlight the importance of making DAESA data available, for goals to be set regarding the universalization of basic sanitation services in the municipality of Sousa and for developing actions driven at the main problems identified in the diagnosis conducted in the municipality. In addition, DAESA could develop projects in partnership with the city administration of Sousa, to find investments towards effectively solving the problem with *Canal do Estreito*, to ensure that the population gain access to a good-quality sewage system and for the environment not to be affected by poor management of the city sewers.

We conclude that by having access to the indicators of basic sanitation services in the Metropolitan Area of Sousa, it is possible to set more objective goals to optimize sanitation services in the region.

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