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Potential x effective comparison: analysis the sanitary sewage treatment index n the city of Rio Branco - Acre

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1 INTRODUCTION

According to the TrataBrasil Institute (2015), basic sanitation is understood as a set of actions aimed at preserving the environment to prevent diseases and promote health, improving the quality of life of the population. In Brazil, it is a constitutional, composed of public services, infrastructure, and operational facilities of water supply, sanitary sewage, urban cleaning and management of solid waste, drainage, and management of urban rainwater (Brasil, 2020).

The World Health Organization (2020) emphasizes that investments in sanitation, especially in sewage treatment, reduce the incidence of diseases and hospitalizations and avoid compromising the water resources of a given city. It also ensures that for every R$ 1.00 invested in sanitation, R$ 9.00 is saved in health (World Health Organization, 2019).

In 2020, Brazil had average rates of care for the total population, identified by the National Sanitation Information System (SNIS), 84.1% for the public water supply network and 55% for sewage collection. Considering only the urban population, the data show high service by water services, with a national average index equal to 93.4%, while in sewage collection this rate was 63.2%. Regarding sewage treatment capacity, of the 55.0% that is collected, only 79.8% are treated (SNIS, 2020).

On the other hand, according to SNIS (2020) in the northern region, there is the lowest rate of care for total and urban populations with public water supply networks of 58.9% and 72.0%, respectively. The same occurs for sewage networks, where values of 13.1% are recorded for the total population and 17.2% for the urban population.

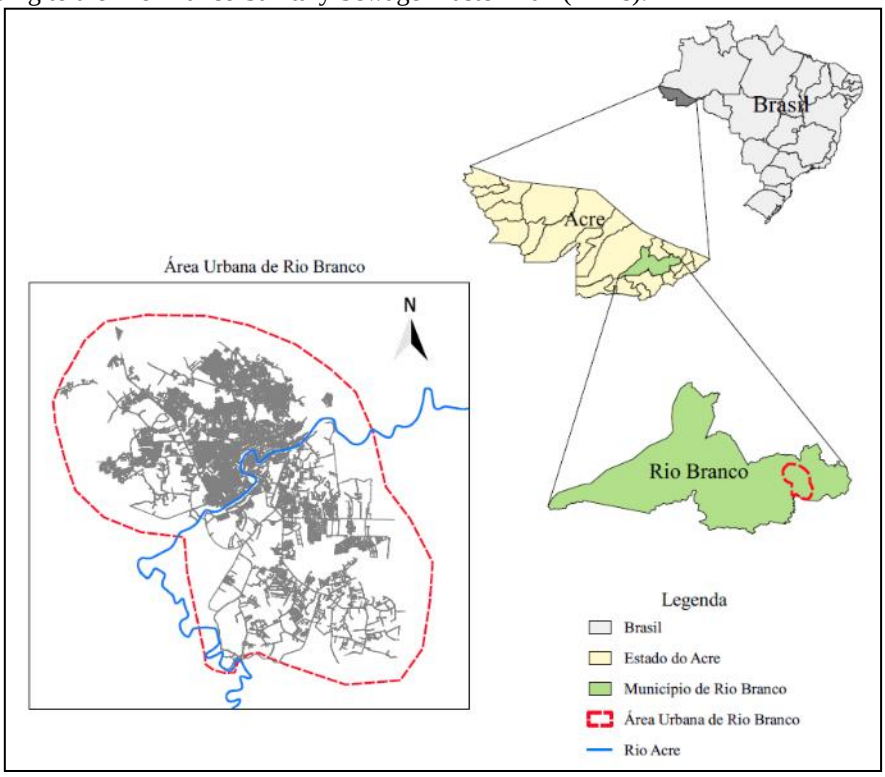
In the municipality of Rio Branco, the capital of the state of Acre, the situation is no different, there is a deficit in sewage collection and treatment services since the city has only 21.29% of urban service with a sewage collection network (SNIS, 2020).

In this sense, this study aimed to diagnose the sewage treatment capacity in the city of Rio Branco, from the treatment plants that were implanted to make up the system.

2 METHODOLOGY

The municipality of Rio Branco, the capital of the State of Acre, is located in the Northern region of Brazil and has an estimated urban area of 116.81 km², being the 63rd largest city in the country among the 5,570 municipalities (GEOINFO, 2018). Rio Branco has located at coordinates 9°58'29" south latitude and 67°48'36" west longitude, at an altitude of 152.5 meters (HID, 2000). We chose to define the urban area of the municipality of Rio Branco given the absence of consolidated information on sewage treatment in the rural area of the municipality (Figure 1).

Figure 1: Delimitation of the study area in the municipality of Rio Branco (in green) and the demarcation of the urban area (dashed in red), according to the Rio Branco Sanitary Sewage Master Plan (PDEs).1



Source: The authors (2022).

For the development of the work, actions and procedures were necessary that can be identified in four stages:

1) documentary research with the former State Department of Water and Sanitation (DEPASA), now called SANEACRE (Acre Water and Sewage Service);

2) visits the sewage system of the city of Rio Branco, especially in sewage treatment plants. The consultation of the database of the National Sanitation Information System (SNIS) was included in this stage;

3) data systematization;

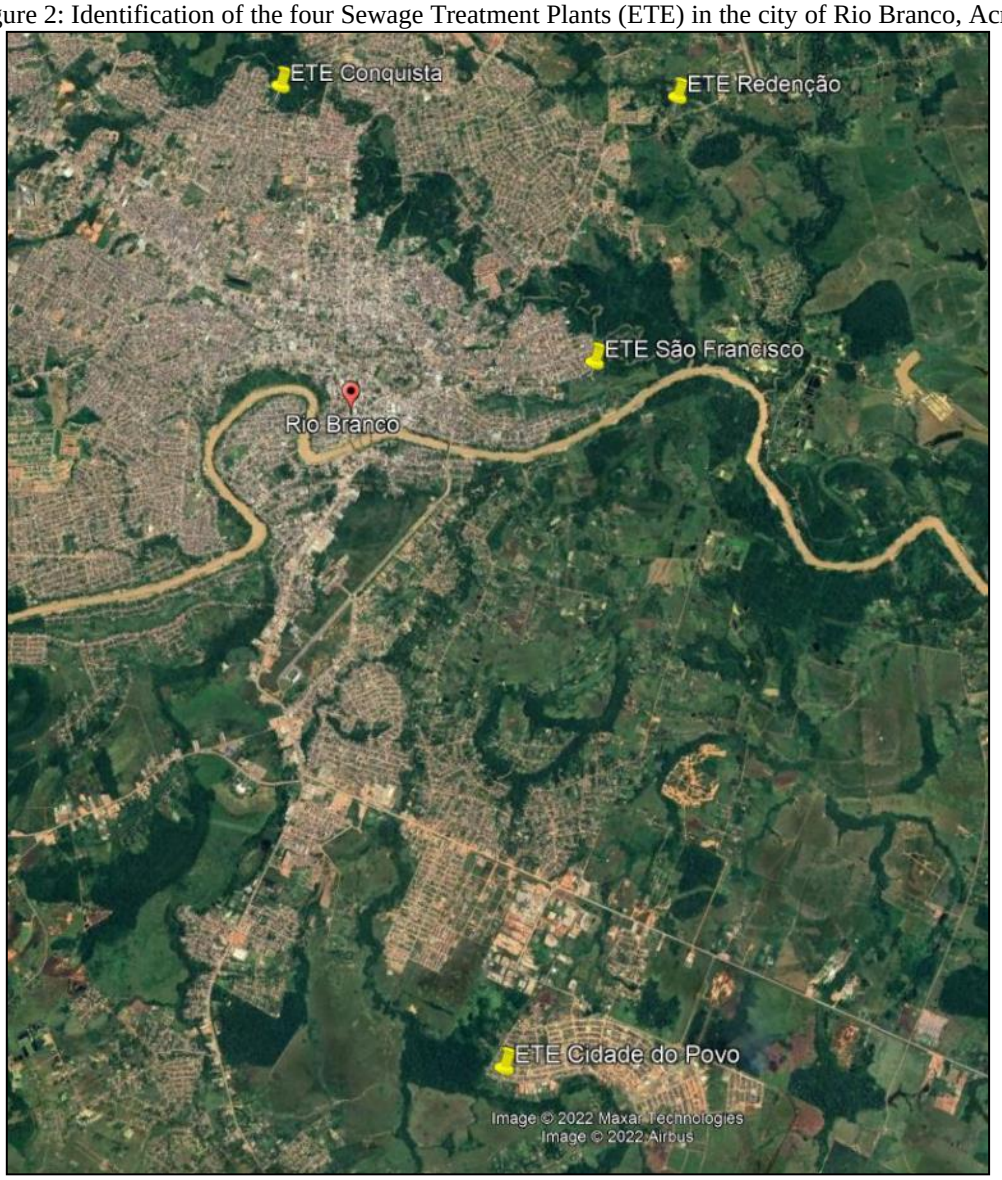
4) analysis under the aegis of descriptive techniques.

For the analysis of sewage treatment coverage, carried out by the conventional Sewage Treatment Plants available to the city, a table was prepared to compile the project data (capacity of the population served and flow) and input flows of each TEE made available and informed by DEPASA, as well as the number of inhabitants of the capital Rio Branco according to data from the Brazilian Institute of Geography and Statistics (IBGE), to obtain the percentage of sewage treatment coverage capacity and percentage effectively treated with the reference year 2020.

3 CONCLUSION

Regarding the sewage treatment plants existing in Rio Branco that must serve the urban area of the city, we have: ETE São Francisco, ETE Conquista, ETE Cidade do Povo, ETE Redenção and several Compact ETEs (Figure 2). Compact ETEs are small units, while the others constitute medium and large treatment units.

Figure 2: Identification of the four Sewage Treatment Plants (ETE) in the city of Rio Branco, Acre.

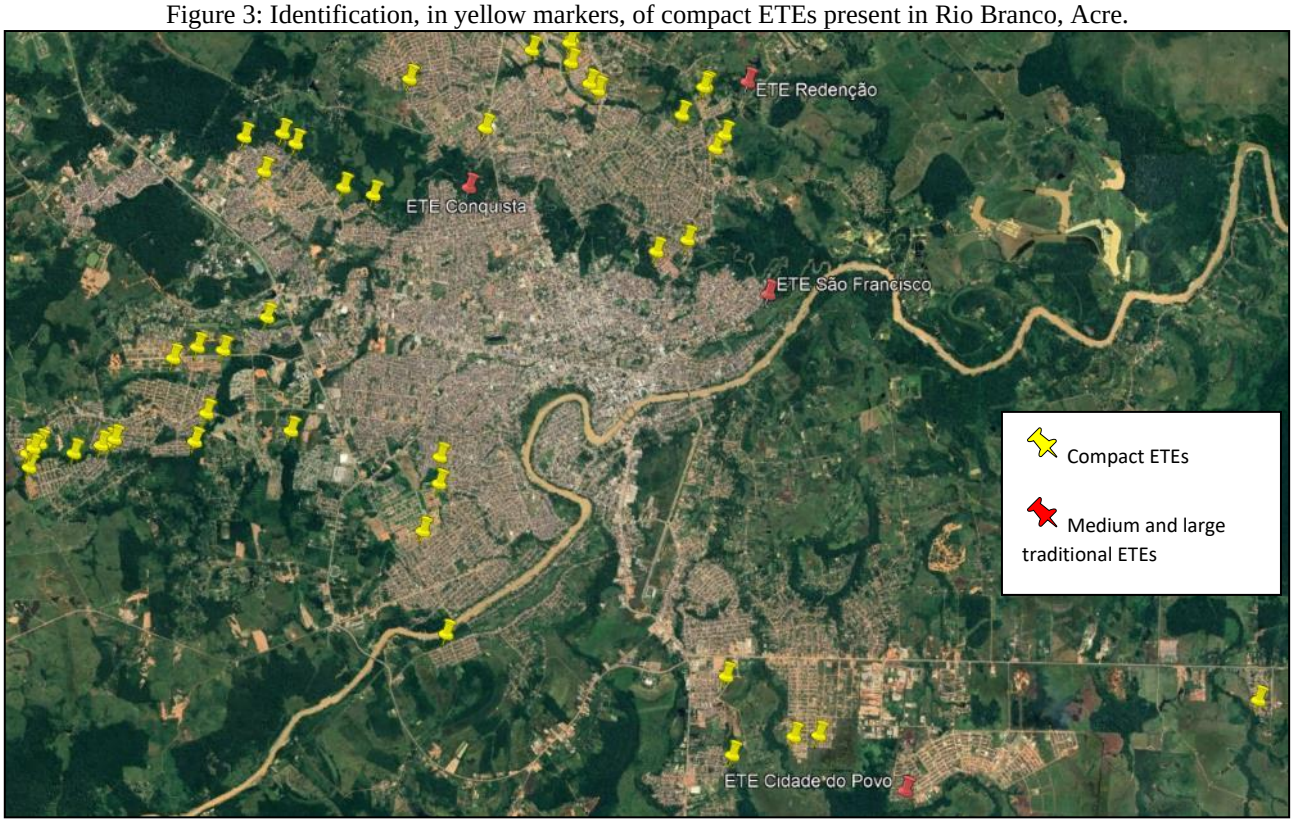


Source: Google Earth (2022) - Adapted by the authors (2022).

In addition to the four main ETEs, responsible for the treatment of sewage collected in Rio Branco, the so-called compact ETEs are used in an auxiliary way, which perform the treatment in situ and on a smaller scale, however, they are treatment plants with technology similar to those used in a larger scale, through sealed tanks and smaller ones.

The city of Rio Branco has a large number of compact ETEs (Figure 3) because the sewage system is not yet interconnected (EEA → Network → ETE). Thus many neighborhoods and housing estates need to provide referral and treatment to the sewage produced, as well as that of private condominiums installed in the municipality.

Figure 3: Identification, in yellow markers, of compact ETEs present in Rio Branco, Acre.



Source: Google Earth (2021) - Adapted by authors (2022).

3.1 SERVICE CAPACITY WITH SEWAGE TREATMENT

From the systematized methodological stages, it was possible to obtain important preliminary information about the sewage treatment system in the city of Rio Branco. It is observed that the sewage flows referring to compacted stations were not accounted for by the absence of consolidated information by the public entities responsible for the operation and maintenance. In addition, it is evident that the Conquest, People's City, and Redemption ETEs are not in operation and, therefore, have a zero value for the average input flow (l/s) (Table 1).

The master plan for sanitary sewage in the city of Rio Branco (2020) provided for a population, for the year 2020, of 488,325 inhabitants. According to the plan, the sewage of 70% of this population would

be treated, that is, 341,828 inhabitants. However, according to IBGE data, the population of 2020 was 413,418 inhabitants, 15.3% lower than the forecast made in the master plan.

The 4 ETEs have a maximum capacity to treat 440 l/s of sewage, which corresponds to the treatment for a population of 220,000 inhabitants, about 53.21% of the population predicted by IBGE. What was executed is lower than planned by PDES, which was 70%. The real situation of the treatment system is even worse, since only one TEE is in operation, treating 17.6 l/s, which corresponds to the care of approximately 8,800 inhabitants, reflecting only 4.0% of sewage treatment coverage (Table 1).

Table 1: Capacity of Sewage Treatment Plants in the city of Rio Branco, Acre.1

Estação de Tratamento de Esgoto	Diretrizes do PDES (projetado para 2020) Previsão - População Atendida	População de Rio Branco (2020) - IBGE	Capacidade de Tratamento (2021)			Vazão de Entrada Média da ETE (l/s) 2021 (***)	Atual Cobertura de Tratamento (2021)	Corpo Receptor dos Efluentes Tratados
			Habitantes	% de pop.	Vazão (l/s)			
ETE São Francisco (*)	341.828	413.418	125.000	30,2%	250,0	17,6	4,00%	Igarapé Usina
ETE Conquista			30.000	7,3%	60,0	0,0	0,00%	Igarapé São Francisco
ETE Cidade do Povo			25.000	6,0%	50,0	0,0	0,00%	Igarapé Judia
ETE Redenção (**)			40.000	9,7%	80,0	0,0	0,00%	Igarapé Redenção
Total			220.000	53,21%	440,0	17,6	4,00%	

ETE São Francisco (*) - Construidos 4 módulos com capacidade de tratamento de 62,5 l/s cada, no entanto apenas 2 (dois) módulos estão em operação.
ETE Redenção (**) - Encontra-se em fase de pré-operação.
Vazão de Entrada Média da ETE (***) - Dados obtidos no DEPASA.

Source: The authors (2022).

Translation:
Column 1
Sewage treatment station
Column 2
PDES guidelines (projected in 2020)
Prediction
served population
Column 3
Treatment capacity (2021)
Population
% of population
Flow rate
Column 4
ETE average inlet flow (1/s) 2021
Column 5
Current treatment coverage (2021)
Column 6
Receiving body of treated effluents

It is noted that the average inflow rate at sewage treatment plants is small to the treatment capacity. This shows that the rate of sewage treatment in the city of Rio Branco tends to grow as sewage collection networks expand and the appropriate referrals to ETEs are made.

Relating the flow capacity of the ETEs with the inflow flow, it is verified that these are with a real treatment coverage of only 4% of the capacity, evidencing the need for investments for the implementation of sewage collection and transportation units for treatment since the ETEs are underutilized.

With the present study, it was possible to observe numerous problems, from the management of the system to the interruption of the operation of stations by scrapping.

Considering the population of the city of Rio Branco in 2020, with 413,418 inhabitants and, relating to the capacity predicted by conventional ETEs highlighted in this study, there is a treatment coverage capacity of approximately 53.21% of the total population, lower than the 70% planned by the PDES.

It was also concluded that in 2000, PDES was elaborated, with a view to service over a 20-year horizon. However, of the four references ETEs included in that plan, only one of them is in operation with limited capacity. Thus, the coverage of sewage treatment carried out in the current conjuncture in the city of Rio Branco is a measly 4%, representing a flow rate of only 17.6 l/s.

As for the PDES for the city of Rio Banco, it is evident the need for revision because of the changes that occurred both in the population and in the structural changes of the urban area, such as the large popular housing complex called Cidade do Povo.

Finally, with compact ETEs, it is expected that with the interconnection of the sewage system, composed of collecting networks, lifting stations, and treatment plants, sanitary sewage will finally be routed to large stations and these compacts become inoperative, since they are non-definitive alternatives and, therefore, can be deactivated, since they did not meet the demand. In addition, moving towards the universalization of basic sanitation, proposed by the Legal Framework of Sanitation, it is assumed that places that do not have a collection network are contemplated and can also be treated in the ETEs.

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