Geotemas, Pau dos Ferros, RN, Brasil
ISSN: 2236-255X, v. 15, 2025.

QUALITY OF LIFE IN FRANCISCO SÁ (MINAS GERAIS, BRAZIL): A GEOGRAPHICAL ANALYSIS BASED ON SANITATION INDICATORS

Qualidade de Vida em Francisco Sá (Minas Gerais/Brasil): Análise Geográfica a Partir dos Indicadores de Saneamento Básico

Calidad De Vida En Francisco Sá (Minas Gerais/Brasil): Análisis Geográfico A Partir De Indicadores De Saneamiento Básico

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https://doi.org/10.33237/2236-255X.2025.6833

Article History
Reveived: 05 february, 2024
Accepted: 26 march, 2024
Published: 16 april, 2024

ABSTRACT

This study aims to analyze the quality of life in Francisco Sá by examining basic sanitation indicators. The methodology involved analyzing secondary data from the 2022 Demographic Census conducted by the Brazilian Institute of Geography and Statistics, followed by discussion and tabulation of the results. It is noted that inadequate sanitation services, particularly sewage services, have significant implications for the population's health and quality of life. In Francisco Sá, there is a disparity in the provision of basic sanitation services between urban and rural areas. The rural area has lower availability of sanitation services and inadequate infrastructure; of the 1983 households (24.8%) not connected to the general distribution network, nearly all are in rural areas, primarily using deep or artesian wells, with 1600 households relying on such sources (80.7%). Regarding sewage collection, the urban service rate is 84.91%, with all waste being treated. However, rural households lack access to an adequate sewage network and primarily use rudimentary septic tanks or pits, contributing to area and water table contamination, facilitating disease transmission and impacting the population's quality of life. Additionally, garbage collection does not cover the entire population, leading many households to dispose of waste improperly.

Keywords: Quality of Life; Basic Sanitation; Francisco Sá.

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RESUMO

O objetivo deste trabalho é analisar a qualidade de vida no município de Francisco Sá a partir dos indicadores de saneamento básico. Para tanto, utilizou-se como metodologia a análise de dados secundários coletados do Censo Demográfico do Instituto Brasileiro de Geografia e Estatística (IBGE), de 2022 (último censo realizado), e a discussão e tabulação dos resultados. Considera-se que a precariedade do saneamento e, principalmente, do serviço de esgotamento sanitário tem implicações severas para a saúde e qualidade de vida da população. Em Francisco Sá, percebe-se uma desigualdade na oferta dos serviços de saneamento básico relacionada à situação domiciliar (área urbana e área rural). Sendo que sua área rural conta com uma menor disponibilidade de serviços de saneamento e infraestrutura inadequada, dos 1.983 (24,8%) domicílios que não possuem ligação com a rede geral de distribuição, quase todos estão na área rural e recorrem principalmente a poço profundo ou artesiano, sendo 1.600 domicílios (80,7%). Quanto à coleta de esgoto por rede geral, o índice de atendimento urbano é de 84,91%, sendo tratado em sua totalidade. Já, na área rural, os domicílios não possuem acesso a uma rede de esgoto adequada, valendo-se principalmente do uso de fossa rudimentar ou buraco, que contribui para a contaminação da área e do lençol freático, facilitando a transmissão de diversas doenças e afetando a qualidade de vida da população. E, a coleta do lixo não abarca toda a população; devido a isto, muitos domicílios se veem obrigados a realizar o descarte de forma irregular.

Palavras-chave: Qualidade de vida; Saneamento Básico; Francisco Sá.

RESUMEN

El objetivo de este trabajo es analizar la calidad de vida en el municipio de Francisco Sá con base en indicadores de saneamiento básico. Para ello, la metodología utilizada fue la revisión bibliográfica y el análisis de datos secundarios recolectados del Censo Demográfico 2022 del Instituto Brasileño de Geografía y Estadística (IBGE) (último censo realizado), y la discusión y tabulación de los resultados. Se considera que la precariedad del servicio de saneamiento y, principalmente, del alcantarillado tiene severas implicaciones para la salud y la calidad de vida de la población. En Francisco Sá, existe una desigualdad en la prestación de servicios de saneamiento básico relacionada con la situación del hogar (área urbana y área rural). Dado que su zona rural presenta menor disponibilidad de servicios de saneamiento e infraestructura inadecuada, de los 1,983 (24.8%) hogares que no cuentan con conexión a la red general de distribución, casi la totalidad se encuentran en zonas rurales y utilizan principalmente pozos profundos o artesianos, 1,600 hogares (80.7%). En cuanto a la recogida de aguas residuales a través de la red general, la tasa de servicio urbano es del 84,91%, siendo tratadas en su totalidad. En las zonas rurales, sin embargo, los hogares no tienen acceso a un sistema de alcantarillado adecuado, recurriendo principalmente a fosas o pozos sépticos rudimentarios, que contribuyen a la contaminación de la zona y del nivel freático, facilitando la transmisión de diversas enfermedades y afectando la calidad de vida de la población. Y la recogida de basura no cubre a toda la población; Debido a esto, muchos hogares se ven obligados a eliminar los residuos de forma irregular.

Palabras clave: Calidad de vida; Saneamiento básico; Francisco Sá.

1 INTRODUCTION

Basic sanitation is a right guaranteed by the Brazilian Constitution (1988) and defined by Law No. 11.445/2007. This law establishes national guidelines encompassing services, infrastructures, and operational facilities for water supply, sanitary sewage, urban cleaning, urban drainage, solid waste management, and rainwater management (Brasil, 2007). Basic sanitation initiatives enhance the population's quality of life by positively impacting public health and reducing infant mortality, diarrheal diseases, parasitic infections, and skin disorders. Ineffective sanitation services contribute to socio-environmental vulnerabilities, particularly in economically disadvantaged communities (Teixeira and Guilhermino, 2006). According to the World Health Organization (1998), poor basic sanitation poses a significant threat to human health.

Access to basic sanitation is essential for a dignified human life. Providing potable water and ensuring the proper disposal of sewage and waste helps prevent disease spread, promote quality of life, and ensure decent living conditions and environmental preservation. However, social, political, and economic factors lead to highly unequal access to these services in Brazil. Areas with the poorest development and social equity indicators also suffer from the worst sanitation and health outcomes (Teixeira; Guilhermino, 2006).

Given the above, this study aimed to analyze the quality of life in the municipality of Francisco Sá in Minas Gerais State (Brazil) based on basic sanitation indicators.

2 METHODOLOGY

This research adopts a quantitative-qualitative approach, offering new perspectives on the subject along with statistical analysis. The methodology utilized involves analyzing secondary data from the 2022 Demographic Census conducted by the Brazilian Institute of Geography and Statistics (IBGE), which was the most recent census conducted. The advantages of this data source include its swift data collection and broad potential for exploration. However, secondary analysis is limited by the available data and the necessity to understand how the variables were constructed, defined, and measured.

Data manipulation was performed by cross-referencing various variables in the IBGE Automatic Retrieval System related to the publication of the Household Characteristics survey. This approach enables an understanding of significant household elements and the population's living conditions across the national territory, focusing on aspects such as water

supply, waste disposal, sewage disposal methods, and the existence of bathrooms or toilets and water pipes.

The collected data was organized into graphs and tables using Microsoft Excel (v. 2.93) and Microsoft Word (v. 2.93) and subsequently analyzed and interpreted textually. Additionally, a cartographic survey was conducted using the QGIS 3.26 program and fieldwork in January 2025. During the fieldwork, a camera was used to capture iconographic records, and a logbook documented observations and characteristics related to basic sanitation in both rural and urban areas of Francisco Sá.

According to Hammouti (2002), a logbook is used to document observations, experiences, characteristics, processes, and events and is an invaluable tool for researchers, as it encapsulates all impressions of the studied phenomenon, thereby enhancing the analysis's credibility.

An illustrative case of the disparity between sanitation services in urban and rural areas was examined in Francisco Sá, which consists of two districts, Cana Brava and Catuni, each containing several rural communities. Notably, the rural community of Várzea Dourada, distinguished by its population size, was selected for comparison with the municipality's urban area.

This investigation aligns with a literature review of established scientific knowledge, drawing on authors such as Soares, Bernardes, and Netto (2002), Apoitia (2003); Teixeira and Guilhermino (2006), Ribeiro and Rooke (2010), Pereira, Teixeira, and Santos (2012), Costa Júnior *et al.* (2013), and Almeida *et al.* (2024), among others, by consulting books and scientific articles accessible in virtual libraries, using descriptors such as quality of life, basic sanitation, and human health.

The study was conducted in four stages: the first involved a concise literature review on the importance of basic sanitation for quality of life. The second stage presented the socio-economic aspects of the municipality of Francisco Sá (Minas Gerais, Brazil) and the rural community of Várzea Dourada. The third stage aimed to present the research findings, leading finally to the concluding considerations.

3 BASIC SANITATION AND QUALITY OF LIFE

In Brazil, during the mid-19th and early 20th centuries, sanitation efforts were structured under the paradigm of hygiene, primarily as a health action aimed at reducing mortality from various diseases. Even before the causative agents of epidemics were

understood, organizing sanitation systems was deemed an appropriate response. From the 1990s through the early 21st century, the concept of basic sanitation became linked to sustainable development, as well as to environmental preservation and conservation (Soares; Bernades; Netto, 2002).

Law 11.445 provides a detailed definition of basic sanitation, described as:

> [...] a set of services, infrastructures, and operational facilities for: a) public drinking water supply, from collection to building connections and respective measuring instruments; b) sanitary sewage, including adequate collection, transportation, treatment, and final disposal from building connections to its final discharge into the environment; c) urban cleaning and solid waste management involving collection, transportation, transshipment, treatment, and final disposal of household waste and waste from sweeping and cleaning public areas and roads; d) drainage and management of urban rainwater, encompassing transportation, detention or retention to mitigate flood flows, as well as treatment and final disposal of rainwater drained in urban areas (Brasil, 2007).

Basic sanitation is closely linked to the population's quality of life. Pereira, Teixeira, and Santos (2012, p. 241) argue that concern for quality of life arises from a movement within the human and biological sciences, which aims to "value broader parameters than symptom control, reduced mortality, or increased life expectancy." They note that many scholars equate quality of life with health, though others argue it holds a broader significance. Notably, that quality of life has been prioritized in the first decades of the 21st century.

For Pereira, Teixeira, and Santos (2012, p. 241-242):

> The etymology of the term 'quality' derives from the Latin word *qualis*, meaning the characteristic way of being of something, considered both in itself and in relation to another group. Thus, it can have both positive and negative characteristics. However, with regard to quality of life, it generally refers to something good, worthy, and positive.

Numerous definitions attempt to explain the concept of quality of life; however, no single definition is widely accepted. This term encompasses health-related factors and other significant elements, such as interpersonal relationships (family, friends, etc.) (Pereira, Teixeira, and Santos, 2012). Costa Júnior *et al.* (2013, p. 35) support this view, stating that "quality of life is an eminently human notion, closely associated with the degree of satisfaction found in family, love, social, and environmental life and even in existential aesthetics." The most commonly used definition is from the World Health Organization (1998), stating that quality of life reflects individuals' perceptions and "that their needs are

being met or denied opportunities to achieve happiness and self-fulfillment, regardless of their physical health state or social and economic conditions."

The precariousness of basic sanitation relates to insufficient water supply and lack of water treatment, inadequate sewage disposal, improper storage of solid waste, and poor housing conditions. These factors can contribute to the spread of pathogenic microorganisms and vectors of disease, significantly impacting human life expectancy and quality of life, particularly regarding health (Figueiredo, 2021).

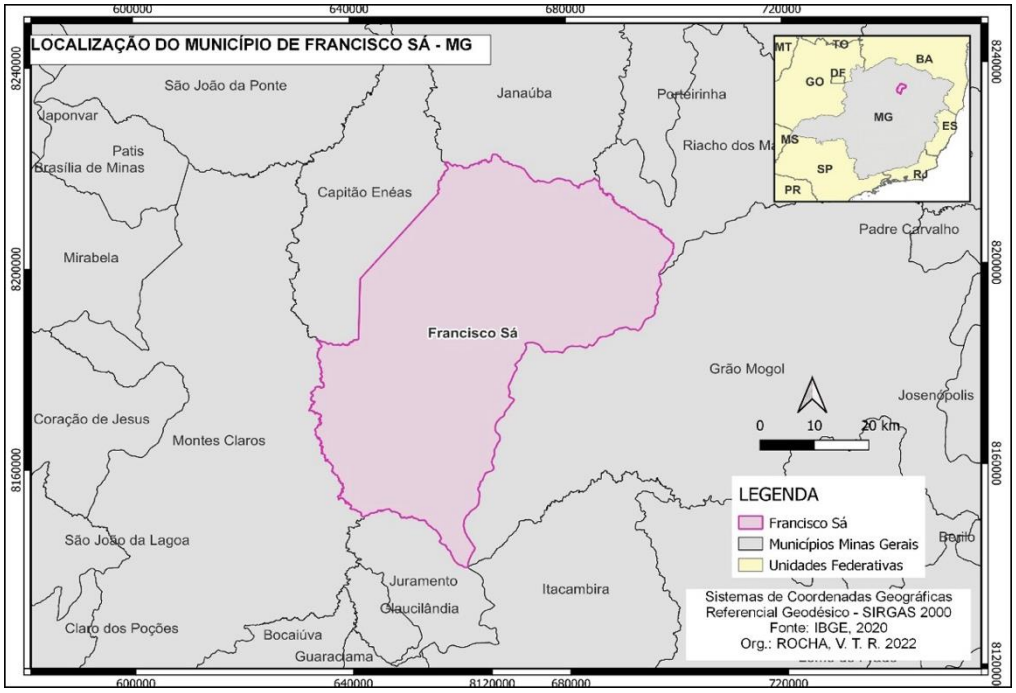
In light of this, we will examine the socio-economic aspects of the municipality of Francisco Sá and the rural community of Várzea Dourada, which form the focus of this study.

4 CHARACTERIZATION OF THE STUDY AREA

The municipality of Francisco Sá was established with the installation of cattle ranches in the Verde Grande River basin by Captain Antônio Gonçalves Figueiras in 1704. From that time, the process of territorial occupation commenced and expanded. In 1867, the district of São Gonçalo do Brejo das Almas was formed, associated with the municipality of Montes Claros. By 1923, through the political and administrative emancipation process, the municipality of Brejo das Almas was created by State Law No. 843/1923, with its territorial base formed from parts of Montes Claros and Grão Mogol. In 1938, State Decree-Law No. 148 officially changed the municipality's name from Brejo das Almas to Francisco Sá in honor of the former Minister of State for the Ministry of Transport and Public Works. In 1948 and 1962, two districts of Francisco Sá were emancipated, leading to the creation of the municipalities of Janaúba and Capitão Enéas, respectively (IBGE, 2020).

This municipality is located in the Immediate Geographic Region of Montes Claros, covering an area of roughly 2747 km^2, with a population of 23,476 inhabitants. Of these inhabitants, 15,572 reside in urban areas, accounting for 66.33%, while 7904 (33.67%) live in rural areas, resulting in a population density of 8.55 inhabitants/km^2, according to the 2022 Census. Francisco Sá is bordered by the municipalities of Grão Mogol, Riacho dos Machados, Juramento, Montes Claros, Capitão Enéas, and Janaúba (Figure 01).

Figure 01 – Location of the municipality of Francisco Sá in Minas Gerais State, southeastern Brazil



Source: IBGE, 2020. **Org**.: Authors, 2022.

Of the 23,476 inhabitants of Francisco Sá, the majority are aged 35–39, totaling 1821 individuals, representing 8.0% of the population. Regarding sex, there are 12,061 males (51.4%) and 11,425 females (48.6%). From ages 0–64, men outnumber women with the exception of the 5–9 age group, where there are 731 females (6.4%) compared to 698 males (5.8%). The number of women aged 65–100 or older exceeds the number of men in the same age range (Table 01).

Table 01 – The population of Francisco Sá according to age and sex, 2022

Age (years)	Sex	
	Men	Women
0–4	683	650
5–9	698	731
10–14	864	794
15–19	880	843
20–24	916	765
25–29	877	784
30–34	865	787
35–39	973	848
40–44	936	864
45–49	869	736
50–54	807	743
55–59	766	669
60–64	608	597
65–69	456	471
70–74	367	430
75–79	245	324
80–84	139	196
85–89	77	112
90–94	28	49

95–99	5	15
≥ 100	2	7
Total	12,061	11,415

Source: IBGE, 2022. **Org.:** Authors, 2025.

Most of the inhabitants of Francisco Sá identify as brown, with 15,674 people (66.8%) making up this group. They are followed, respectively, by 5202 individuals (22.1%) who identify as white, 2554 (10.9%) as black, 34 people (0.14%) as yellow, and 12 people (0.06%) as indigenous (Table 2).

Table 02 – Distribution of the population by color/race, 2022.

Color/race	n
White	5202
Black	2554
Yellow	34
Brown	15,674
Indigenous	12
Total	23,476

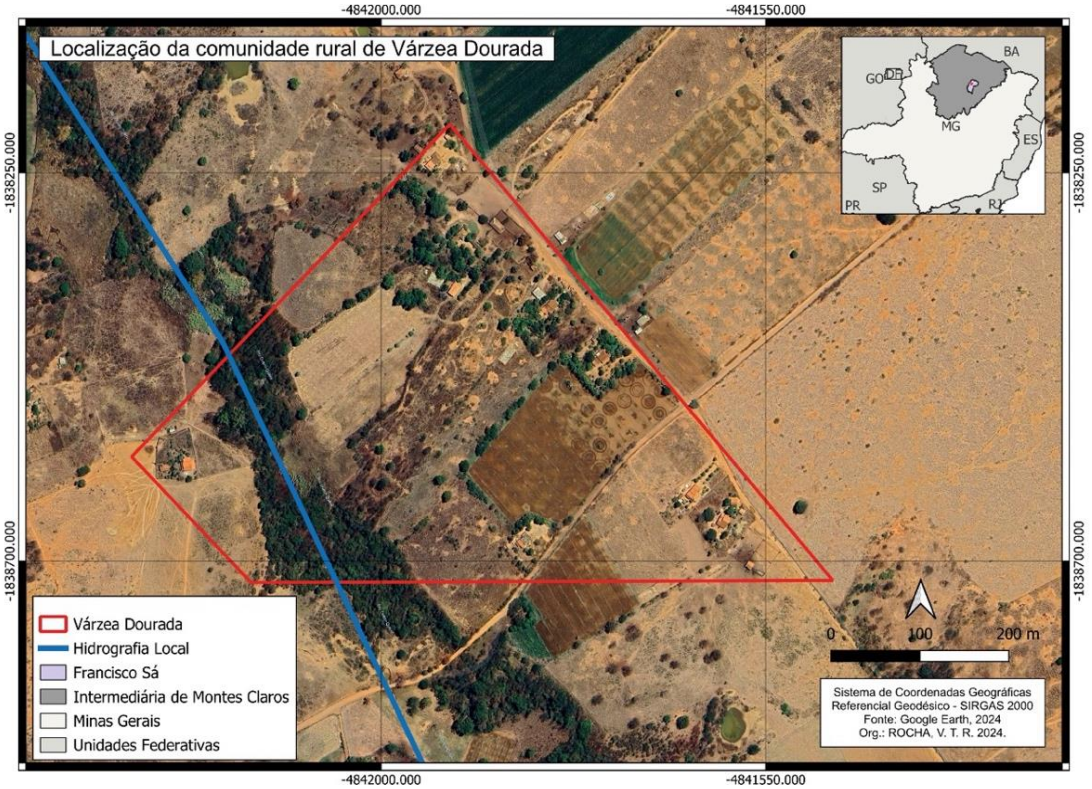
Source: IBGE, 2022. **Org.:** Authors, 2025.

The municipality's gross domestic product amounts to BRL 276,204.32 x 1000 at current prices and comprises 87% services, 8% agriculture, and 5% industry (IBGE, 2020). Additionally, Francisco Sá is roughly 453 km from the state capital, Belo Horizonte, and 48.912 km from the regional center, Montes Claros. Regarding physical geography, Francisco Sá encompasses the Upper-Middle São Francisco depression and the Southern Espinhaço Mountains. It experiences a semi-humid central Brazil Tropical climate, with four to five dry, sub-warm months and temperatures averaging at 15–18 °C in at least one month. Environmentally, the region includes the Cerrado and Caatinga biomes (IBGE, 2025). It is also part of the São Francisco hydrographic region (Agência Nacional de Águas, 2015).

In the rural areas of Francisco Sá, which comprises two districts—Cana Brava and Catuni—besides the main district, the rural community of Várzea Dourada, or Baixa do Charquinho as it is popularly known, is noteworthy for its significant population. This community consists of small, medium, and large rural producers located approximately 28 km from the urban area of Francisco Sá.

Figure 02 illustrates where the community's formation began and has since expanded to nearby localities.

Figure 02 – The location of the rural community of Várzea Dourada



Source: Google Earth, 2024. **Org.:** Authors, 2024.

Generally, the families in this community are descendants of quilombolas. According to a local memoirist, Francisco Sá was formerly known as Brejo das Almas “because there was a large lagoon where criminals disposed of the bodies of the gold diggers” (Tito da Silveira, 1971, p. 53). On the edge of this lagoon, many black refugees formed a quilombo; therefore, it can be said that Francisco Sá originated from a black settlement. Additionally, in their accounts of local history, various memorialists provide sparse information suggesting the existence of some black rural communities or their descendants in the municipality.

Most residents of Várzea Dourada are engaged in milk production and have established two cooling stations at strategic locations in the community. It is an approximately 250-year-old community, and its religious festivals are significant to the region. The community features an elementary school, bars, soccer fields, a health center, and a community center where events are held. This community will be discussed in more detail subsequently.

5 RESULTS AND DISCUSSION

Among the occupied permanent private households in Francisco Sá, there are 7793 houses (97.6%), 177 apartments (2.2%), 6 townhouses or condominiums (0.09%), 3

dilapidated or unfinished permanent residential structures (0.07%), and 2 rooming houses or tenements (0.04%), totaling 7981 households (Table 03).

Table 03 - Distribution of occupied private permanent dwellings by type, 2022

Type of household	Households (units)
Home	7793
Townhouse or condominium	6
Apartment	177
Rooming house or tenement	2
Deteriorated or unfinished permanent structure	3
Total	7981

Source: IBGE, 2022. **Org.:** Authors, 2025.

Among these households, 7557 (94.7%) have access to piped water inside the house, apartment, or dwelling; 353 (4.4%) have piped water only on the ground, and 71 (0.9%) do not have piped water (Table 04).

Table 04 - Distribution of households by piped water availability, 2022

Piped water availability	Households (units)
Piped directly into the house, apartment, or unit	7557
Piped, but only available in the yard or lot	353
No piped water	71
Total	7981

Source: IBGE, 2022. **Org.:** Authors, 2025.

According to the Francisco Sá Municipal Basic Sanitation Plan (PMSB), established by municipal law, piped water is distributed by the autonomous water and sewage system. The average per capita water consumption is 112 liters per inhabitant per day. The urban drinking water distribution rate is 99.9%, while the service rate for the rural population has not been estimated or disclosed. Regarding connections to the general water distribution network, 5522 households (69.2%) are connected to this network and use it as their primary source of water. Those connected to the mains network but using it primarily in another way account for 6.0% (476 households). Additionally, there are 1983 households without a connection to the mains, representing 24.8% (Table 05).

Among households connected to the mains but using alternative water sources, 93.9% (447 households) rely on a deep or artesian well. This is followed by 3.1% (15 households) that use a spring or mine. Only 0.2% (1 household) resort to a water tanker, while 0.8% (4 households) utilize stored rainwater. Additionally, 1.4% (6 households) draw

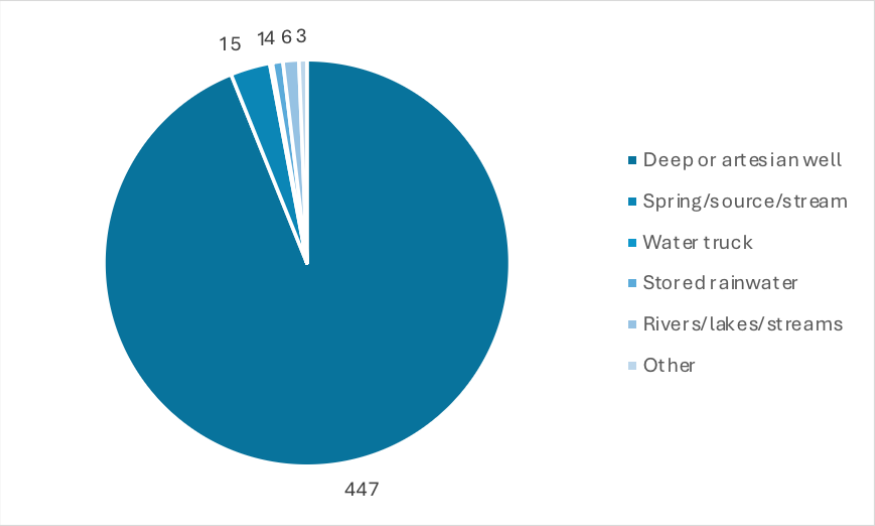
from rivers, dams, streams, lakes, and creeks. Lastly, 0.6% (3 households) use other forms of water (Figure 03).

Table 05 – Distribution of households by connection to the public water supply network, 2022

Connection to the public water supply network	Households (units)
Connected to the network and primarily use it as their main water source	5522
Connected to the network, but mainly rely on another water source	476
Not connected to the public water network	1983
Total	7981

Source: IBGE, 2022. **Org.:** Authors, 2025.

Figure 03 - Distribution of households connected to the public water supply but relying primarily on other sources, 2022.



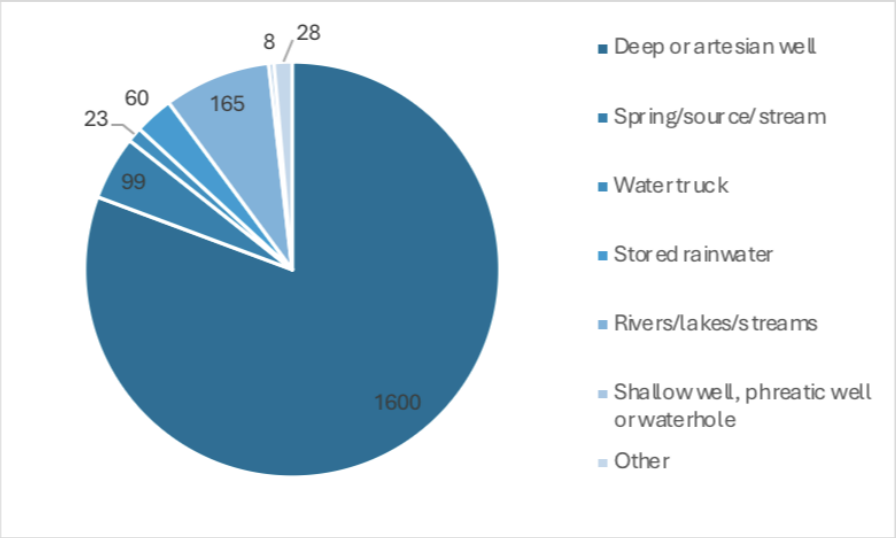
Source: IBGE, 2022. **Org.:** Authors, 2025.

Among the 24.8% of households that are not connected to the main water distribution network in Francisco Sá, nearly all are located in rural communities, such as Várzea Dourada, Córrego do Charquinho, Folha Miúda, and Coqueiros, among others. Of these households, 1600 (80.7%) rely on a deep or artesian well; 99 (5.0%) use a spring, source, or stream; 23 (1.1%) depend on a water truck; 60 (3.0%) collect stored rainwater; 165 (8.3%) utilize rivers, lakes, or streams; 8 (0.4%) use shallow wells, groundwater, or waterholes; and 28 (1.5%) resort to other means of water collection (Figure 04).

In Francisco Sá, exploiting groundwater is common due to insufficient sanitation services. However, various factors can compromise its quality, such as the disposal of domestic and industrial sewage in rudimentary pits, inadequate solid waste disposal, and modern agricultural practices. These factors collectively represent sources of contamination

by pathogenic bacteria, viruses, parasites, as well as organic and inorganic substances (Apoitia, 2003).

Figure 04 – Distribution of households not connected to the general water network and using alternative forms of supply, 2022



Source: IBGE, 2022. **Org.:** Authors, 2025.

Rainwater harvesting and storage are crucial sustainable practices, helping to preserve the planet's drinking water reserves. The objective is to store as much rainwater as possible during the rainy season for use during periods of water scarcity. Various methods of rainwater storage exist, such as household cisterns, which are individual reservoirs built close to homes; trench cisterns, which are reservoirs dug into the ground with deep vertical walls; and sidewalk cisterns, which are semi-underground concrete surfaces with a slope to facilitate rainwater collection, along with other containers such as drums, buckets, water tanks, and disposable liters (IBGE, 2022), as shown in Figure 05.

To ensure that stored water is safe for consumption, it must adhere to the quality standards established by Ordinance No. 888/2021, which outlines procedures for controlling and monitoring the quality of water designated for human consumption and its portability standards. In the rural community of Francisco Sá, clay or boiling filters are specifically employed for this purpose.

Figure 05 – Rainwater tanks at a household in rural Francisco Sá, 2025

Source: Authors, 2025.

The type of sanitation system used for bathrooms or toilets in permanent private households was classified as follows (IBGE, 2022):

1. Public sewer system or stormwater drainage – when the household's wastewater and sewage were connected to a collection system that directed it to a general discharge point, even if the system lacked a treatment facility.
2. Septic tank – when the bathroom or toilet was connected to a septic tank, meaning the waste was discharged into a nearby underground chamber where it underwent treatment or sedimentation, with or without the liquid portion being subsequently directed to a discharge point.
3. Filter tank – when the household sewage treatment system consisted of a septic tank and an anaerobic filter.
4. Rudimentary pit – when the bathroom or toilet discharged into a basic pit (e.g., a simple hole or dugout).
5. Ditch – when the toilet was connected directly to an open ditch.
6. River, lake, stream, or sea – when the waste was discharged directly into a natural water body such as a river, lake, stream, or the sea.
7. Other – when the waste disposal method did not fall under any of the above classifications.

According to the Trata Brasil Institute (2015), sanitation networks are significantly underutilized in Brazil. Despite the existence of networks, residents often remain

unconnected, even though there is a legal mandate requiring interconnection (art. 45 of the National Basic Sanitation Law). According to the PMSB of Francisco Sá, the urban service rate for the household sanitary sewage network is 84.91%, with all waste treated. However, this figure should be improved by increasing the number of households connected to the sewage network in the municipality.

Regarding the types of sanitation systems in use, 4141 households (51.9%) in Francisco Sá are connected to the public sewer or stormwater network; 79 (1.0%) use a septic tank or filter tank connected to the network; 621 (7.8%) use a septic tank or filter tank not connected to the network; and 3027 (37.9%) rely on rudimentary pits. Additionally, 5 households (0.08%) discharge waste into an open ditch, 8 (0.12%) into natural water bodies such as rivers or lakes, 31 (0.3%) use other forms, and 69 (0.9%) reported having neither a toilet nor a sanitary facility (Table 06).

Table 06 – Distribution of households by type of sanitation system, 2022

Type of sewage system	**Households (units)**
Public sewer or stormwater drainage	4141
Septic tank or filter tank connected to the network	79
Septic tank or filter tank not connected to the network	621
Rudimentary pit or hole	3027
Ditch	5
River, lake, stream, or sea	8
Other	31
No bathroom or toilet	69
Total	7981

Source: IBGE, 2022.**Org.:** Authors, 2025.

Francisco Sá's sewage services have improved since the penultimate census of 2010. However, significant challenges remain in achieving universal service in the municipality. A substantial proportion of households, particularly in rural areas, lack access to an adequate sewage system, relying instead on rudimentary pits or holes (Figure 06).

When liquid effluent is disposed of in the rudimentary pits, sewage infiltrates the soil, posing a constant risk of area and water table contamination, which facilitates the transmission of various diseases, such as hepatitis, diarrhea, cholera, and salmonellosis (Ribeiro; Rooke, 2010). Contamination by total and fecal coliforms is a major factor in water pollution and is directly associated with water-borne diseases (Apoitia, 2003).

Figure 06 – Rudimentary pit of a household in the rural area of Francisco Sá, 2025

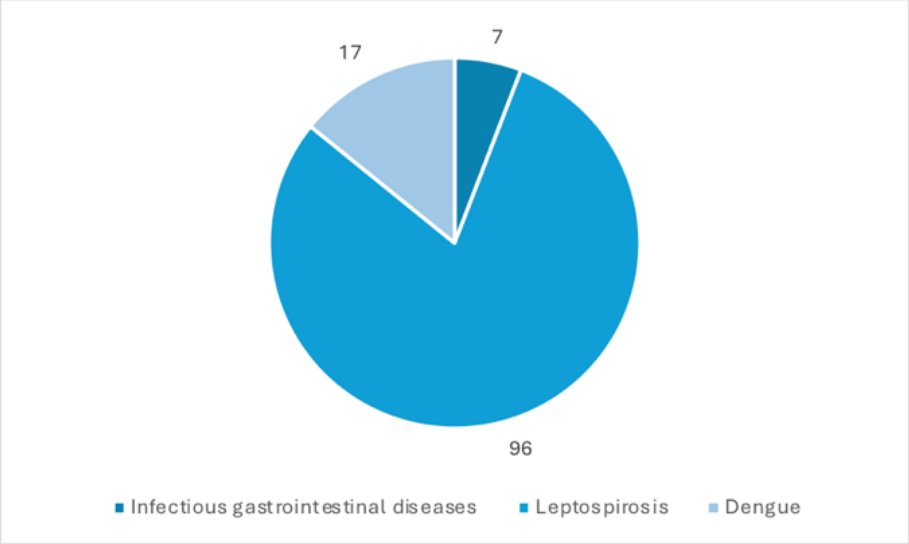
Source: Authors, 2025.

In Brazil, one of the main obstacles in managing water resources is obtaining financial resources to support projects to treat effluents, regulate excessive water use, and improve the relationship between water resource quality and the population's quality of life (Tundisi, 2005).

Poor sanitation significantly impacts socio-economic conditions, particularly in public health, as it increases the incidence of gastrointestinal infections and respiratory diseases, consequently leading to higher hospitalization rates. This results in people taking time off work, and workers in areas with poor sanitation often underperform in terms of productivity, affecting their professional careers and income potential. Moreover, the spread of these diseases disrupts children's and young people's school activities, interfering with their educational performance (Ribeiro; Rooke, 2010).

In Francisco Sá 2024, according to the Department of Information and Informatics (DataSUS), there were 120 hospitalizations due to diseases associated with the lack and/or inefficiency of basic sanitation. Among these were seven hospitalizations for infectious gastrointestinal diseases, 96 for leptospirosis, and 17 for dengue (Figure 07).

Figure 07 – Hospitalizations due to diseases associated with poor sanitation in Francisco Sá, 2024



Source: DataSUS, 2024.**Org.:** Authors, 2025.

Dengue, for example, is an arbovirus transmitted by the vector *Aedes aegypti*, which is also responsible for yellow fever, *chikungunya*, and the *Zika* virus. The vector thrives in areas lacking basic sanitation, inefficient water supply and/or standing water, and places with accumulated waste (Almeida; Cota; Rodrigues, 2020). These conditions, therefore, reflect environments with poor infrastructure that facilitate the emergence of arboviruses and various other diseases (Almeida *et al.*, 2024).

According to Filho *et al*. (2022), improved sanitation conditions are essential to prevent damage to human health and reduce public expenditure. In 2013 alone, if sanitation conditions had been adequate, approximately 57,574 hospitalizations could have been avoided. These hospitalizations cost more than 20 million reais, resources which could have been better allocated towards addressing the causes rather than treating the consequences (Paiva; Souza, 2018).

Regarding public policies and measures to enhance basic sanitation in rural and urban areas, thereby contributing to the health of residents, advanced and efficient technologies for collective sewage collection and treatment are recommended over individual sewage disposal and limited access to drinking water (Salla, 2019).

In addition to improvements in basic sanitation, expanding the coverage of the Family Health Strategy – including the qualification of professionals, increasing the number of basic health Units, and extending home visits by health agentes – can reduce hospitalizations due to infectious diseases linked to inadequate sanitation services. This is

because symptoms can be resolved or minimized before hospitalization becomes necessary (Paiva; Souza, 2018).

Another important measure is the implementation of handwashing interventions at the family and community levels (Wolf, 2022). Scalize (2021) notes that handwashing is intrinsically linked to basic sanitation, as the habit of handwashing increases with the improvement of sanitation conditions, thus preventing various diseases.

Concerning the number of bathrooms or toilets for exclusive household use, 6520 households have one bathroom, accounting for 81.7%; 1057 households have two bathrooms, constituting 13.4%; 189 households (2.4%) have three toilets; 48 households (0.6%) have four toilets; 46 households (0.5%) have only one toilet shared by multiple households; 52 households (0.6%) have only a pit for excrement; and 69 households (0.8%) have neither a toilet nor a bathroom (Table 07).

Table 07 – Distribution of households by the number of bathrooms or toilets for exclusive use, 2022

Number of bathrooms or toilets for the exclusive use of the household	**Households (units)**
1	6520
2	1057
3	189
4	48
Only shared bathrooms used by more than one household	46
Toilet or pit latrine only	52
No bathroom or toilet	69
Total	7981

Source: IBGE, 2022. **Org.:** Authors, 2025.

Regarding the disposal of household waste in the municipality of Francisco Sá, waste is collected by a cleaning service in 5128 (64.3%) households. In 2563 (32.1%) households, it is burned on the property. Waste is discarded in waste skips in 173 (2.2%) households. In 46 (0.6%) households, waste is discarded in vacant lots, hillsides, or public areas. In 26 (0.3%) households, waste is buried on the property, and 45 (0.5%) households use other disposal methods (Table 8). According to the Francisco Sá PMSB, the mass of household and public waste collected per capita is 0.591 kg per inhabitant per day.

Table 08 – Distribution of households by waste destination, 2022.

Waste disposal method	**Households (units)**
Collected at the household by public cleaning services	5128
Discarded in a waste skip	173
Burned on the property	2563
Buried on the property	26

Discarded in vacant lots, embankments, or public areas	46
Other	45
Total	7981

Source: IBGE, 2022. **Org.:** Authors, 2025.

Disposing of solid waste in inappropriate places is known to cause serious environmental damage, particularly to soil and water (both underground and surface) (Junior; Freire, 2013). Burning solid waste in open areas or unlicensed containers, installations, and equipment is prohibited by Law 12.305/2010 of the National Solid Waste Policy. This policy encourages the separation of household waste to ensure proper disposal in sanitary landfills, which are designed to minimize environmental harm by preventing the contamination of soil, water, and air. Despite this regulation, burning waste on private property is common in the municipality, with 32.1% of households engaging in it. According to Deboni *et al.* (2010), this practice poses significant risks, as combustion can release pollutants that contaminate the atmosphere and negatively impact human health.

Implementing a waste treatment process would substantially reduce the total amount of waste sent to landfills. The National Solid Waste Policy (2010) stipulates that procedures must be adopted for the environmentally correct disposal of collected waste before it reaches its final destination, thereby decreasing the volume of landfill materials. The policy also mandates municipalities to implement selective waste collection involving cooperatives or other associations formed by low-income individuals collecting reusable and recyclable materials. This approach facilitates waste recovery while promoting income generation and social inclusion.

The management of municipal solid waste in Francisco Sá is irregular, as waste is currently disposed of at a landfill near the city (Figure 08). However, a municipal sanitary landfill is under construction, which will ensure that solid waste is managed according to current environmental legislation.

According to the Francisco Sá Department of the Environment, the urban area produces approximately 9310 tons per day of municipal solid waste (Prefeitura Municipal de Francisco Sá, 2021). Theoretically, both urban and rural areas are fully serviced by waste collection. However, in practice, this service is limited to the urban area, occurring six times a week, twice per neighborhood, using two compactor trucks with a capacity of seven tons each. Additionally, waste skips are strategically located throughout the city for household

waste discarding. It is important to note that the municipality lacks a selective waste collection program; both dry and wet waste are collected together.

Figure 08 – A Landfill in the municipality of Francisco Sá, 2025

Source: Authors, 2025.

There is only one waste pickers' association in the municipality, established on September 1, 2012, known as *Associação dos Catadores de Materiais Recicláveis do Município de Francisco Sá*. This association lacks a recyclables recovery unit; waste pickers collect and store materials on the outskirts of the dump for later sale. Despite the association's formation, waste pickers continue to work informally due to inadequate infrastructure. Furthermore, insufficient training and environmental education hinder these workers' comprehension of their critical role in waste management.

Environmental education is the process through which individuals and communities develop social values, knowledge, skills, attitudes, and competencies to conserve the environment, a shared resource essential for quality of life and sustainability. This educational effort also promotes environmental preservation, mitigating the degradation affecting our planet (Freire, 2006).

Environmental education was first coined in 1965 during the Keele University Education Conference in England. Numerous discussions have occurred since then, with one of the most significant being the First Intergovernmental Conference on Environmental Education in Tbilisi (Russia) in 1977 (Dias, 2004).

Environmental education should extend beyond providing minimal information about physical environmental aspects; it should be an integral part of the cognitive development of individuals. It is crucial to disseminate information and raise awareness in a coordinated manner, especially through government-founded public policies that enhance formal and informal environmental education (Neiman; Rabinovici, 2002).

The significance of environmental education grows as the discord between humanity and nature intensifies due to increased pollution. Moura (2002, p. 286) defines environmental pollution as any human action or omission that, by discharging materials or energy onto natural elements such as water, soil, and air, disrupts environmental balance harmfully.

The 3 Rs of Sustainability—reduce, reuse, recycle—comprises a series of measures adopted at the Earth Summit in Rio de Janeiro in 1992 and the 5th European Environment and Development Program in 1993. This policy applies to all waste types, including solid, liquid, and gaseous effluents (Quintela, 2015). The 3Rs entail reducing raw material and energy consumption, reusing products by repurposing them, and recycling to return used materials to the production cycle.

Therefore, environmental education in Francisco Sá should be an everyday effort involving campaigns, seminars, radio interviews, and print/virtual media to foster community involvement in developing the Municipal Plan for Integrated Solid Waste Management and building a more sustainable Francisco Sá. This contributes to residents' quality of life through public policies initiated by the City Council and supported by schools and other municipal entities.

6 FINAL CONSIDERATIONS

This study enabled the analysis of the quality of life for residents in Francisco Sá, using basic sanitation indicators as parameters. This was achieved by reviewing the literature and analyzing secondary data from the IBGE Demographic Census of 2022. Urban areas generally have more favorable conditions for survival due to broader access to water supply and sewage collection services. Conversely, rural areas continue to face significant challenges, with limited availability of sanitation services and inadequate infrastructure (Souza, 2009). Therefore, there is an inequality related to household situations.

The research indicated that this scenario is evident in the municipality of Francisco Sá, as 1983 (24.8%) households lack a connection to the general distribution network, with

nearly all of them situated in rural areas and primarily reliant on deep or artesian wells, accounting for 1600 households (80.7%). Regarding sewage collection through the general network, the urban service rate is 84.91%, with all sewage being treated. Nevertheless, in rural areas, households lack access to an adequate sewage system and mainly use rudimentary pits or holes. This practice contributes to contamination of the area and the water table, thereby facilitating the transmission of various diseases and negatively impacting the population's quality of life.

Solid waste management in the municipality remains irregular, as waste is sent to the municipal dump. Garbage collection does not cover the entire population; consequently, many households are compelled to dispose of their waste in non-standard ways. These include burning it on their property (32.1%), dumping it on vacant lots, hillsides, or public areas (0.6%), burying it on their property (0.3%), and disposing of it elsewhere (0.5%). These irregular disposal methods harm the environment and pose health risks to humans.

In conclusion, the discussions and reflections developed in this study aim to inspire future municipal managers to invest in comprehensive basic sanitation services (water supply, waste disposal, and sewage) that extend beyond the urban areas and adequately serve the rural regions, which require improved service.

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