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Domestic sewage discharge into the Córrego da Água Quente stream in São Carlos/SP: diagnosis, legal instruments and guidelines for adaptation[1] [2]

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ABSTRACT

This article aims to carry out a diagnosis of the sewage collection system in the Córrego da Água Quente watershed (MBHCAQ), located in the municipality of São Carlos/SP, and to extract from legal instruments and concrete cases some measures for adapting the discharge of domestic sewage. Based on a qualitative approach, data was obtained from documentary research, which was analyzed using the Content Analysis technique. The study's relevance is based on targets 6.2 and 6.3 of "SDG 6 - Drinking Water and Sanitation", which set out to achieve access to adequate and equitable sanitation for all by 2030 and improve water quality. It was possible to conclude that it is necessary and feasible to adapt sewage disposal, mainly based on case studies that promote actions in this direction. With the rules currently in force, it is possible to implement projects, plans, programs, and policies to stop sewage discharge into the Córrego da Água Quente or any other body of water located in the Municipality of São Carlos/SP.

KEYWORDS: Domestic Effluents; Sewerage; Basic Sanitation.

1 INTRODUCTION

In Brazil, basic sanitation is a right provided for and guaranteed by the Constitution (Brazil, 1988), which requires the Union to establish guidelines for its inclusion in urban development. Even though it was late, the Brazilian guidelines for basic sanitation were established by Law no. 11.445, of January 5, 2007, known as the Basic Sanitation Law (Brasil, 2007), amended by Law no. 14.026, of 15/07/2020 (Brazil, 2020), which updated the legal framework for basic sanitation in the country.

Sanitary sewage is made up of the activities, provision, infrastructure maintenance, and operational facilities necessary for the adequate collection, transportation, treatment, and final disposal of sanitary sewage from the building connections to its final destination for the production of reuse water or its adequate discharge into the environment (Brazil, 2007, art. 3º, I, b).

Under the new legal framework for sanitation, providers of basic public sanitation services are obliged to provide sewage collection network infrastructure up to the respective connection points necessary for the implementation of the service (Brasil, 2020, art. 18-A). Thus, in places where a public sewage system is available, buildings are obliged to connect to it, under penalty of fine and other sanctions provided for in national legislation (Brasil, 2007, art. 45, §5º).

The 2030 Agenda for Sustainable Development is part of a Global Action Plan. It proposes 17 Sustainable Development Goals (SDGs), based on a partnership between the Member States that adopt it (Moraes; Sousa; Albuquerque, 2022). In particular, SDG 6 on drinking water and sanitation, which aims to ensure the availability and sustainable management of water and sanitation for all people, the object of this research is delimited by targets 6.2 and 6.3, which relate to achieving equitable access to sanitation and improving water quality by reducing the discharge of untreated sewage:

> 6.2 - By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, with special attention to the needs of women and girls and those in situations of vulnerability
> 6.3 - By 2030, improve water quality by reducing pollution, eliminating dumping, minimizing the release of hazardous chemicals and materials, halving the proportion

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of untreated wastewater, and substantially increasing recycling and safe reuse globally (SDG Brazil, 2023).

The Córrego da Água Quente watershed (MBHCAQ), the subject of this study, is located in the urban area of the municipality of São Carlos, São Paulo state, Brazil. It has a collection network covering almost 100% of its area and two sewage pumping stations (EEEs Água Quente and Água Fria), which direct domestic sewage to the municipality's sewage treatment plant (ETE Monjolinho). Since 2016, the construction of the EEEs was completed, 100% of the region's sewage has been sent for treatment (SAAE, 2016). However, data on water quality parameters collected at various points in the Córrego da Água Quente (CAQ) show inadequate conditions in the body of water, indicating that domestic sewage is being discharged directly into the body of water (Baio, 2009; Campanha, 2012; Barrenha, 2015; Periotto, 2021), confirming information on sewage pollution that has been reported since the 1990s (Santos, 1993).

In this context, studies that indicate measures and guidelines to achieve targets 6.2 and 6.3 of SDG 6, even locally, are extremely important.

2 OBJECTIVES

This work aims to diagnose the domestic sewage collection system in the MBHCAQ and to extract from legal instruments and case studies some measures for directing sewage to the existing treatment system.

3 METHODOLOGY

The research is based on a qualitative approach (Creswell, 2010), and the data was obtained through documentary research and analyzed using the content analysis technique (BARDIN, 2011). Legislation was researched to identify the diagnostic data, and a bibliographic survey was carried out on scientific research platforms and university production repositories. Information was also sought from the Brazilian Institute of Geography and Statistics (IBGE), research in official documents from São Carlos/SP, and the São Carlos Autonomous Water and Sewage Service (SAAE) website.

When researching federal legislation, it was decided to highlight three specific rules on sanitation, namely Federal Law no. 11.445, of 05/01/2007, Federal Law no. 14.026, of 15/07/2020 and Federal Decree no. 7.217, of 21/06/2010.

Research into legislation in the state of São Paulo was carried out by consulting the website of the São Paulo Legislative Assembly, using the keyword "esgotamento," resulting in 105 regulations, some of which have already been repealed. After a thematic analysis of each of the standards in force, 30 standards related to the subject of this study were selected.

Regarding legislation in the municipality of São Carlos-SP, the search was conducted on the São Carlos City Council website using the keywords "esgotamento" and "esgoto". The search resulted in 150 norms, and four norms with thematic relevance were selected. The keyword "servidão" was added to the search, resulting in 15 standards, 03 of which were related to the subject of this study. Finally, the search for the keyword "ambiental" generated 29 standards, 02

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of which were selected. It is important to note that the regulations mentioned in this article have not been repealed and are therefore considered in force.

About extracting and compiling proposals for action, the method used was that of case studies, and three programs that promote measures aimed at adapting property connections to the collection network were selected.

4 RESULTS

4.1 Diagnosis of sewage collection in the Córrego da Água Quente watershed

The CAQ, the watercourse that is the subject of this study, is part of the MBHCAQ, which is approximately 12.5 km² in size and located in the south of the municipality of São Carlos/SP (Teia, 2002).

The CAQ is approximately 6 kilometers long, and its surroundings are intensely anthropized. As can be seen in Figure 1, the banks and Permanent Preservation Areas (APPs) of the watercourse are densely occupied, mostly by low-income housing, such as in the Presidente Collor de Melo, Cidade Aracy, and Antenor Garcia neighborhoods.

In the case of the MBHCAQ, population density began in a disorderly manner, with occupation aimed at the low-income population, culminating "with the consolidation of the Cidade Aracy neighborhood, on the left bank of the same stream, in an area endowed with environmental fragilities and unsuitable relief and soil for buildings" (Lima, 2017, p. 12), with significant silting processes (Campanelli, 2012).

Since the 1980s, and especially in the 1990s, there have also been mineral extraction sites for the construction industry in the region and other areas of the municipality (Tóro-Tonissi, 2005), which increases the environmental fragility of the microbend.

The CAQ is intensely silted up, with several areas susceptible to erosion. These erosive processes have been intensified by the growing population density, deforestation, and agricultural activities impacting the watershed (Teia, 2002).

Figure 1 - Occupation of the banks of the Córrego da Água Quente.

Source: PERIOTTO, 2021 (adapted).

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The disorderly and massive occupation of the MBHCAQ "is associated with the period of sprawl of the city of São Carlos and the creation of peripheral neighborhoods, a process that was accentuated from the 1980s onwards" (Lima, 2017, p. 12). In this sense, back in the 1990s, Santos (1993) pointed to high levels of water contamination by fecal coliforms and nutrient concentration in the CAQ, demonstrating a low level of water quality in the water body, which is corroborated by subsequent analyses (Baio, 2009; Campanha, 2015; Barrenha, 2015; Periotto, 2021), which report worrying sewage contamination in the region.

Data from the 2017 National Basic Sanitation Survey by the Brazilian Institute of Geography and Statistics (IBGE, 2017) identifies 988 km of sewage collection network throughout the municipality of São Carlos and approximately 43 million liters of treated sewage per day, equivalent to 15.7 billion liters of sewage per year. Data from SAAE São Carlos regarding the production of treated sewage in 2017 (SAAE, 2017) show a volume of 21.6 billion liters of treated sewage that year, corresponding to approximately 98% of the sewage produced in the municipality.

Until 2016, the domestic sewage produced in the MBHCAQ was poured directly into the CAQ and the hillsides without any treatment. With the completion of the Água Quente and Água Fria EEE works, sewage from the Cidade Aracy, Antenor Garcia, Presidente Collor, Novo Mundo, Planalto Verde, Monte Carlo, Jardim Gonzaga, and CEAT neighborhoods was directed to the Monjolinhos ETE (Mazzuco; Moschini, 2018; Teia, 2002).

The Monjolinho WWTP has an efficiency of over 90% in removing organic matter and treats approximately 39 million liters/day (SAAE, 2020). In addition, the municipality sends sewage to the Santa Eudóxia WWTP, which serves the Santa Eudóxia district, with final post-treatment discharge into the Quilombo River, and the Água Vermelha WWTP, serving the Água Vermelha district, with treated effluents discharged into the Ribeirão das Araras (SAAE, 2020).

The São Carlos Municipal Basic Sanitation Plan (PMSSanCa), published in March 2012, reports that the sewage collection and disposal network in São Carlos reached, at the time of publication, 99% of urban households and 1% would be located on the outskirts of the city, but already with a project and request for funding so that it could be served (PMSSanCa, 2012).

Mazzuco and Moschini, when studying the Cidade Aracy neighborhood in particular, report that "access to urban public facilities in households is satisfactory, as they serve at least 98.60% of homes". The authors provide the following data (Mazzuco; Moschini, 2018, p. 11): 97.39% of households have sewage collection and disposal; 99.50% of households have a general or rainwater sewage system; 0.5% of households have a septic tank.

Despite the data on public facilities and sewage treatment figures presented here, the quality of the water in the CAQ is still inadequate, especially in terms of the physical and chemical parameters that identify the presence of sewage in the body of water. In this sense, according to Periotto (2021), in the water collected at ten different points in the CAQ in 2021, the presence of E.coli was verified, with values from 2,240 UFC/100ml to 22,880 UFC/100ml and total coliforms with values from 3,120 UFC/100ml to 28,840 UFC/100ml.

4.1.1 Results extracted from the diagnosis of the sewage collection system

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The diagnosis of sewage collection and disposal in the MBHCAQ points to an optimistic theoretical scenario since the (few) data published by SAAE indicate 100% service by the sewage collection network and the existence of pumping stations in the region. However, the factual scenario reveals a different reality, since it is notable that the domestic effluent from the micro-basin is not fully sent for proper treatment.

It should be added that the water quality diagnosis and monitoring data accessed were exclusively produced and disseminated by researchers and scientific papers, and no such data could be found on the Municipality of São Carlos website or SAAE.

Based on the diagnosis, it can be said that although there is a collection network in the watershed, domestic sewage is discharged into the QAC without proper treatment.

4.2 Analysis of federal, state, and municipal legislation related to sanitation

An analysis of the legislation makes it possible to understand the regulatory framework on the rights and obligations of the population with regard to basic sanitation, as well as provide the legal basis for any actions taken by the municipality with a view to adapting irregular sewage discharges. In addition, assessing the need to issue essential standards that do not yet exist is possible.

4.2.1 Federal legislation on sanitation

Law no. 11.445/2007 (Brazil, 2007) establishes the national guidelines for basic sanitation and Law no. 14.026/2020 (Brazil, 2020) updates its legal framework, amending Law no. 11.445/2007. The law requires the basic sanitation service provider to make the collection network infrastructure available up to the connection point of the property (art. 18-A). In this case, if the collection network exists, buildings must connect to it. They are subject to the payment of fees, tariffs, and other public prices related to service provision (art. 45). Failure to comply subjects the user to payment of a fine and other sanctions (art. 45, § 5º).

Brazil's new sanitation framework also requires the basic sanitation service provider to set a deadline of no more than one year for users to connect their buildings to the sewage network. In the event of non-compliance, the service provider must make the connection at a charge to the user (art. 45, § 6º). In the case of a property occupied by a low-income family, the law authorizes the connection to the network to be made free of charge by the provider of the public basic sanitation service (art. 45, § 8º). Only in the absence of public basic sanitation networks will individual solutions for the removal and final disposal of sanitary sewage be allowed (art. 45, § 1º).

Decree no. 7.217, of June 21, 2010 (Brazil, 2010) regulates Law no. 11.445/2007 (Brazil, 2007), establishing the rules for its implementation. Under this rule, public sanitary sewage services are considered to consist of one or more of the following activities: (i) collection, including building connection, of sanitary sewage; (ii) transportation of sanitary sewage; (iii) treatment of sanitary sewage; and (iv) final disposal of sanitary sewage and sludge originating from the operation of collective or individual treatment units, including septic tanks (art. 9º).

The Decree establishes that the rules regulating sewage services may stipulate a time

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limit for the user to connect to the public network, preferably not exceeding 90 days (art. 6, § 2). In addition, it authorizes legislation and regulatory norms to provide penalties for discharges of rainwater or sewage incompatible with the sanitary sewage network (art. 9, § 2).

Regarding low-income users, the Decree makes it possible to adopt subsidies to make the connection feasible, including within the home (art. 11, § 4º).

4.2.3 State legislation (São Paulo) on sanitary sewerage

State Law no. 7.750, of 03/31/1992 (São Paulo, 1992) (partially revoked by State Complementary Law no. 1.025, of 07/12/2007 (São Paulo, 2007) partially revoked it, keeping only some of its articles in force, and provided for the State Sanitation Plan as an instrument of the State Sanitation Policy. Although the law was published in 1992, the preparation of São Paulo's 1st State Basic Sanitation Plan began in 2021 and has not yet been finalized (PESB, 2023).

State Law no. 10.083, of September 23, 1998 (São Paulo, 1998) provides for the State Sanitary Code and, in Section II on Sanitary Sewage, establishes that any and all sanitary sewage systems are subject to inspection by the competent health authority in all aspects that may affect public health (art. 21).

State Decree no. 52.895, of 11/04/2008 (São Paulo, 2008) authorizes the Secretariat of Sanitation and Energy to represent the State of São Paulo in entering into agreements with São Paulo municipalities, or consortia of municipalities, aimed at drawing up municipal basic sanitation plans.

State Law no. 14.687, of 02/01/2012 (São Paulo, 2012d) instituted the "Pro-Connection Program", a financial subsidy for the low-income population to carry out the work necessary to make household sewage connections that require the execution of intra-household extensions, which will be described in a specific topic. This law was regulated by Decree No. 58.208 of July 12, 2012 (São Paulo, 2012b).

State Decree no. 58.107, of June 5, 2012 (São Paulo, 2012a) instituted the Strategy for the Sustainable Development of the State of São Paulo 2020, which aimed to establish an agenda for the sustainable development of the state, presenting sectoral goals that would define government action until 2020. With regard to sewage, the government's commitment was to universalize sanitation by 2020, with 100% sewage collection and 100% sewage treatment in all the state's municipalities.

State Law no. 17.383, of 05/07/2021 (São Paulo, 2021) provides for the creation of regional basic sanitation units in the state of São Paulo. In this sense, the law creates 4 Regional Units (URAEs) for the provision of public drinking water supply and sewage services (art. 3º). The law's Single Annex lists the URAEs and the municipalities that make them up. The municipality of São Carlos is part of URAE 2 - Centro.

The law establishes a period of 180 days for São Paulo municipalities to sign up to the respective URAE employing a formal declaration signed by the mayor (art. 4º):

Finally, in order to implement the necessary sanitary sewage infrastructure, São Paulo state has enacted rules that make it possible to create administrative easements, which allow expropriation for this purpose.

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4.2.4 Municipal legislation (São Carlos) on sewage disposal

Municipal Law no. 11.236, of October 23, 1996 (São Carlos, 1996) provides for the Policy of Protection, Control and Conservation of the Environment and Improvement of the Quality of Life in the Municipality of São Carlos. Art. Article 3 of the law gives municipal administration bodies the power to exercise supervisory and police powers in cases of non-compliance with environmental legislation.

Municipal Law no. 13.649, of 15/09/2005 (São Carlos, 2005) prohibits the direct or indirect discharge of rainwater into the sewage collection network and the discharge of sewage into the rainwater network. According to art. According to Article 2 of the standard, wastewater is classified as follows: (i) Rainwater: that which results from atmospheric precipitation and flows through building installations, streets, or urban public spaces; (ii) Domestic wastewater: that which results from domestic activity and human metabolism; (iii) Industrial wastewater: that which results from industrial activity, with characteristics other than domestic.

The 3 and 4 articles of this law establish the fiscal actions to be taken in the event of non-compliance with rule 1º. SAAE notifies the user in writing to regularize the connection to the network within 90 days; 2nd. After the notification period has elapsed, SAAE will verify, within ten working days, whether the irregularities have been remedied; 3rd. If the irregularities continue, the owner of the property will be fined by SAAE 25 São Paulo State Tax Units (UFESP). The fine will be charged monthly and included in the water and sewage bill until the irregularity is remedied. The value of the UFESP in 2023 is equivalent to R$34.26 and, in the case of the planned fine, would total R$856.50.

Ten days after the fine is imposed, SAAE may also initiate administrative proceedings to apply other sanctioning measures: - limit the supply of water to the respective property, supplied by the public network, by installing a flow-reducing device on the connection that supplies the property, maintaining only the minimum supply of water with the aim of satisfying the basic needs of the residents, until the irregularity is extinguished; - withdraw or revoke the License Permit for the implementation of underground water collection and use works, as well as informing the Department of Water and Electric Energy - DAEE of the fact; - if the irregularity persists, SAAE must inform the Municipal Department of Housing and Urban Development, so that the work can be embargoed or the construction interdicted, if applicable.

Suppose the irregularity persists twelve months after the monthly fine has been levied. In that case, SAAE must notify the Municipal Department of Housing and Urban Development to consider withdrawing or revoking the permit until the undue discharges are stopped and the connections are regularized.

Municipal Law no. 14.795, of 28/11/2008 (São Carlos, 2008) institutes the Municipal Environmental Education Policy, which enables environmental education actions and programs on basic sanitation in the municipality. Municipal Law no. 14.969, of 25/06/2009 (São Carlos, 2009) authorizes the municipal executive branch to enter into an agreement with CETESB to carry out environmental licensing and inspection procedures for activities and undertakings with a local impact.

Municipal Law no. 16.884, dated 20/11/2013 (São Carlos, 2013) institutes the Municipal Water Supply and Sanitary Sewerage Plan for São Carlos. Along these lines, the

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PMSSanCa, drawn up in 2012, foresees a horizon up to the year 2030 (PMSSanCa, 2012).

In establishing the objectives and goals for sanitary sewage in São Carlos, the PMSSanCa (2012, pp. 311-313) points out the following primary needs: - correction of cross-connections; - elimination of bad odors from sewage treatment; - access deficit; - absence of a bathroom for exclusive use by the household; and - deficiencies in the communication system between the local authority (SAAE) and users.

Table 108 of the PMSSanCa (2012, pp. 312-313) sets out the guidelines, objectives, and targets for sanitation, considering the 2030 horizon. The definition of sanitation programs, projects, and actions is illustrated in Table 111 of the PMSSanCa (2012, pp. 324-326), which involves structural and non-structural measures.

Municipal Law no. 17.005, of 20/12/2013 (São Carlos, 2013) institutes the Municipal Program for Environmentally Sustainable Urban Drainage in the Municipality of São Carlos and consolidates the Municipal Plan for Basic Sanitation. The law consolidates the Municipal Basic Sanitation Plan together with Municipal Law no. 14.480, of 05/27/2008, which provides for the Municipal Policy on Urban Cleaning and Solid Waste Management, and with Municipal Law no. 16.884/2013, which establishes the Municipal Water Supply and Sanitary Sewerage Plan for São Carlos (art. 2º).

Finally, in order to implement the necessary sanitary sewage infrastructure, the Municipality of São Carlos enacted rules that made it possible to create administrative easements.

4.2.5 Results extracted from the legislation examined

There are two premises for proposing plans, programs, and projects aimed at establishing public policies: a diagnosis of the current scenario and an assessment of the regulatory framework needed to support the proposal.

As far as the regulatory framework is concerned, there is sufficient legislative apparatus to implement the necessary measures and actions to regularize clandestine discharges, whether directed directly into the watercourse or through connections to the rainwater network.

In this sense, with the regulations currently in force, be they federal, state, or municipal, it is possible to implement projects, plans, programs, and policies aimed at stopping the discharge of raw sewage into the CAQ or any other water body located in the Municipality of São Carlos, including in order to comply with the regulations.

Brazil's new sanitation framework (Brazil, 2020) requires the basic sanitation service provider to set a deadline of no more than one year for users to connect their buildings to the sewage network. In addition, Federal Decree no. 7.217/2010 (BRASIL, 2010) establishes that the rules regulating sewage services may set a deadline for the user to connect to the public network, preferably not exceeding 90 days (art. 6, § 2).

In terms of municipal inspection, Law no. 13.649/2005 (São Carlos, 2005), grants sanctioning police power to SAAE, which is an autocracy. Municipal Law no. 21.490, of 05/05/2023 (São Carlos, 2023), which provides for the administrative organization of SAAE, can be seen in art. Seventy-five of the duties of the Inspection Department, which is part of the Loss Management and Control Department. Point IV of Art. 75 defines the Inspection Sector as

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responsible for "notifying and fining users in whose properties clandestine connections are detected; abuse and/or waste of water; theft of water or fraud in water and/or sewage installations and equipment" (São Carlos, 2023). It can be seen, therefore, that SAAE is legally authorized to levy an administrative penalty.

However, it is important to note that the fine provided for by Municipal Law no. 13.649/2005 (São Carlos, 2005) is, in 2023, approximately R$ 856.50. When considering the budget for structural works to connect to the collection network, as well as the water and sewage tariffs, the user can assess whether it is financially worthwhile to regularize the discharge of sewage from their home or be subject to the penalty of a fine. Thus, the existence of a sewage collection system is the first step, and the cessation of sewage discharge requires several other steps for it to be effective and efficient, with incentive measures of all kinds, not just financial.

Finally, it should be noted that the PMSSanCa, although it sets targets for 2030, is out of date. Published in 2012, it has not been revised since, and Federal Decree no. 7.217/2010 (Brazil, 2010) establishes that the basic sanitation plan must be reviewed periodically, within no more than four years. As this has not happened, the guidelines, objectives, and targets set fall short of the current reality and are not based on the principles and commitments adopted with the 2030 Agenda and the Sustainable Development Goals (SDGs).

4.3 Analysis of three Brazilian case studies that promote actions aimed at adapting property connections to the collection network

The "Se Liga" and "Ligado na Rede" programs, implemented in the municipality of Niterói, in the state of Rio de Janeiro, aim to increase connections to the municipal sewage network, avoiding the discharge of raw sewage into water bodies.

In addition to these, the "Programa Pró-Conexão" was promoted by the São Paulo State Government, which instituted a financial subsidy for the low-income population to carry out the works necessary to make household sewage connections that require the execution of intra-household extensions, as described in State Law no. 14.687, of 02/01/2012 (São Paulo, 2012d), regulated by Decree n. 58.208, of July 12, 2012 (São Paulo, 2012b).

4.3.1 "Se Liga" project

In 2008, the state of Rio de Janeiro issued Decree no. 41.310, of 15/05/2008, granting a deadline for irregular properties to connect to the sewage collection system (Rio de Janeiro, 2008). The "Se Liga" project originated from this normative act, with the signing of a technical cooperation agreement between the state environmental agency of the state of Rio de Janeiro (Instituto Estadual do Ambiente - INEA) and the water and sewage service concessionaire of the municipality of Niterói, called Águas de Niterói.

The "Se Liga" project has been running since 2016 in various regions of the municipality of Niterói. The aim of the project is to identify, raise awareness of, notify, and, as a last resort, find residential properties that are not connected to the municipality's sewage system. The program's actions are as follows: (i) the Águas de Niterói concessionaire carries out surveys to identify residential properties that are not connected to the collection network and explain the

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need/obligation to connect; (ii) the survey data is sent to the state environmental agency (INEA), which has the power to inspect and apply sanctions; (iii) with the data, the state environmental agency issues a notification to those responsible for the property to make the connection within 60 days; (iv) after the notification period, the team carries out a new inspection and, if the property has not been connected to the network, a notice of infraction is issued, based on State Law no. 3.467, of September 14, 2000, which provides for administrative sanctions arising from conduct harmful to the environment in the state of Rio de Janeiro (Rio de Janeiro, 2000).

By 2018, the "Se Liga" project had raised awareness of the need to connect to the municipal sewage system (carried out during inspections and with information leaflets), enabling 1,377 residential properties in the municipality of Niterói to be connected. As of 2021, the program "Ligado na Rede" (Connected to the Network) has been running as a continuation of the "Se Liga" project.

4.3.2 "Connected to the Net" program

The "Connected to the Net" Program, an initiative of the municipal government of Niterói, began to be developed in 2021, with the completion of some stages of the "Se Liga" Program. The program is identical to "Se Liga". It aims to conduct inspections to identify, raise awareness, notify, and, as a last resort, fine residential properties that are not connected to the sewage system in the municipality of Niterói. The normative basis for implementing the program is Municipal Law no. 2.370, 20/07/2006 (Niterói, 2006), obliging buildings to connect to the sanitary sewage collection network. The program is managed by Niterói's Municipal Secretariat for the Environment, Water Resources and Sustainability (SMARHS), with Águas de Niterói as a partner.

The Municipality of Niterói chose the main basins that discharge effluent into the municipality's lagoons as priority regions for the program's first phase. The inspections take place weekly and, as of September 2021, more than 1,500 properties have been inspected. Of the 1,500 residential properties, 1,100 were connected to the sewage system and 66 were irregular and were notified to connect within 60 days. In 778 residential properties, those responsible were absent and, in these cases, the inspectors returned to try again, including at weekends (Cidade de Niterói, 2021). In May 2021, an agreement to expand the program was signed between the municipality and the Águas de Niterói concessionaire to connect approximately 500 residential properties belonging to socially vulnerable families that were not connected to the sewage network free of charge (Niterói, 2021).

4.3.3 "Pro-Connection" program

The "Pro-Connection Program" was instituted in the state of São Paulo by State Law no. 14.687, of 02/01/2012 (São Paulo, 2012d) and regulated by State Decree no. 58.208, of July 12, 2012 (São Paulo, 2012b). The objective of this Program is to "financially subsidize the execution of intra-domiciliary extensions necessary to make connections to the public sewage collection network, in households of low-income families that agree to join the Program, in municipalities that have their services operated by the Basic Sanitation Company of the State of

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São Paulo - SABESP" (São Paulo, 2012d, art. 1º).

In the case of municipalities not operated by SABESP, State Law no. 14.687, of 02/01/2012 authorizes the State Government to enter into agreements for the creation of a program of this nature (São Paulo, 2012d, art. 1º, § 3º). Annex III of State Decree no. 58.208, of 12/07/2012, amended by Decree no. 58.280, of 08/08/2012 (São Paulo, 2012c) establishes the connection targets in the regions of the State of São Paulo, including municipalities in the interior of São Paulo. There is no information about the municipality of São Carlos joining the Pro-Connection Program.

The Sanitation Coordination - CSAN of the São Paulo State Secretariat for Infrastructure and the Environment (CSAN, 2021), in its Report on the Activities of the State Administration in 2020, clarified that negotiations had begun with the State Secretariat for Finance and Planning with a view to continuing the Program.

4.4 Compilation of strategies, guidelines, and actions drawn from the regulatory framework and case studies

Based on the diagnosis, the regulatory framework, and the case studies analyzed, it is possible to compile guidelines based on them to survey, identify, and regularize irregular sewage discharges (directly into the watercourse or clandestine connections to the drainage network).

As the area around the CAQ is mostly occupied by low-income families, there are no regulatory obstacles to the municipality of São Carlos joining the "Pro-Connection Program" of the state of São Paulo. Along the same lines as art. 45, § 8 of the new Sanitation Legal Framework (Brasil, 2020), the "Programa Pró-Conexão" aims to "financially subsidize the execution of intra-domiciliary extensions necessary to make connections to the public sewage collection network, in households of low-income families that agree to join the Program". In the case of municipalities not operated by SABESP, which is the case of São Carlos, State Law no. 14.687/2012 (São Paulo, 2012d) authorizes the state government to enter into agreements to create a program of this nature (art. 1º, § 3º).

In addition, São Carlos/SP has the necessary regulatory framework to implement an incentive program to connect to the collection network along the lines of the programs presented ("Se Liga" and "Ligado na Rede"), with the aim of identifying, raising awareness, notifying and fining residential properties that are not connected to the network. As can be seen from the rules analyzed, SAAE, through its Inspection Department, has the power to conduct inspections to identify residential properties not connected to the collection network. In addition, Municipal Law no. 13.649, of 15/09/2005 (São Carlos, 2005) establishes the inspection and regularization procedures, such as issuing a written notification to the person responsible for the property to regularize the connection to the network within 90 days. After the notification period has expired and if the property has not been regularized, SAAE is authorized by Municipal Law no. 13.649, of 15/09/2005 (São Carlos, 2005) to find the person responsible for the property 25 São Paulo State Tax Units - UFESP. According to the law, the fine can be charged monthly and included in the water and sewage bill until the irregularity is remedied.

The implementation of this type of program can be carried out in collaboration with various bodies, as authorized by the rules analyzed: (i) with the Municipal Department of

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Environment, Science, Technology and Innovation, since Environmental Education actions are provided for in the scope of the Department, as provided for in Municipal Law no. 14.795, of 28/11/2008 (São Carlos, 2008). In addition, Municipal Law no. 11.236, of 23/10/1996 (São Carlos, 1996) defines the competence of municipal bodies regarding the inspection and control of polluting sources; (ii) with CETESB, by means of an agreement, as authorized by Municipal Law no. 14.969, of June 25, 2009 (São Carlos, 2009), which allows for cooperation in environmental inspection; (iii) with the Environmental Police, for support in inspection and enforcement actions, according to SIMA Resolution no. 05, of January 18, 2021 (SIMA, 2021), which provides for environmental offenses and their respective administrative sanctions.

In the case of buildings very close to the watercourse, where the body of water is at a lower level than the property, it is usually necessary to raise it to the collection network, which is at a higher level than the building, making the connection difficult due to the need for structural works. The initial investment and operational costs of pumping can make it impossible to connect to the grid. In these exceptional cases, the creation of administrative easements, such as the aforementioned municipal regulations that created a right of way for a sewage structure, could provide access to the implementation of an additional auxiliary collection network, so as to enable the sewage to be directed to the network and thus to be properly treated.

Finally, it is worth highlighting the permissive norms regarding educational actions and community involvement, based on Municipal Law no. 14.795, of 28/11/2008 (São Carlos, 2008). The sense of belonging and identification with the watercourse and the benefits of basic sanitation can be stimulated with educational actions and thus generate positive and preventive effects, without the need for repressive and coercive actions.

5 CONCLUSION

Statistical analysis based on data from the National Sanitation Information System shows that 54.1% of the Brazilian population has a sewage system and 49.1% of the country's wastewater is treated. Targets 6.2 and 6.3 of SDG 6 set out to achieve access to adequate and equitable sanitation and hygiene for all and improve water quality by 2030. There is a scenario of progress, considering Brazil's status a few years ago. In the case of MBHCAQ, it was only in 2016 that the minimum infrastructure was in place to direct sewage to the appropriate treatment.

The framework of measures needed to improve water quality and universalize sanitation requires the joint participation of the public authorities and the community and individuals involved. To this end, publicizing data and access to information is essential to start any debate. For the preparation of this work, it was very difficult to obtain municipal public information and data on sanitation, which demonstrates the fragility of access to data and information for anyone.

Finally, it is important to emphasize that the expectation of success in any action and measure requires continuity and commitment. It will not be interrupted in case of a change in public managers or a budget redirection to other purposes.

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