

# Graphical analysis of the right to water in Brazilian capitals after privatisation.

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**Abstract.** Access to drinking water is a fundamental human right recognised by the United Nations and enshrined in the 1988 Federal Constitution of Brazil. The growing privatisation of water supply services in the Brazilian capitals has raised concerns regarding the effectiveness of this right, particularly in terms of universal access, service quality, and applied tariffs. This article, aligned with Sustainable Development Goal 06 of the UN 2030 Agenda, proposes a graphical analysis of the impacts of privatisation on water rights. Drawing on economic, financial, and administrative indicators, it seeks to determine whether such processes have led to progress or setbacks in the fulfilment of this essential right. The study is justified by the social, legal, and political relevance of the issue, especially in the context of redefined state roles in public services. A hypothetical-deductive methodology is employed, combining hypothesis formulation with statistical techniques for constructing and interpreting graphs representing variables such as water quality and distribution losses. The aim is to provide empirical evidence to support academic discourse and the development of public policies that ensure the right to water in Brazil.

**Keywords.** Water rights, privatisation, Brazilian capital, sustainable development, public law.

## 1. Introduction

Access to drinking water is a fundamental human right recognized by the United Nations and enshrined in the 1988 Federal Constitution, which guarantees human dignity and the right to an ecologically balanced environment. However, the growing trend of privatisation of water supply services in the Brazilian capitals has generated controversy regarding the effectiveness of this right, especially given the possible impacts on universal access, quality of services and tariffs applied. Aligned with Sustainable Development Goal 06 of the UN 2030 Agenda, which seeks to ensure the availability and sustainable management of water and sanitation for all, this article proposes a graphic analysis of the right to water in the Brazilian capitals after the privatisation processes of supply systems. The central purpose is to investigate, based on economic-financial and administrative indicators, whether privatisation has promoted advances or setbacks in fulfilling this essential right. The justification for this study lies in the social, legal and political relevance of the topic, especially in a scenario of reconfiguration of the role of the State in public services and of growing debate about the

limits of private action in strategic sectors. To this end, a hypothetical-deductive methodology is adopted, based on the formulation of hypotheses about the effects of privatisation, combined with the application of statistical techniques for the construction and interpretation of graphs representing variables such as water quality and water loss in distribution. This approach aims to provide empirical evidence to support academic debate and the formulation of public policies aimed at guaranteeing the right to water in Brazil.

## 2. Methodology

This research adopts a mixed methodological approach that integrates bibliographical survey, statistical analysis, and application of the hypothetical-deductive method. Initially, a bibliographical review was carried out on water rights, with emphasis on national and international legal frameworks, as well as on the foundations of public law applicable to the provision of essential services by state and private entities. For the empirical analysis, secondary data obtained through access to open public and official databases were used, such as the National Sanitation Information System (SNIS), maintained by the Ministry of Cities

of the Federal Government, and the National Program for Monitoring the Quality of Water for Human Consumption (VIGIAGUA), linked to the Ministry of Health. These data were subjected to treatment procedures, including cleaning, organisation and standardisation, to allow their subsequent statistical exploration and the elaboration of graphs representing variables. Therefore, the results were analysed based on the hypothetical-deductive method, based on the formulation of hypotheses related to the effects of privatisation on the right to water in Brazilian capitals.

### 3. Water as a fundamental right

Water rights are a crucial element of sustainable development, which aims to reconcile economic growth, social justice and environmental protection for present and future generations. The Brazilian Constitution ensures, among its foundations, the dignity of the human person (art. 1, III), the right to health (art. 6 and art. 196), and the right to an ecologically balanced environment (art. 225). All are related to ensuring access to safe drinking water. Therefore, water is considered a public good essential to life, management, and distribution which must be guided by the collective interest and the principle of social function.

“Fundamental rights constitute the set of rights deemed essential for an individual to enjoy a human standard of living. [...] Attention is drawn to the fact that the absence of a fundamental right from the Constitution does not disqualify it from being considered fundamental; however, having a locus in the Constitution reveals several benefits for its beneficiaries. It is important to affirm that the lack of an express constitutional provision regarding the fundamental right of access to drinking water does not hinder the achievement of targets 6.1 and 6.4 (in fine) of SDG 6 in the Brazilian context. On the other hand, legal doctrine argues that the constitutionalisation of a right fosters greater engagement by both the Public Authorities and society in ensuring its effectiveness”. [1]

Correspondingly, in 2002, the United Nations Committee on Economic, Social and Cultural Rights issued General Comment n.º 15, which recognised the human right to water as an integral part of the right to a life with dignity. According to the document, this right is intrinsic to the rights to health, food, and adequate housing, all guaranteed by the International Covenant on Economic, Social and Cultural Rights. Thus, the General Comment establishes that access to water must meet fundamental criteria: availability, quality and safety, acceptability, and physical and economic accessibility, in addition to complying with the general principles of human rights. In this regard, water must be available in sufficient quantity for personal and domestic use; it must be safe, of good quality, and free from health risks; it should exhibit acceptable sensory characteristics, such as colour,

odour, and taste, to prevent individuals from resorting to unsafe alternative sources; and it must be accessible to all.

However, “according to a report published by UNICEF in 2015, there are still many disparities regarding access to water and sanitation. While populations living in more developed regions have achieved universal access to these resources, 48 countries considered to have low development still face significant deficiencies, particularly in Sub-Saharan Africa and Southeast Asia. Furthermore, the same report indicates that 8 out of 10 individuals who still use inappropriate water sources and 9 out of 10 who practise open defecation live in rural areas. This account demonstrates that, despite progress, the most vulnerable populations remain at a disadvantage in terms of access to water and sanitation”. [4][5]

Millennium Development Goal (MDG) 7, titled “Ensure Environmental Sustainability”, included among its targets the aim of halving, by the same year and using 1990 as the baseline, the proportion of the population without sustainable access to safe drinking water and basic sanitation services. To build upon the progress achieved through the Millennium Development Goals (MDGs), incorporating human rights principles, the Sustainable Development Goals (SDGs) established in 2015 to eradicate poverty in all its forms and dimensions. The 17 goals are grounded in the Universal Declaration of Human Rights and International Human Rights Treaties, seeking to combat inequalities and promote human rights for all. [5]

This approach is reflected in the United Nations 2030 Agenda through Sustainable Development Goal 6 (SDG 6), which establishes the goal of ensuring the availability and sustainable management of water and sanitation for all. In this framework, water is recognized as a natural resource and a human right that is indispensable to health, food security, eradication of poverty and promotion of equity. These goals aim to foster a balance between economic, social, and environmental dimensions of sustainable development.

But, “the greatest disadvantage associated with declarations, principles, resolutions, and action plans lies in the fact that they remain political statements, which do not possess the quality of legal enforceability. Although they indicate the gradually emerging trend of international opinion and State practice, and could also lead to the incremental evolution of rules towards binding treaties”. [6]

Although they are non-imposing laws, they can be considered an opportunity for States to analyse the negative and positive impacts of their effectiveness and legal compliance, observe the relevance of international norms and laws for the possible elaboration of action plans, and open up debates and discussions in the national political scenario for

recognition of future law.

#### 4. Concession policy in basic sanitation

The concession policy in Brazil, especially in the basic sanitation sector, has been the main legal and administrative instrument used to enable the participation of the private sector in the provision of public water supply and sewage services. In the Brazilian model, the concession is regulated by Law n.º 8.987/1995 (Concessions Law) and, more recently, by the new Basic Sanitation Legal Framework (Law n.º 14.026/2020), which amended Law n.º 11.445/2007. Through the concession, the government transfers to the private sector the responsibility for the operation, maintenance and expansion of services, for a fixed term and through a bidding process, while the ownership remains with the federative entity (usually the municipality).

“This new law encourages the inclusion of the private sector in the provision of water distribution and sewage treatment services by requiring states and municipalities to conduct public tenders when implementing such services, thereby removing the preferential rights previously held by the State Basic Sanitation Companies – CESBs”. [7]

Therefore, the concession represents a form of contractual delegation of a public service, in which the concessionaire assumes risks and responsibilities, and is remunerated, as a rule, by collecting fees from users. In the case of the water sector, this arrangement seeks to attract private investment to expand coverage and improve operational efficiency, with contractual performance targets and quality indicators. However, this policy has generated debates about its effectiveness, especially regarding the guarantee of the universal right to water, affordable tariffs and social control. Common criticisms point to the risk of excluding the most vulnerable populations and prioritizing profit over the public interest.

“The transition from a public to a private management model created a system of shared governance over water and sewage services, in which the public sector retains ownership — that is, control and responsibility over infrastructure and exceptional costs—while the private sector assumes responsibility for service provision according to pre-established criteria. This dynamic of private concession has been replicated in several countries across Europe and the Americas, albeit with varying degrees of intensity.” [7]

According to this perspective, state sectors were transferred to the private sector through privatization or public concession. The main justification for this change was to contain government spending, reduce public debt and improve the quality of services and products offered, betting on free competition guided by the so-called “invisible hand” of the market. This new

institutional model marked the transition from a producing State to a regulating State of services.

From this, there are four main Brazilian cities under the basic sanitation concession regime or complete privatization, that is, private companies managing water bodies and their distribution to the population. They are:

- Fortaleza/CE:** managed by the Ceará Water and Sewage Company (CAGECE), under a concession regime since 2023, following the opening of private investments, configured as the largest Public-Private Partnership (PPP) project in the country in the basic sanitation sector.
- Maceió/AL:** dual management by the company BRK Ambiental S.A and the mixed-economy company Companhia de Saneamento de Alagoas since 2020.
- Rio de Janeiro/RJ:** management divided by regions between the companies Iguá Rio de Janeiro S.A., Águas do Rio S.A and Rio+ Saneamento, in addition to the State Water and Sewage Company (CEDAE), which has a mixed economy, since 2021.
- São Paulo/SP:** management by the Basic Sanitation Company of the State of São Paulo (SABESP) under a concession regime since 2024.

#### 5. Water analysis in Brazilian capitals

##### 5.1 Microbiological Standard Analysis

For the analysis, the information panel on monitoring basic water quality parameters from the National Water Quality Monitoring Program for Human Consumption (Vigiagua) was used. This consists of a set of actions continuously adopted by public health authorities in different spheres of activity to guarantee the population access to water in sufficient quantity and quality compatible with the potability standard established in current Brazilian legislation. This monitoring must follow the National Guideline for the Sampling Plan for Surveillance of Water Quality for Human Consumption, published by the Ministry of Health and covers the following parameters: Turbidity, Combined Residual Chlorine, Free Residual Chlorine, Total Coliforms and *Escherichia coli*. [8]

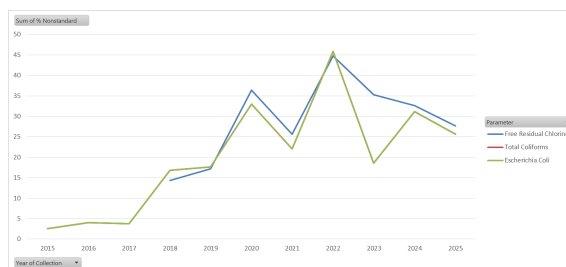
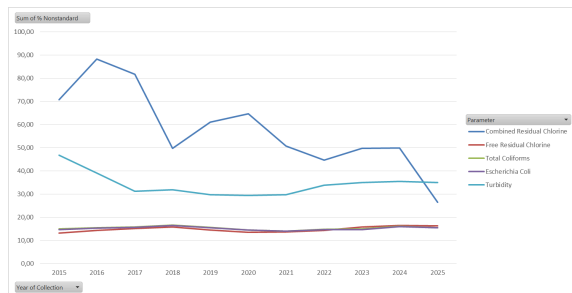


Fig. 1 - Non-standard parameters in the city of Fortaleza/CE.

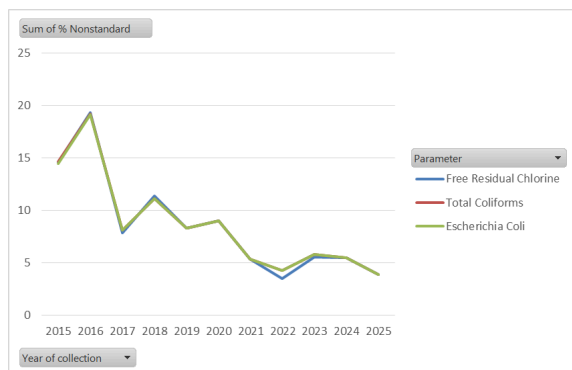
In graph 1, it can be seen that Free Residual Chlorine

was only computed from 2018 onwards, with a three-year data deficit. In addition, turbidity and Combined Residual Chlorine data were not counted in any year. Finally, the sudden increase in *Escherichia Coli* after 2023 is noticeable, despite being in recession during 2025, which is still being cataloged.



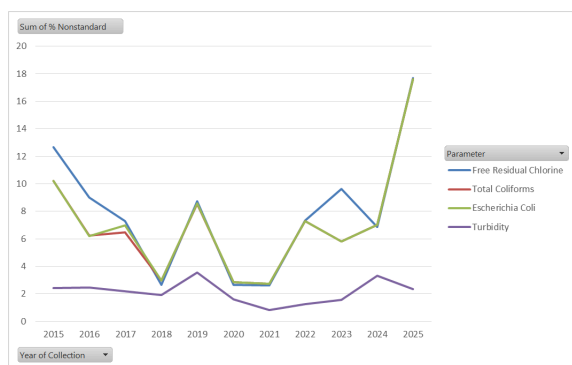
**Fig. 2** - Non-standard parameters in the city of Maceio/AL.

In graph 2, all categories were structured. There is no peak in the microbiological pattern, with small percentage variations occurring between each year, which does not suggest that changes occurred between the entry of private partnerships or not.



**Fig. 3** - Non-standard parameters in the city of Rio de Janeiro/RJ.

In graph 3, turbidity and Combined Residual Chlorine data were not counted in any year. Furthermore, the data between the categories is extremely close, although not equal due to the decimal places. After 2021, there was a small increase in the levels, however it remains below the previous decade.



**Fig. 4** - Non-standard parameters in the city of São Paulo/SP.

In graph 4, all categories were structured. There is no peak in the microbiological pattern. Unlike the other

graphs, the trend is for an increase in the levels of each category, which demonstrates concern for the health of the city's population.

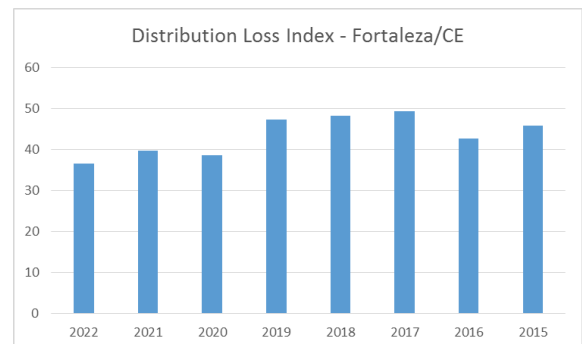
## 5.2 Distribution Loss Index Analysis

For this analysis, the SNIS was used, which is a unit linked to the National Secretariat for Environmental Sanitation (SNSA) of the Ministry of Cities and gathers data on basic sanitation services in Brazilian urban areas. Since 2015, the "Distribution Loss Index" has been analyzed, which addresses the following factors through the calculation below:

1. AG006: Volume of water produced
2. AG010: Volume of water consumed
3. AG018: Volume of treated water imported
4. AG024: Volume of service

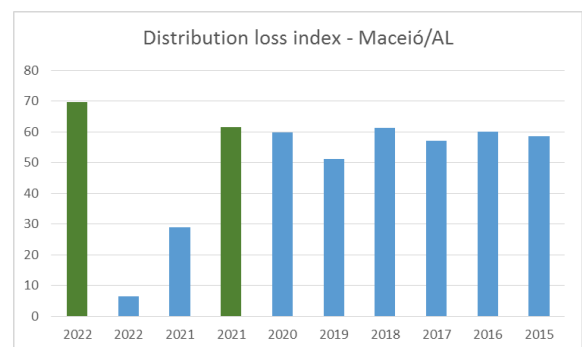
$$\frac{AG006 + AG018 - AG010 - AG024}{AG006 + AG018 - AG024} \times 100$$

**Fig. 5** - Distribution loss index calculation.



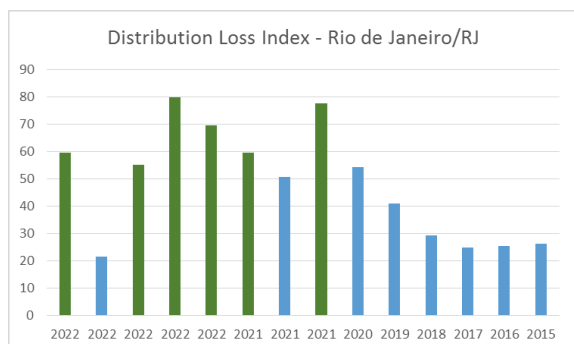
**Fig. 6** - Distribution loss index in the city of Fortaleza/CE.

From graph 6, it can be seen that the levels of water loss are higher than the national level, estimated at around 39%. However, it is not possible to assess the impacts of private administration, noting that it occurred in the city from 2023 onwards.



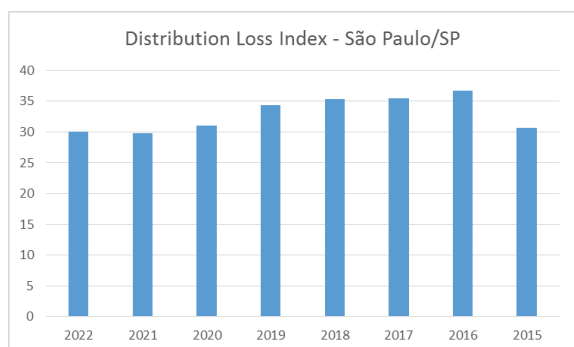
**Fig. 7** - Distribution loss index in the city of Maceio/AL.

From graph 7, it can be seen that after private participation, the increase in the loss of water levels in distribution to the population increased considerably, which could affect the lack of water for residents and an increase in the tariff for costs.



**Fig. 8** - Distribution loss index in the city of Rio de Janeiro/RJ.

From graph 8, it can be seen that after private participation, there was an increase in the loss of water levels in distribution to the population in all private companies that participate in water management in the city, making the city of Rio de Janeiro one of those that loses the most water in distribution, both in relation to cities with public, mixed economy or private participation.



**Fig. 9** - Distribution loss index in the city of São Paulo/SP.

Graph 9 shows that water loss levels in distribution have been reduced over the years, and are now below the national level. However, it is not possible to assess private participation, as it occurred in the city after 2024.

## 6. Conclusion

Although it is not explicitly enshrined in the Brazilian Constitution, the right to water is determined and made public to the country's population through considerations based on the right to human dignity, as well as the right to a healthy environment. Along with the Constitution, Brazilian legal and political sources consider international standards and treaties as a basis for debate, discussions and internalization for enforcement and, ultimately, concreteness and efficiency in the country. To this end, Agenda 2030, through the Sustainable Development Goals, specifically SDG 06, conveys a message that water must be recognized as a natural resource and a human right that is indispensable to health, food security, eradication of poverty and promotion of equity.

Based on this, this article sought to address the

concession policy for basic sanitation in Brazil. This model aims to allow the participation of the private sector in water and sewage management in cities. However, this policy has generated debates about its effectiveness, especially regarding the guarantee of the universal right to water, affordable tariffs and social control.

Therefore, a search was carried out in open public secondary data on microbiological patterns of water and water loss in distribution before and after the concessions. Thus, it was concluded that the cities of Maceió and Fortaleza are stable in relation to microbiological patterns, while Rio de Janeiro is declining, and São Paulo has seen a large increase in its levels - characterizing a serious scenario in relation to the health of the inhabitants. As for water loss in distribution, it was not possible to account for the cities of Fortaleza and São Paulo, since the data were up to the year 2022. Finally, the cities of Rio de Janeiro and Maceió have seen significant increases in their losses, which could cause serious harm to the population in terms of the arrival of drinking water in their homes.

## 7. Acknowledgement

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