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Financing water and sanitation services: two types of funds for facing investment challenges in Brazil

La financiación de los servicios de agua y saneamiento: dos tipos de fondos para hacer frente a los desafíos de la inversión en el Brasil

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Abstract
In the countries of the Global South, investments in the water and sanitation sector have historically not met the overall needs. The poor are generally the most affected. The creation of funds to support universalization of water supply and sewerage services may represent an important instrument as a sustainable investment strategy. This study displays the features and characteristics of two distinct fund models at the state level in Brazil. It indicates that despite challenges these funds offer opportunities for meeting the main objective of the water and sanitation policy in Brazil, the universalization of service provision. It suggests also that the Brazilian experience might be adapted to other contexts.

Keywords: investment gap; universalization; financing mechanisms.

Resument
En los países del Sur Global, las inversiones en el sector del agua y el saneamiento no han satisfecho históricamente las necesidades generales. Los pobres son generalmente los más afectados. La creación de fondos para apoyar la universalización de los servicios de abastecimiento de agua y de alcantarillado puede representar un instrumento importante como estrategia de inversión sostenible. En el presente estudio se exponen las características y los rasgos de dos modelos de fondos distintos a nivel estatal en el Brasil. Los resultados muestran que, a pesar de los desafíos, estos fondos ofrecen oportunidades para cumplir el principal objetivo de la política de agua y saneamiento en el Brasil, la universalización de la prestación de servicios. También sugiere que la experiencia brasileña podría adaptarse a otros contextos.

Palabras claves: *brecha de inversión; universalización; mecanismos de financiación*.

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1. INTRODUCTION

Water and sanitation services are characterized by intense immobilization of capital due to the massive infrastructure typically required for their operation (Decker, 2015). In developing countries, investments have been generally insufficient to meet the needs and priority has clearly been given to water supply services and urban areas, affecting especially the poor. Therefore, a great deficit in the universalization of services persists, especially regarding sanitation services and rural areas (Hukka & Katko, 2015; Kumasi, 2018; Queiroz & Nascimento, 2016). Nevertheless, covering the demand for service expansion represents only part of the challenge.

There is also an increasing need for financial resources to replace infrastructure, issue that affects developed countries as well. Therefore, the task of promoting sustainable universalization is enormous.

This scenario suggests the urgency of assessing the problem of financing within new rationales, strategies and approaches (Hukka & Katko, 2015; Cucos et. al, Ruiters & Matji, 2016) (Hukka & Katko, 2015; Ruiters & Matji, 2016). The gap in investment resources needed to meet the goals of universal water and sanitation services, as well as the benefit of these services, has already been the subject of several studies (Hutton 2012; Hutton & Varughese, 2016; OCDE, 2011; OCDE, 2010). However, the discussion on mechanisms to overcome the deficit is still limited (OECD 2011; Ruiters & Matji, 2016), especially with regards to case studies, which is the main contribution of the present study.

This study dresses upon the investment deficit data of the Brazilian National Plan for Basic Sanitation (Plansab) and identifies different financing mechanisms historically employed. However, in light of limitations faced, this paper proposes two fund models to be used as complementary instruments. Included herein is a discussion regarding the concept and nature of the services and their users, as well as decisions to be made by society related to how, where and in what to invest in. This paper argues that establishing funds for the universalization of water and sanitation services represents an important instrument for ensuring sustainable investments, as it was the case of other industries (Brasil, 2011). However, there is limited literature using this approach.

The present study seeks to contribute to a better understanding of the financial challenges of service expansion. Due to the complexity of the institutional panorama of service provision, the present analysis is narrowed down to the Brazilian state of Minas Gerais.

The Water and Sanitation Act (WSA), No 11.445 of 2007, the primary federal law governing the water and sanitation sector and establishes guidelines for, and responsibilities for governments. This law formally foresees the creation of regional and local governmental funds aiming at financing service universalization. Tariff revenues are one of the possible financial sources (BRASIL, 2007).

The WSA introduces the obligation that independent regulatory agents oversee service providers. Because the sector is characterized by a natural monopoly, regulation is supposed to prevent the abuse of economic power and to protect the rights of users.

Therefore, regulatory ruling should cover aspects such deadlines for progressive expansion goals, quality standards, the tariff policy among other aspects (BRASIL, 2007). Two important features of this framework are similar to those found in other countries of the Global South: the centrality of local governments and the presence of autonomous regulatory bodies in charge of calculating tariffs (Berg, 2013)

1.1 Characterization of the investment deficit in Brazil: insufficient trajectory

Public service providers in developing countries often charge less than necessary to cover operation costs, to the detriment of service quality and slow expansion (Gerlach & Franceys, 2010). The tariff, when charged, is often only sufficient to recover the operation and maintenance costs, while expansion, replacement and repair costs, which are more significant, are rarely covered (A/HRC/3039).

Since the late nineties, international discourse has advocated for cost recovery through tariffs together with privatization schemes. Although expansion targets and quality standards were not necessarily met, private operators forced the increase in tariff levels that especially affected the poor and in many cases led to social pressure and even to renationalization of water services. Regardless of the model of service provision, though, there is unused-yet narrow-room for assigning financial resources to both operation costs and service expansion through

tariffs. The case of Brazil is no different. The slow development of the sector indicates that the investment capacity is insufficient. Thus, this paper proposes the concept of investment deficit as the difference between the estimated resources needed (according to the Plansab) and the existing capacity to invest. To fill this gap, this study proposes and discusses the features of two types of funds. Borja (2014) gathered the most common water and sanitation financial resources in Table 1.

Table 1. Main financing sources of water and sanitation in Brazil

Type	Source
Non-costly resources	General budget – Public grants – Treasure (Union, States, Municipalities and Federal District).
Costly resources	Funds managed by the Federal Government (FGTS and FAT/BNDES).
Service provider resources	Taxes and tariffs
National System Resources of Water Resources	Charge for the use of Water resources
Outside loans	Loans from international organizations (BID, BIRD, JBIC, KfW).
Private resources/instrument	Partnership with the private sector Real State entrepreneurs. Debentures. Stocks and bonds. Credit Right Funds (FIDC), Real State Investment Funds (FII).

Source: Borja (2014)

Historically, public budgets have been the most important sources, followed by international organizations. Tariffs have been used as well, even if only partially. Although charges for the use of water resources are very important for funding sewage treatment plants in other countries, such as France (MARETTE et. al., 2006), this instrument has limited use in Brazil. In some Brazilian states, public companies have sold part of their stock in the market, bringing in financial resources from private actors. This was the case of the company of the state of Minas Gerais, which conducted its IPO in 2006. Focusing on Minas Gerais, this paper identifies the investment levels needed to attain universalization and estimates the investment capacity based on the trajectory of all investment sources combined. The difference between them constitutes the investment deficit, to be overcome through new sources in order to achieve universalization. For Minas Gerais, the main financing resources are, in addition to tariffs, government grants and public or private debt. It is important to understand that underneath the choices related to the financing method lays a broader discussion regarding the nature of water sanitation services. For some, it is a strictly commercial relation between providers and users, while for others it is a right. Choices here have a significant influence on the redistributive effect of a public policy (MULAS, 2013).

1.2 New strategies for financing the deficit: Water and sanitation as a right

Different ideas guide the discussions on how to overcome the challenge of sanitation financing, where the principle of cost recovery by the end user via a tariff tends to prevail. In this perspective, there are distinct positions which oscillate between a full cost recovery (WORLD BANK, 2004) and a sustainable cost recovery (OECD, 2009). In the first case all costs should be paid by the users, while in the second part would be covered by other sources, public or private. Furthermore, according to the OCDE (2010) this mechanism would assure future and secure cash flows by the combination of tariffs, taxes and transfers, and the use of such revenues as a basis to attract loans from the private sector. In any case, the problem of affordability to end users must be considered through proper systems of subsidies and tariff structures (OCDE, 2009). However, the higher the tariffs, the harder it is to solve the equation. Nevertheless, access to these services may also be considered a human right (UN Resolution 64/292 of 2010). States have thus immediate and binding obligations to achieve progressively the full realization of the human rights to water and sanitation (A/HRC/3645). Therefore, in addition to the discussion of affordability to the end user, public policies must provide financing mechanisms, such as funds, to realize this right (SULTANA; LOFTUS, 2010).

2. METHODOLOGY

In the state of Minas Gerais, the major service provider is Copasa (Water and Sanitation State Company) and concessions in 586 municipalities (243 for water and sanitation and 343 for water only). Approximately 90% of the urban population in the areas covered by Copasa have access to water and 67% have access to sanitation. Almost 75% of sewage is treated before discharge (Brasil, 2016). The Copasa is regulated by the Arsae (Regulatory Agency for Water and Sanitation), the regulatory body at state level. The state of Minas Gerais is situated in the South-eastern region of Brazil. It has a total area of 586,519 km² (7% of the national territory), a population of 20,869,101 inhabitants (IBGE, 2015) living in 853 municipalities and HDI of 0.731 (Atlas Brasil, 2010). The mining industry is central in the state's economy and the GDP reached U$ 156 billion (FJP, 2013). Service provision features in Minas Gerais: 93% of the urban population covered by water supply and 67% by sewage, while 47% of used waters treated before disposal. To cover the investment deficit, this study proposes two distinct funds: (1) Public Fund at state level covering all of Minas Gerais; (2) Regulatory Fund restricted to the municipalities served by the company Copasa. The first case considers a fund supported by state legislation (MINAS GERAIS, 2006); and the second case is a regulatory instrument developed by Arsae, which consists of defining a certain percentage from the service provider's revenue to be used only for purposes agreed upon with the regulator. This is to guarantee the sound application of these resources to accomplish the predetermined goals (ARSAE, 2016). The following figure displays the methodological steps of this study.

Figure 1. Methodological steps

2.1 Investment deficit calculation

The calculation of the investment deficit was based on the methodology proposed by Queiroz (2016). This study considers three distinct scenarios on which both deficit and investment needs were calculated (2022, 2028, 2033), based on the following premises: the Fund should be sufficient to meet the demand for financial resources; providers already have some capacity to make investments, which is estimated based on historical data. The level of resources needed to meet the demand was estimated as the difference between the resources required and this investment capacity.

2.2 State fund, origin of the resources

Following sources were identified among available ones: revenue installments, interest on the capital of Copasa itself and the State budget. Other sources, such as transfers from the Union and fines issued by the regulator, may be used as well, but were not considered in this study. Aspects of these three sources are discussed below.

2.3 Revenue installments

The WSA authorizes the creation of funds, to which a portion of the service revenue can be destined. Considering that the tariff defined by the regulator assures financial equilibrium of the service provider, eventual destination of a revenue portion for a fund would have an impact on the tariff level and costs would be passed to users. Estimations were made considering the average revenue of all service providers in Minas Gerais from 2006 to 2013 per municipality (based on information from the National Information System on Sanitation, Brasil, 2016).

2.4 Copasa dividends distribution

As the major shareholder of Copasa, the state receives interests and dividends on capital annually. At present, there is no formal obligation that these resources are used in the water and sanitation sector, so that they are added to the public budget, although

they come from service charges on consumers. The water and sanitation sector is subsidizing other sectors at state level. The potential annual value to be destined to the Fund from this source is estimated as the average value received by the State in the form of interest on net equity, from 2006 to 2014.

2.5 Public budget

Selecting the Public Budget is a matter of social justice. Taxes, which make up the greatest portion of the budget, must serve the distributive function of the State. Excessively binding the public budget can make public administration difficult. Therefore, it is proposed that the participation of the public budget in the fund decreases progressively over time. Percentages that could compose the Fund were calculated based on the average revenue of Minas Gerais State from 2006 to 2014.

2.6 Regulatory fund

WSA establishes the obligation that the regulator edits norms related to technical, economic and social dimensions of service provision (Brasil, 2007). It must define thus, among others, all aspects of the tariff policy. The Regulatory Fund concept used in this study is based on the Specific Destination mechanism as developed by Arsae (2016). In short, it foresees an additional percentage in the tariff to be collected by the service provider and used in compliance with a set of objectives defined by the regulator. These resources must be channeled through a specific bank account and are subject to special monitoring by the regulator. This regulatory mechanism is similar to the general fund concept in several aspects. The Regulatory Fund proposed here is limited to the service provider itself and to its municipalities. This mechanism has already been used by the Arsae in some local providers but not yet for Copasa. This study proposes a Regulatory Fund for it. The same calculations were made for the Regulatory Fund but applied only to Copasa's market. The financing source of the Regulatory Fund is part of the service provider's revenue or rather the tariff paid by users. Information from 2006 to 2013 was gathered from the from the National Information System for Sanitation to calculate the investment deficit and the average income of the service provider. The division of the deficit by the income provides the necessary increase in the tariff (%) to finance the fund and achieve universalization. For greater simplicity the present study disregarded the effect that additional taxation has on the analysis.

3. RESULTS

Table 2 shows the investment deficit (the difference between the investment requirements and the investment capacity). The results show a deficit of 615 million dollars per year in the case in which the universalization goal is set for the year 2022. In this scenario, state investments would have to double to achieve the goal. The deficit diminishes to 330 million by year 2028 and to 251 million by 2033. These quantities still represent a significant increase in investment compared to the current capacity. One relevant aspect is the deficit proportion of water and sanitation in relation to the total: where in 2022 the participation of water is approximately 20%, it goes up to 25% in 2028 and reaches 33% in 2033. This again illustrates the aging of the water infrastructure and the need for its replacement. Figure 1 shows the relationship between the total deficit and the system needs by service. To achieve the universalization of sanitation services in 2028 and 2033, annual investments would have to increase by 61% and 47%, respectively.

Table 2. Total and annual investment deficit (x 1,000,000 U$)

	2022		**2028**		**2033**	
	Total	**Annual**	**Total**	**Annual**	**Total**	**Annual**
Water supply	1,001	125	1,177	84	1,534	81
Sewerage	3,919	490	3,446	246	3,233	170
Total	4,919	615	4,623	330	4,768	251

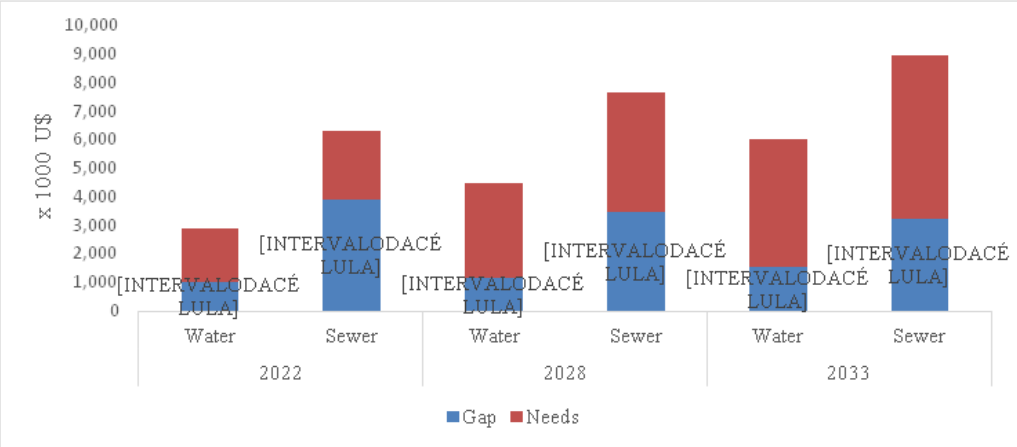

Figure 2. Relationship between deficit and investment needs by service

3.1 Revenue installments

If the revenue installments are the only source of funding, the revenue percentages should correspond to 40%, 22% and 16% for the universalization goals of 2022, 2028 and 2033, respectively. Affordability concerns would be greater in this scenario; therefore 5% was defined as the maximum percentage from the revenue installments to compose the fund, although insufficient to meet the existing deficit. It is important to note that some municipalities still do not charge for water and sanitation services. This fact increases the potential for revenues due to increased coverage, and consequently increased revenue fractions to compose the fund.

3.2 Interest on net equity

Copasa distributes dividends to its shareholders as interest on net equity. Therefore, it is proposed that 100% of the value distributed to the State as the major shareholder be passed on to the Fund. To evaluate the potential of this contribution, an average of values distributed form 2006 to 2014 was considered, amounting to 24.8 million dollars per year, which represents about 10% of the annual deficit for the universalization goal of 2033. The interest on net equity is also insufficient when considered the only source of financing. The interest on net equity tends to increase as borh coverage and investments grow.

3.3 State budget

Based on the revenue history from 2006 to 2014, a maximum percentage of 1.25% was stipulated in the simulations carried out to compose the fund. Different percentages for transfer to the Fund (0.25%, 0.5%, 0.75%, 1.00% and 1.25%) were applied to the average revenue. For 0.25% and 0.50%, the values represent less than 30% of the deficit for the goal of 2033. The value of 0.75% is close to half, and 1.25% represents 70% of the deficit.

3.4 Fund composition proposal

As observed in the previous topic, none of the selected sources, in reasonable percentages and by themselves, are able to meet the existing deficit for the proposed universalization goals. Because of this, three different scenarios were simulated considering the three financing sources, with variation in the growth of revenue and interest on net equity distributed to shareholders

- Hypothesis 1 (H1): does not consider growth in revenue nor that of interests on net equity;
- Hypothesis 2 (H2): considers a 10% growth in interest on net equity among the scenarios; and
- Hypothesis 3 (H3): considers a 15% growth of revenue and interests on net equity among the scenarios.

Revenue percentages (RP) of 1%, 2% and 5% and state budget (SB) percentages of 0.25%, 0.50%, 0.75%, 1.00% and 1.25% were considered to compose the Fund. In six simulated combinations, the values met the deficit for the goal of 2033, as shown in Figure 2. In Hypothesis 1, with only the revenue installment of 5% and 1.25% of the State budget it is possible to meet the deficit. In Hypothesis 2, for the revenue installment of 5%, only 1% of the State budget would meet the deficit. Finally, in addition to the possibilities of Hypothesis 2, in Hypothesis 3 a revenue installment of 2% and 1.25% of the State budget also meet the deficit. The simulated compositions show that in none of the combinations

was it possible to achieve universalization by 2022 and 2028. Another important aspect is the weight of the state budget for universalization of services: it represents 55% to 70% of the fund value.

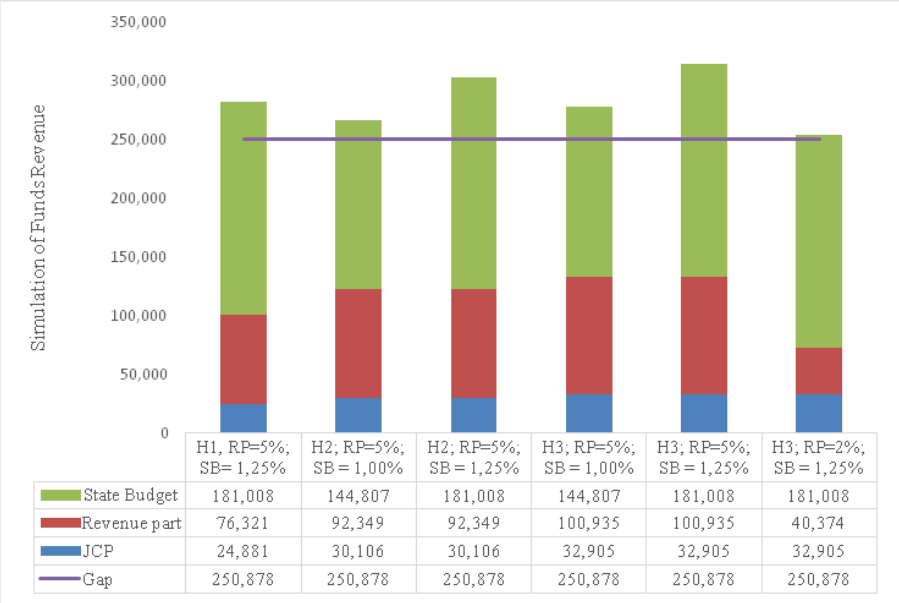

Figure 3. Fund composition

4. REGULATORY FUND

4.1 Investments deficit

Table 3 shows the investment deficit for the different horizons, per year and total in the municipalities serviced by Copasa. The total deficit for the different objectives consists of 2.19 billion, 1.65 billion and 1.1 billion dollars, respectively, for 2022, 2028 and 2033. The deficit shows a downward tendency for the Copasa systems over the horizons, while for the municipalities without sewage service an upward trend is observed.

Table 3. Copasa investment deficit (millions of U$)

	2022		**2028**		**2033**	
	Total	**Annual**	**Total**	**Annual**	**Total**	**Annual**
Water	620	78	671	8	680	38
Sewage	1.573	197	981	70	450	25
No sewage service	952	119	1.022	73	1.075	60
Total	**3.145**	**393**	**2.674**	**191**	**2.205**	**122**

A total of 393 million dollars are needed annually to reach the universalization goal by 2022, which would practically double the investment demand in relation to the calculated capacity. For the 2028 objective, the annual deficit is approximately 118 million dollars, or 191 million in the case that the sewage systems assumption is considered. For 2033, the annual deficit is 122 million dollars, given that almost half of this value is relative to municipalities without sewerage service. The proportional demand of municipalities without service goes up from 30% in 2022 to 50% in 2033.

4.2 Financing

Table 4 shows the revenue increase required to meet the deficits identified in the previous topic. Considering the current market, the percentages vary from 22% in 2022 to 5% in 2033. In the case that the

company obtains more concessions, the increases needed to finance the regulatory fund would be 32% for 2022 and 10% for 2033. These are very significant fractions for meeting the deficit only by the regulatory fund. However, the concessionaire revenue would increase due to the charged sanitation services in these municipalities.

Table 4. Necessary revenue percentage for universalization of the different services

	2022		2028		2033	
	Gap	**% Revenue**	**Gap**	**% Revenue**	**Gap**	**% Revenue**
Current Concessions	274	22.73	118	9.79	63	5.21
Assuming sewage concessions	393	32.60	191	15.84	122	10.16

5. CONCLUSION

The funds discussed here are a variation of the typology proposed by Borja (2014), since they would be non-profit funds seeking the universalization of sanitation services and be based on the human rights to water and sanitation. The results indicate an enormous challenge for the universalization of both services, each one displaying its own challenges. Regarding sanitation, expansion is still the main action to be developed considering the enormous access deficit. Regarding water supply, the need for replacement of the existing infrastructure will grow over time. Two aspects of the Brazilian scenario of past years have a direct impact on the calculated estimates of this study, which are water shortage and economic situation. The water shortage context experienced by the country in the past 5 years, especially in the South-eastern region, can influence the demand as well as estimated capacities. On the necessity side, the possibility of longer or more frequent repetitions of these phenomena in the hydrological cycle reinforces the importance to increase water security, which would require even more investments in infrastructure for water supply and in actions to maintain and recover water sources. Regarding capacity, the need to reduce water consumption diminishes the revenue of the service providers, further restricting the availability of tariff resources for investment. The current economic situation tends to cause a decrease in resources available from the public budget, affecting the investment capacity. All the aspects approached show a scenario of increased investment gap. However, regardless of the crises being temporary or not, the current context reinforces the importance of broadening the financing mechanisms for the sector, such as the institution of the funds as presented herein. A State Fund would allow, in theory, the universalization of water and sanitation in Minas Gerais,. Therefore, it appears to be a fairer alternative. However, such a Fund would face several challenges for its implementation. In the context of budget difficulties, it is a common practice to use fund resources to guarantee fiscal balance. An alternative to the Sanitation State Fund is the possibility of instituting an internal regulatory fund for the regional service provider, which in the case of the Brazilian state of Minas Gerais, is Copasa. At first glance its smaller coverage would limit universalization to the sole areas covered by the provider. However, the Regulatory Fund has a broader implementation process and a more simplified administration than the State Fund. Furthermore, its main characteristic is a smaller risk of improper resource use, since the regulator, through tariff mechanisms, can correct eventual deviations from the original objective.

In conclusion, answers to the question of how to finance the provision of water and sanitation services to the poor are of political nature and are context sensitive. In the present study it was possible to delineate two proposals for financing funds at state level in Brazil. Although each one presents challenges and peculiarities, they have both the potential to act as effective and feasible instruments for achieving universalization in other Brazilian states and other countries as well. Knowing that there is no fit-for-all recipe, service providers, regulators, public entities and other stakeholders must be aware of their particular economic, social, institutional and cultural setting and dare to be creative. Thinking and acting out-of-the-box is necessary to change the deficit curb, foster service expansion and induce faster and sustained development.

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