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**TrackFin: Tracking financing to
sanitation, hygiene and drinking-
water of the municipality of
Petrópolis, state of Rio de Janeiro,
Brazil.**





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1 - Introduction

The purpose of the TackFin tool is to track the financial flows within the sanitation industry. The WHO developed this tool upon finding that a direct analysis of the investment plans is not enough to duly understand the industry. The purpose of the tool is to allow consistent pieces of evidence to assist in planning and decision making, improving the industry's governance. Therefore, it allows an assessment of the industry to understand the investments required, as well as the operating costs to achieve the universalization goals,

This methodology has already been deployed at national level in Ghana, Mali, Brazil and other countries, where national databanks and estimates based on averages are used. The results of the deploying the TackFin in Brazil show that the financial flows of the industry were not sufficient to achieve the goals and objectives proposed by the National Basic Sanitation Plan (*Plano Nacional de Saneamento Básico* - PLANSAB), the main planning document of the sanitation industry in Brazil.

The TrackFin was deployed at municipal level for the for the first time in this project. In order to achieve this purpose, the municipality of Petrópolis, in the state of Rio de Janeiro was chosen, given its advanced stage of sanitation service coverage, as compared to the other Brazilian municipalities.

The purpose of the study is to deploy the TrackFin tool in the municipality of Petrópolis, state of Rio de Janeiro to assess the financial a sustainability of the sanitation services and reduce the risks associated with the lack of control and transparency of the sanitation system in the region, to validate the deployment of the TrackFin tool at municipal level and, specifically, to track the financial accounting of the sanitation industry in the municipality of Petrópolis, state of Rio de Janeiro, for the years of 2014, 2015 and 2016.

The scope of the study comprises the deployment of the tool in Petrópolis, a municipality of the state of Rio de Janeiro, having the years of 2014, 2015 and 2016 as its temporal scope, including:

- Water treatment and distribution services, collection and treatment of sanitary sewage, solid waste management, water resource management, support and assistance services, Hygiene and health;
- All the investment facilities in sanitation, within the temporal and spatial limits defined;
- All costs involved, including operating and maintenance expenses, financial expenses, administrative support and others;
- All the sources of funds, including transfers from government agencies, private investment, contributions, fees and contributions paid.

Chapter 2 contains the references of the TackFin initiative and the results obtained at national level in Brazil during 2011/2012. Chapter 3 describes the municipality of Petrópolis, its geographic and political-economic characteristics. Chapter 4 details the development of the project, including a description of the role of all players involved in the sanitation industry. Chapter 5 contains the data of the sanitation industry in the municipality of Petrópolis. Chapter 6 describe the financial data of the municipality. Chapter 7 details the results of the TrackFin in Petrópolis, including a discussion on the topic and the conclusions of the study.

2 - References and historical records of the initiative

2.1 - Introduction

The UN structure does not comprise a single agency to address all issues bound to water and sanitation individually, and these areas are addressed by different bodies. The UN-WATER mechanism (www.unwater.org) tries to consolidate UN's efforts, and is responsible for the consistency between different points of view, so that the UN may offer a response integrated to the demands of the countries, to the challenges the issue represents, and to the needs of the set of nations.

The main purpose of the members and associates of the initiative is to support the UN member States in their actions to develop sustainable management of water and sanitation. In order to achieve this purpose, three core points were defined for the activities, which are interlinked, of course: Fostering policies, monitoring, informing and inspiring actions.

As a result, the ODS-6 and its several goals consider the full cycle of water and sanitation, with a wide vision that has never been devised with such explicitness and directness before. Monitoring and informing require a great effort to coordinate actions and offer consistent and reliable data and information on the trends and challenges of the main managerial aspects of the industry.

2.2 - Results of the Brazilian National TrackFin

All these initiatives taken into account allowed Brazil to participate in the initial TrackFin proposals, with a national study, considering the entire country and a specific study presented herein, based on works carried out in the municipality of Petrópolis, state of Rio de Janeiro.

The results of the National TrackFin are consolidated in a 10-page document, the Lessons Learned highlighted in the Bulletin mention they were positive to the country in the following areas: 1 - Data and 2 - Financial Flow Related Results. Regarding the data, the reports mapped the different databases and evaluated their quality, winding up in the following conclusions: a- Existing gaps; b- Need to implement improvements in the existing information systems (type of data collected, data organization and how it is made available for reference, either for internal use by the Federal Government and for the general public); c- Need to improve statistical research focused on financial data.

Table 2.1 contains some of the data obtained in the study, whereby it is clear that the sanitation industry represents only about 1.1% of Brazil's GNP, and approximately 5.3% of the total public expenditure.

Indicator	2010	2011	2012
Total expenses of the WASH industry at national level (BRL million)	BRL 41,268	BRL 44,111	BRL 50,940
Total expenses of the WASH industry as a % of the GNP	1.12%	1.06%	1.16%
Total per capita expenses of the WASH industry (BRL)	BRL 216.34	BRL 227.00	BRL 259.89
Total expenses of the WASH industry as a % of the total public expenditure	5.18%	5.15%	5.44%
Total expenses with potable urban and rural water as a % of the total expenses of the WASH	58.32%	59.36%	58.41%
Total expenses with urban and rural sanitation as a % of the total expenses of the WASH industry	41.62%	40.22%	40.50%
Total expenses with urban and rural Hygiene as a % of the total expenses of the WASH	0.002%	0.17%	0.36%
Total expenses of the utility-supplied household usage as a % of the total expenses of the WASH industry	84.12%	83.33%	83.82%

Table 2.1 – TackFin Brazil Indicators – funding source approach. Source: Peixoto et al. (2013)

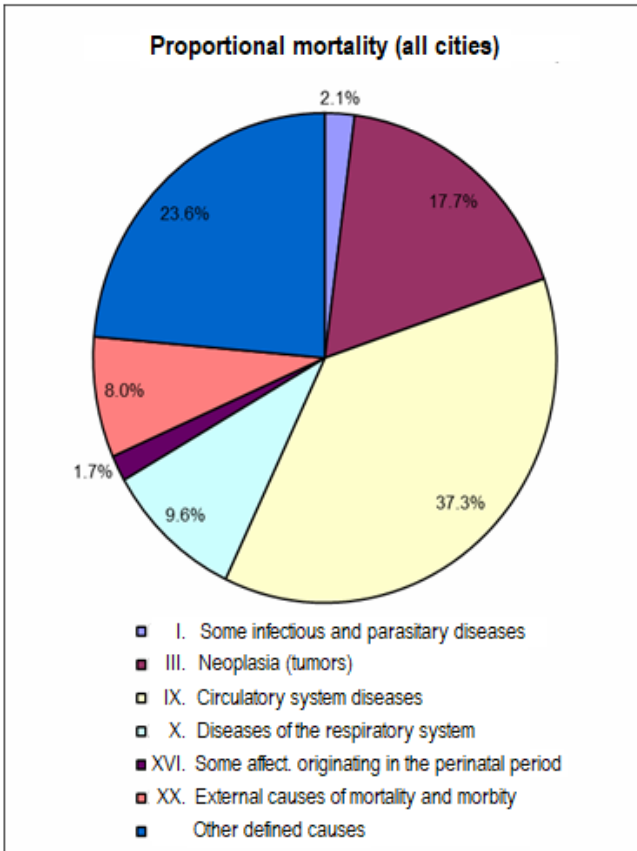
Regarding the second area highlighted in the Final Bulletin, Financial Flow Related Results, the data and information available in financial flows and costs of the industry were confirmed to be sufficient for a conclusive assessment on the effectiveness of the existing public policies in the industry, evidencing the need to improve and expand the existing information system. In the national sphere, at the time of the study, regarding the implementation and monitoring of the National Basic Sanitation Plan (*Plano Nacional de Saneamento Básico - PLAN SAB*), an effective tracking of the

Plan was considered essential, as well as the economic-financial assessment, in order to allow the measurement of the span of the goals designed for 2033. In that sense, the TrackFin tool shall be very useful to track the trends of the financial flows and to define the guidelines, or even to develop new financial strategies.

The National TrackFin paper comprises 13 Recommendations for Future Studies and Next Steps, considering mechanisms and procedures, revision, expansion and qualification of the financial information found in the National Sanitation Information System (*Sistema Nacional de Informações de Saneamento* - SNIS), to develop new information modules on other areas of public policies associated with Water, Sewage and Hygiene issues, further developing and expanding, in mid-term, the questionnaires used by the National Household Sample Research (*Pesquisa Nacional por Amostras de Domicílios* - PNAD) or even by the Family Budget Research (*Pesquisa de Orçamentos Familiares* - POF), developed by the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística* - IBGE). Regarding the Hygiene item, the document suggests to the UN/WHO a better classification of Hygiene and Health Fostering Practices, so as to offer more transparency of the concepts, hence facilitating data collection at national level into the databases of the Ministries of Health and Education. Below are other specific recommendations that shall demand further analyses and actions on behalf of the industry players, above all the Ministry of the Cities.

3 - General data of the sanitation industry of Petrópolis

The municipality of Petrópolis is located in the Serra do Mar mountain range, in the state of Rio de Janeiro, approximately 80 km away from downtown Rio de Janeiro. The rainfall rate is that of approximately 2,200 mm/year. The region's geology is of granitic-gneissic origin, which forms non-weathered soil layers of shallow depth in rocky cliffs, with potential land sliding on the hillsides during the rainy season. The municipality had a Gross Domestic Product of BRL 9,287,903.00 in 2011 (IBGE), 67% from services, 22% from industrial activity, and 11% from agriculture and others, and it is the 69th largest GDP of the country. With a total area of 795.8 km²(307.26 mi²), the municipality is divided into five districts, with the following areas: Petrópolis - 143 km² (55.21 mi²), Cascatinha - 274 km² (105.8 mi²), Itaipava – 121 km² (46.72 mi²), Pedro do Rio - 210 km² (81.1 mi²), Posse - 63 km² (24.32 mi²).



(IBGE, PNUD data).

Figure 3.1 – Causes of mortality in the municipality of Petrópolis - 2015. Source: DATASUS.

The population of the municipality is that of 295,917 inhabitants (IBGE Census 2010), 95% of which considered urban. With an estimated 45,626 families in 2015 (SIAB/DATASUS). The scholastic frequency of the children between 6 and 14 years of age is that of 97.4% (IBGE, 2010). The causes of mortality are shown in Figure 4.1, with prevalence of diseases in the circulatory system (37.3%) and neoplasia (17.7%). Regarding the children under the age of 5, the mortality rate has been decreasing along the past three decades, totaling 64 deaths in 3,958 births, in 2015 (MDG website). The human development index (HDI) was that of 0,745 in 2010

As mentioned in the two previous chapters, the municipality of Petrópolis has peculiar characteristics in terms of public service integration, from the point of view of the municipality and of its political and administrative units. Therefore, the water supply and sewerage services, assigned to

BOX 3.1 – The National Sanitation Information System (*Sistema Nacional de Informações sobre Saneamento* - SNIS) is a databank of the urban water supply, sanitary sewage, solid waste and drainage services of the Brazilian municipalities, on a yearly basis. The data available today in the SNIS are widely used to assess the performance of the municipal services and monitor the situation of the municipalities, states and the country, regarding the goals of the National Basic Sanitation Plan (*Plano Nacional de Saneamento Básico* - PLANSAB) and of the respective municipal plans. COMDEP in charge of submitting the sanitation data of Petrópolis to the SNIS.

a private company since January 1998, are coordinated by a Municipal Utility Company, COMDEP, and the solid waste management and urban drainage are also bound to this company. Since 1997, the assignment of basic sanitation, water supply and sanitary sewage services, under exclusivity ruling, is granted to the Companhia Águas do Imperador S/A - CAI, which also includes the direct billing of service users.

3.1 - Water supply and sewerage services

The major indicators related to the utility providing services to the Municipality of Petrópolis, the operator Águas do Imperador, during the period from 2012 to 2015 (Chart 5.1) were obtained from the SNIS. The selected information records the total investments carried out (FN033), the length of the water network (AG005), the length of the sewerage system (ES004), the number of active water-consuming households (AG013), and the number of active sewerage system using households (ES008).

The selected parameters as verified, allow a global evaluation and the identification of some potential inconsistencies that require further assessment. For example, the reduction of the sewage treatment index (IN046), which could lead to an increased coverage of the water networks, without the respective increase of collection networks, and without the relevant increase in the capacity of treatment. It is also possible to verify a decrease in the cash sufficiency ratio (IN101), followed by a reduction of the total manpower productivity ratio (IN102). The other relevant indicator refers to the index of Losses in Distribution (IN049), with a reduction of losses and an effective improvement of the respective controls, therefore quite positive for the Municipality. It is also verified that the number of active water-consuming units increased 4 times as much as the number of active sewerage system users in the period from 2012 to 2015, with an additional larger increase in the length of the water network than that of the sewerage system expansion.

Chart 3.1 - Petrópolis WSS Service Escalation from 2012 to 2015. Source: SNIS.

No.	Indicator	Unit	Initial Dec/201	Current Dec/2015	Escalation in the Period
1	Cash sufficiency ratio (IN101)	%	119.71	103.87	-15.94 p. p.
2	Total manpower productivity ratio (IN102)	connections/employees	168.20	160.34	-4.67%
3	Total investment per target application (FN033 + FN048 + FN058)	BRL Million	8.740	9.445	8.07%
4	Length of water network	Km/Mi	645.0/400.8	723.2/449.4	12.12%

5	Length of the sewerage	Km/Mi	255.0/158.4	273.90/170.2	7.14%
6	Hydrogeneration rate (IN009)	%	99.29	99.93	0.64 p. p.
7	Large-scale measuring rate (IN011)	%	99.72	100.00	0.28 p. p.
8	Number of active water-consuming households (AG013)	thousand units	63,521	74,230	16.86%
9	Number of active sewage system using households (ES008)	thousand units	58,221	61,110	4.96%
10	Index of losses in distribution (IN049)	%	39.85	21.23	-18.62 p. p.
11	Index of total population with water supply (IN055)	%	91.03	94.04	3.01 p. p.
12	Average <i>per capita</i> water	l/indiv/day	90.20	119.33	32.29%
13	Index of total population with sewage collection (IN056)	%	80.10	83.51	3.41 p. p.
14	Percentage of treatment of the sewage collected (IN046)	%	94.57	82.58	-11.99 p. p.
15	Total expenditure with services per m ³ measured (IN003)	BRL/m ³	2.80	3.93	40.36%
16	Average fee in force (IN004)	BRL/m ³	3.35	3.97	18.51%

3.2 - Solid waste related services

In Petrópolis, the municipal agency in charge of the solid waste related services is the Petrópolis Municipal Development Company (*Companhia Municipal de Desenvolvimento de Petrópolis - COMDEP*), a publicly managed mixed-economy corporation. Regarding indicator IN015- Coverage of the Waste Collection Service in relation to the Total Population of the Municipality, in %, the values accrued are quite similar during the period from 2012 to 2015, and are close to the universalization standards.

The Consortium Serrana II, set forth the implementation of a Waste Treatment Center (WTC) in the municipality of Três Rios, which would provide services to the municipalities of Areal, Comendador Levy Gasparian, Paraíba do Sul, Petrópolis, Sapucaia and Três Rios. The study informs that the municipality of Petrópolis

operates a controlled landfill, and as soon as the WTC operations started in Três Rios, the wastes would be directed to this Central, which happened by the end of 2017.

At Petrópolis, the volume of solid wastes collected and disposed into the landfill in 2016 totaled 311,554 tons, 62.5% of which being wastes from households and public facilities, 37.4% of construction and demolition debris and, 0.1% of healthcare facility wastes.

3.3 - Hygiene, Education in Sanitation and Environmental Education

It is evidenced and confirmed that the availability of potable water supply and sewerage services does not change the health status of a community in a sustainable manner. In other words, the availability of the services is a required condition, but not enough. Of course being able to use and knowing how to use these services correctly is necessary. Changes habits for those who did not have such services available but can count on them now is essential. This is where the unquestionable importance of Hygiene lies, and this is why the theme was included by the UN-Water Initiative, also known as WASH - Water, Sanitation and Hygiene.

In Brazil, the initiatives for the development of Hygiene and of Education in Sanitation programs offered to the communities have several implementation methods, the most common of which being the efforts to address the issues in the schools

The utility companies that provide water supply, sewerage and solid waste collection services uphold more comprehensive programs and many of them address the theme jointly with environmental education. With the presence of these references, we take care of identifying, within the municipality of Petrópolis, the pieces of evidence of the development of Hygiene, Education in Sanitation and Environmental Education activities. In reference to the 2015-2025 Municipal Plan of Education, approved by the Municipal Act No. 7334, of July 23,

Box 3.2 – The importance of Environmental Education. Without any disregard to the issued related to Hygiene and Education in Sanitation, the broader insight of the environmental education fosters the discussion of the relationship between lifestyle and the environment we desire, further allowing the citizens additional elements to understand the importance of their actions for their own survival and for the sustainability of the planet. One topic does not suppress the other. On the contrary, it brings the issues together. Hence, considering the ODS-6, its indicators 6.3-1, 6.3-2, 6.4-2, 6.5-1, 6.5-2 and 6.6-1, the positive outcomes shall strongly depend on the performance of the environmental education programs. While the results of indicators 6.1-1 and 6.2-1 are regularly more affected by primary Education in Sanitation and Hygiene all over the country.

2015, we found that Hygiene is not directly mentioned as a subject, nor is Education in Sanitation. Environmental Education, however, is in the syllabi. Hygiene is in the agenda when the plan mentions the facilities of the public schools in general.

More recently, the *Saúde na Escola* (Health in School) Program of the Federal Government started its development in Petrópolis. The program assigns a nursing assistant for each school, who is able to provide first-aid assistance, such as bandages, and act in prevention, providing information on dental and personal health. The program clearly contributes. However, it is also clear that the opportunity of integrating the program to the preventive and broader insights of education in sanitation and environmental education was lost.

In interviews with COMDEP professionals in Petrópolis, we received information about the activities carried out by the Company towards environmental education and enhancement of citizenship in general. Regarding the COMDEP, within the program of selective solid waste collection, there is an effort for enhancement and awareness, carried out in a partnership with the Bureau of Environment and Sustainable Development, at the Mosela Center for Environmental Education, as well as in other City Hall facilities, known as Ecopoints. The water supply and sanitary sewage service utility promotes environmental education programs with activities in schools and communities of the municipality. These comprise lectures, visits to sewage treatment stations and eventual visits to biodigesters or events directly in communities or institutions.

There is no doubt that the City Hall, its bureaus, the utility company, and several institutions in Petrópolis have activities scheduled or ongoing in the environmental education area. However, education in sanitation, specifically, does not mentioned in the research carried out. The lack of integration between the different initiatives and the dispersion of efforts without a set forth direction calls one's attention. Perhaps this is where an important opportunity lies to deploy the Municipal Basic Sanitation Plan and the its effective social control, including the assessment of results.

3.4 - Universalization, the Municipal Plan and the ODS-6 indicators.

The Petrópolis Municipal Basic Sanitation Plan (*Plano Municipal de Saneamento Básico* - PMSB) brings forth in item 5.7.4 the Goals for the Universalization of the Services (coverage and buy-in) and for the Reduction of the Index of Losses. It further discusses the intended universalization set forth in the utility granting and service universalization agreement provided in Federal Act 11.445/2007, which sets forth the municipal basic sanitation plans. Ultimately, it proposes upholding the universalization of the water supply services with the expansion of coverage to 96% of the population, and the availability of networks by 2027, keeping that same threshold until 2042.

For the sanitary sewage systems, the utility goal was kept at 80% of the population, including the relevant sewerage systems and treatment.

At the time of issuance of the PMSB, the buy-in rate for the water supply system of the utility was of approximately 66%, although the availability was well above that, i.e. 95% of the population. This significant difference between the availability and the effective buy-in is due to the large number of small springs with good-quality raw water to supply local condominiums and communities. The PMSB reviewed the causes for buy-outs, and the different hypothesis to troubleshoot the deadlock, and indicated that this is a “chronic cultural issue” that was stronger when the operation was carried out by the former municipal utility CAEMPE.

Regarding the Index of Losses the ratio between the volumes (intake, water-main conveyed, treated, made available and consumed) represented a total loss level of about 42%, whereas the diagnosis for the preparation of the PMSB, supposedly in 2014, had municipalities of the size of Petrópolis with rates below 30%. Petrópolis had, among all municipalities in the country with a population of more than 100 thousand inhabitants, the best evolution in the control of losses in distribution during the period 2014-2015, reducing its losses in distribution by approximately 33%.

The PMSB set the goals for water supply and sanitary sewage, per annum, from 2012 to 2027. It is worthy to note that several aspects with a threshold by 2015 were not achieved, and the plan must be reviewed.

Let us highlight the importance of monitoring, disclosing and discussing the partial results of the national and local plans, and for that purpose, the indicators are essential for the progress, obstacles and solutions to be known, as well as to detail the paths covered to overcome the challenges of each such goals. In many cases, however, we still cannot count with well-defined indicators.

4 – Institutional mapping and the process developed in Petrópolis

This project was funded by the OPAS ETRAS, and took place between September 2017 and May 2018. It was steered by the Bureau of Sanitation and Environmental Health of the National Public Health School of the Oswaldo Cruz Foundation – Ministry of Health.

There is a wide range of state institutions at different levels, and other players performing in the sanitation industry in Brazil. This decentralization is not necessarily effective at local level. Among the federal institutions are: Ministry of the Cities – Bureau of Environmental Sanitation; Ministry of the Environment (Bureau of Sanitation Environmental,

National Water Agency (*Agência Nacional das Águas - ANA*); Ministry of Health (Health Surveillance Bureau), National Health Foundation (*Fundação Nacional de Saúde - FUNASA*). In the state of Rio de Janeiro, in addition to the Environment Bureau, the Environmental Agency (INEA) plays an important role in water resource management and environmental licensing for any activities. However, there are few institutional players performing in the sanitation industry in the municipality of Petrópolis. The water supply and sewerage services are operated by the Companhia Águas do Imperador, and the collection and disposal of solid wastes and drainage services, by COMDEP.

4.1 - The TackFin methodology

While mapping the financial flows for the provision of WASH services, certain procedures were carried out, which must respond to three basic questions regarding the methodology used.

1. What is being funded and by whom?
2. What is being produced, by whom and at what cost?
3. What is being consumed and by whom?

Before need to respond to these questions, the methodology used approaches and must identify the following, by means of meetings with the main players and data researching:

- The types of funding, that is, the financial flows that circulate among the funded units and the service providers. This information comprises: fees paid by the services, public transfers, volunteer contributions and funds that generate burdens or otherwise.
- The cost of goods and services WASH delivered, including the investment costs – operation, maintenance, capital and financial costs – identifying the main players involved in the provision of WASH services.
- The types of WASH services consumed: water supply and sanitation services; WASH industry support services (policies, legislation and regulations, planning, management). In addition to resource management – protection of water resources and development of hydrographic basin – and hygiene programs, such as environmental health education in the schools and community centers.

The TackFin methodology was developed by the World Health Organization - WHO, and disclosed in the “Guidance Document TrackFin- GLAAS”, with the following stages:

- Preparation: mobilization of political support to allow access to the accounting of investments in sanitation, a team formed based on the institutions involved, definition of the scope of accounting and political issues involved, identification of the minimum requirements for report content and planning.
- Data collection: definition of the terms of services and delimitation of the sanitation industry in the region, resource mapping, data collection of financial flows and fixed asset inventories;
- Analysis of the data and disclosure of the results: a compilation of accounts and indicators, preparation of sanitation accounting reports, disclosure of the results to political players;
- Preparedness for the next TrackFin cycle, including proposals for scope expansion in relation to the first study: financial accounting follow-up of the municipality's sanitation industry for a period of 10 years, including improvements of the methodology, as well as of data and information.

For the mapping of the financial flows, data and information were collected from public sources and meetings held with representatives of the Petrópolis City Hall, and the companies COMDEP and CAI. Among the reference websites and databanks are: SNIS Portal; Federal Government Transparency Portal; IBGE Portal; BNDES, CEF Portals; Petrópolis City Hall Portal; COMDEP public company Portal (Petrópolis); Companhia Águas do Imperador–CAI Portal. In addition to the appraisal of financial flow data listed above, other players of the WASH system were identified, such as the Piabanha Basin Committee.

The SNIS data were compared to those provided by COMDEP and the CAI balance sheet of the years the team had access to. The analysis requires a verification of data consistency. The SNIS System verifies the significant data distortions, but mistakes may potentially not be detected by the system, or even in case of an undue interpretation of data. There is a data and information glossary, but since the system is quite extensive, errors may occur for lack of attention.

Figure 4.1 shows the several players performing in the sanitation industry at municipal level. During the reference years of the study, flows did not necessarily occur between all players, but they are nevertheless shown without the financial flow arrows. Likewise, there may have been no financial flows between the players, for example, with the Piabanha River Basin Committee, which invests directly in the basin and carries no financial flows with other players:

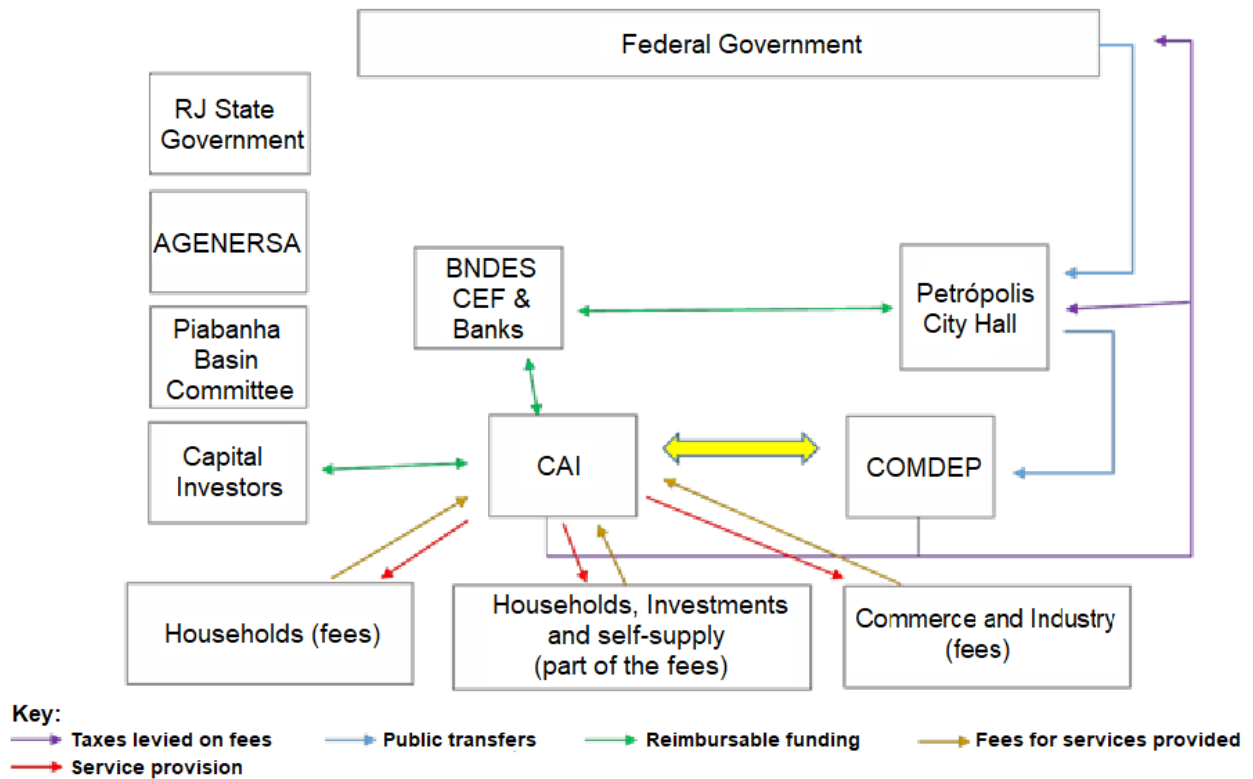


Figure 4.1 – Petrópolis TrackFin Financial Flow Diagram

4.2 – The sanitation industry in the municipality of Petrópolis

By 1998, all activities of the sanitation industry were carried out by the municipality, at first by the public utility CAEMPE. As of the 1st of January, 1998, the water supply, sewage collection and treatment were subject to a utility grant to the private company Companhia Águas do Imperador - CAI. Since then, the company has been investing in the expansion of the water supply and sewerage networks in the region, with the consequent reduction in the number of alternative sanitation solutions.

However, there are still several condominiums and households that use wells and alternative sources of water, even when the block has utility water provided at its door, with the purpose of mitigating the risk of supply shortages, common above all when the supply used to be a responsibility of the public utility CAEMPE.

Box 4.1 - the Importance of urban drainage as a component of basic sanitation

Petrópolis is utterly vulnerable to heavy storms. Both in terms of floods and regarding the direct consequences of land sliding along its slopes. The stormwater drainage system is not separated from the sewage collection network, which impacts the effectiveness of sewage treatment and the drainage system itself. Built-in channels, narrow streets and heavy slopes make it harder to build an efficient flow-separating system. In events of heavy storms, the drainage channels are clogged by solid wastes unduly disposed of by the population and not collected by the urban waste collection company.

The solid waste collection and disposal service is managed by COMDEP, successor of CAEMPE. Box 4.1 details some of the relevant aspects of the ratio between drainage and sewage in the municipality of Petrópolis.

4.2.1 – The Companhia Águas do Imperador - CAI

On the 1st of January, 1998, the Águas do Brasil Group-SAAB assumed control of the water supply and sewerage services of the city of Petrópolis, by means of the utility Companhia Águas do Imperador. That was the group's first operation. The agreement was executed before the enactment of Act 11.445, which regulates the utility grant, therefore not characterizing the agreement as a burdensome grant, which has become a common ruling after the mentioned regulation was in force. CAI had its 2015/2014 accounting statements audited by Lopes Machado Auditoria.

The operating licenses and the grants for water supplying and sewage treatment were issued to the various operating units by the Rio de Janeiro State Environment Bureau (INEA). Some of the licenses were issued by the Municipal Environment and Sustainable Development Bureau.

The Rio de Janeiro State Energy and Basic Sanitation Regulating Authority (*Agência Reguladora de Energia e Saneamento Básico do Estado do Rio de Janeiro – AGENERSA*) (<http://www.agenersa.rj.gov.br/>) was not assigned to provide the usual grant. The regulation of the grant agreement between CAI and the Petrópolis City Hall is a responsibility of COMDEP. The grant agreement includes a water supply and sewerage network expansion plan, and the payment by the utility of a grant fee to the municipal granting authority, of 3.5% of the monthly effective collection volume.

4.2.2 – Petrópolis Municipal Development Company (*Companhia de Desenvolvimento Municipal de Petrópolis - COMDEP*)

COMDEP, a public company of the municipality, is in charge of steering the solid waste collection and disposal service, in addition to other infrastructure-related services in the municipality, such as drainage, road maintenance and other works. According to the 2015 SNIS Solid Waste Diagnosis (SNIS, 2017), the municipal solid waste management in Brazil is usually carried out by the direct public administration, by means of a specific office, department or sector of the structure of the municipality (93.7% of the municipalities in Brazil). In 2015, the average indicator of total expenses with urban solid waste handling per municipality was that of BRL 133/inhabitant in the Southeast region.

The Petrópolis City Hall charges a waste collection fee, included in the property tax (IPTU) payment slips, whose revenue is transferred to COMDEP. Furthermore, according to the 2015 SNIS Diagnosis, 65% of the municipalities in the country that not charge any fee for waste management purposes. These fees may be an important source to help the waste management industry to achieve financial self-sufficiency. In Brazil, these fees are still not sufficient to cover the costs of the industry in most municipalities, as shown below (SNIS, 2017):

- 346 municipalities with sufficiency rate of 10% or less, which corresponds to 30.5% of the sample;
- 297 municipalities with sufficiency rate above 10% and less than or equal to 25% – 26.2% of the sample;
- 278 municipalities with sufficiency rate above 25% and less than 50% – 24.5% of the sample;
- 134 municipalities with sufficiency rate above 50% and less than or equal to 75%, which corresponds to 11.8% of the sample;
- 63 municipalities with sufficiency rate above 75% and less than 100%, which corresponds to 5.6% of the sample;
- 8 municipalities with 100% sufficiency, which corresponds to 0.7% of the sample; as mentioned above, 8 municipalities, or 0.7% of the sample, with sufficiency rate above 100% and up to 108.2%.

4.2.3 – Other players

The regulation of the water supply and sewerage utility agreement is executed by the Civil Works Bureau of the municipality of Petrópolis, a task not assigned to AGENERSA, the state's regulating body. Inspections are also carried out by the municipality by engineers hired by COMDEP.

The Health Surveillance Bureau is structured in three areas: Epidemiological, Sanitary and Environmental Surveillance. Earlier, before the current municipal management, such structure did not exist. The Sanitary Inspection, which is entitled to a 0.5% inspection fee over the revenue of the licensed entities, used to report to the Treasury Bureau.

Box 4.2 – The role of the regulating bodies in Brazil

The public sanitation services, in general terms, have traits of a natural monopoly, that is, a single company operating in the municipality; users have no alternative providers nearby; a perfect information (the users are aware of the fees - prices) and a structural entry barrier (legal), among others. Another characteristic of the sanitation services is its condition of essential public service – with a strong potential of impacting the environment and external factors of the population's health.

Regarding the ownership of that segment, the municipality is the holder of the services intended exclusively to the municipality, which assigns to this authority the economic, regulating and granting power over the sanitation services. Before such reality, the tax policy, the monitoring of the goals set forth in the agreements and other aspects shall be an exclusive duty of the regulator assigned by the granting authority.

Meetings were held with the Surveillance to allow a better comprehension of the evolution of the controls, programs and actions within the municipality. Environmental education, sanitation and hygiene actions are in place in the municipality, in different departments, among which the Sanitary and Environmental Surveillance of the Municipal Health Bureau.

The Piabanha River Hydrographic Basin and the Preto and Paquequer Rivers Sub-Basin Committee has an important role in protecting the water streams, and an active participation in issues related to sanitation in the region.

5 – Financial performance and flow monitoring

The analysis of the financial flows shall comprise three items when submitted: one for the water supply and sewerage utility Águas do Imperador; one for the municipal urban waste collection utility COMDEP; and the third one to the other players of the sanitation industry in the municipality of Petrópolis.

Despite its GNP of BRL 11.2 billion in 2015 (IBGE), the municipality of Petrópolis has a per capita GNP of BRL 37,636.57, which is ranked 27th in the overall list of the state. Although the municipality is a touristic winter resort with several hotels/inns and summer facilities for the medium/high class, that

apparent affluence ins not common to the entire population. There are underrated households, several of which built on hillsides and subject to land sliding and floods. The challenges for the universalization of the sanitation services to the entire population, with quality and accessibility to the needy population, are quite significant.

5.1 – Financial flows of the Companhia Águas do Imperador - CAI

Table 5.1 comprises a summary of the accounts of CAI’s balance sheet in the period from 2014 to 2016. It shows that both the operating earnings as the net earnings oscillate along the years, despite the constantly increasing operating income, which represented as much as 20.9% of the total in this period. The increasing revenues are due to the expansion of the client households, once the per capita consumption held and almost stable condition, in average at 176 m³ of water and 156 m³ of sewage per active unit.

BRL thousands	2014	2015	2016	2016/2014 (%)
Current assets	29,643.87	33,326.27	40,753.15	37.5%
Total assets	96,211.56	104,947.55	115,951.72	20.5%
Long-term liabilities	45,545.02	46,357.53	45,858.78	0.7%
Net earnings with depreciation	8,342.85	7,997.97	29,672.92	255.7%
Current liabilities	14,226.28	16,051.32	21,949.15	54.3%
Shareholders' Equity	36,440.26	42,538.71	65,164.31	78.8%
Operating Income	85,834.60	90,925.66	103,754.82	20.9%
Operating earnings with depreciation	14,247.38	16,663.46	44,536.00	212.6%

Table 5.1 - CAI balance sheet selected data. Source: SNIS 2016

Note that the numbers do not include revenues with construction works carried out by the Companhia Águas do Imperador, which originate from construction services in the very sanitation system of the municipality. These are entered in the balance sheet as revenues, and in the same financial year, and the same amount, as construction costs. It is worthy to highlight that, pursuant to the agreement, all water supply and sewerage operating assets used by CAI must be transferred to the Municipality of Petrópolis at the end of the utility grant agreement.

Table 5.2 shows the escalation of CAI’s expenses. It is worthy to highlight that, for a 9% increase in the volume of water invoiced, and a 2% increase in the volume of sewage invoiced, a significant increase occurs in the expenses with

staff, chemicals, energy and direct duties, which were counterbalanced with reductions in the expenses with outsourced and other services.

BRL thousands	2014	2015	2016	2016/2014 (%)
In-house staff	13,677.91	16,739.46	22,088.69	61
Chemical products	543.88	599.85	737.35	36
Electric power	3,302.52	5,045.67	5,558.16	68
Outsourced services	15,661.64	17,312.81	8,867.94	-
Direct taxes and duties	7,805.76	8,716.11	10,313.61	32
Other exploration expenses	19,272.91	15,597.16	9,814.77	-
Interests and charges	3,773.66	8,383.43	7,303.65	94
Depreciation, amortization and	9,722.05	8,921.47	14.47	-
Indirect taxes and duties	4,092.45	3,934.87	14,894.99	264
Total expenses with services	77,852.77	85,250.83	79,593.63	2%
Volume of water invoiced (m ³)	11,713	12,173	12,802	9%
Volume of sewage invoiced (m ³)	9,602	9,535	9,818	2%

Table 5.2 - Detailing of CAI's expenses. Source: SNIS 2016

Basically, the single funding source of the water and sewerage operation in Petrópolis had its origin in the National Bank for Economic and Social Development (*Banco Nacional de Desenvolvimento Econômico e Social* - BNDES). The funding facilities were obtained with variable interest rates, some of which with subsidized fees. Hence, 94.91% of the funding facilities obtained during the period from 2002 to 2017 were acquired in the past 5 years (2011-2017). All funding support methods were based on the form of support of funding were provided in an indirect modality. In such modality, the assessment of the funding is carried out by the authorized financial institution, which undertakes any risk of default in the payments. It also allows a negotiation with the client of the funding conditions - payment schedule and warranties - in compliance with certain rules and limits defined by the BNDES.

CAI's taxation framework in the municipality of Petrópolis includes, as commonly seen in Brazil, minimum fees, progressive taxation for growing consumption, and social fees for different consumers: residential, commercial, industrial and public. These fees were restated several times during the period of effectiveness of the grant. Such readjustments were calculated per the rates set forth in the agreement, and many times were readjusted upon court decisions.

Table 5.3 shows that the percentage of users who actually paid social fees over the total consumption is relatively low: about 4% in the relevant period. However, the existence of a minimum fee is relevant. One may construe that an expressive percentage of these households with minimum fees also

uses alternative solutions and consumes only the minimum possible volume of the water supplied by the utility. The average of water supply and sewerage fee in the municipality is that of BRL 4,47/m³ (2016), a rate 34% higher than the average of the private operators in the southeast region, and 31% higher than the average of the regional operators in the same region.

	2014	2015	2016
Average fee in force IN004 (BRL/m ³)	3.94	3.97	N/D
Standard fee (% total)	97.0%	41.0%	35.4%
Minimum fee	N/D	55.7%	60.5%
Total eco. % Active Water	N/D	55.7%	60.5%
Social fee (% total)	3.0%	3.4%	4.1%
Households where the minimum fee applies	N/D	47,860	52,276

Table 5.3 – Minimum and social fees in the municipality of Petrópolis (Source: SNIS).

The total expenses are also 14% higher, if compared to the private operators, and 25% higher than the regional operators'. Due to the irregular landscape of the municipality, such higher costs are justified. Another hypothesis to be considered is if the neighboring municipalities of the universalization area have costs per m³ higher than those of the municipalities with low levels of service.

5.3 – Financial flows of the Petrópolis Municipal Development Company - COMDEP

COMDEP provides other services, in addition to solid waste management. The analysis provided herein shall use as a reference for the allocation to the solid waste industry the 2016 interim analytical balance sheet, which comprises the cost centers and the specific expenses related to the services provided by COMDEP. The revenues originate from the urban services provided by COMDEP, and urban waste collection represents approximately 70% of the total net revenue in 2016. In addition to these revenues, let us include the revenues of the water supply and sewerage utility, Companhia Águas do Imperador, of BRL 3.6 million. The total net revenue of BRL 48 million is not enough to cover the BRL 81 million expenses.

Out of the total costs/operating expenses, BRL 37.4 million – 46.7% – are related to urban waste collection expenses, BRL 35 million in salaries and social security dues. Part of the services is carried out directly by COMDEP (625 direct employees in 2015), and another part, by outsourced companies

. There are certain overhead expenses, however, that COMDEP distributes among the services provided by the company. Like several infrastructure and sanitation companies do in Brazil, COMDEP operates with a negative bottom line, with negative net margin, profitability and current assets in 2016. COMDEP's operation is maintained with an accumulation of tax and social security liabilities, totaling almost BRL 200 million by the end of 2016.

However, it is worthy to emphasize that approximately 29% of the total costs and expenses are related to interests, approximately BRL 23 million during the financial year. The BRL 33 million in losses is added to the losses of previous years, totaling by the end of 2016 accrued losses of approximately BRL 230 million, an amount that approaches the total cumulative tax liabilities. There are no data or information on the monetary amounts of assets related to the handling of solid wastes in the accounting or in the SNIS report. Note that part of these assets is a property of the companies outsourced to collect or dispose of wastes.

5.4 – Other financial flows

There are other players whose financial flows also impact the sanitation industry in Petrópolis. Although these flows do not represent significant amounts, the consequences are politically important, and affect the population's health in the municipality.

There is no specific managerial control of the Health Surveillance Bureau do discriminate the expenditures or even the resources of all different sources, which were directed to the Environmental Surveillance sanitation sector. The resources are received from several origins: sanitary inspection fees, mandatory transfer from the state or Federal Union, eventual agreements for specific purposes and others.

The Health Surveillance Bureau was only structured in the several areas it manages in the current municipal mandate. Therefore, not only resources, but also expenses, were not entered in the accounting records separately for the several Surveillance Bureaus. In order to estimate the amount for the contribution of the Environmental Surveillance, we shall consider that 5 health agents, 1 coordinator, and 2 laboratory technicians work specifically with water quality control. These assumptions add up to the following amounts, considering yearly bonus and other social benefits.

The Piabanha River Basin Committee, in whose scope the municipality or Petrópolis is inserted, plays a relevant role in the management of hydric resources in that region. In order to estimate the amount of contribution of the Piabanha River Basin Committee in the WASH industry of Petrópolis, we shall consider that







an environmental engineer and one technician work specifically with the management of the hydric resources in the municipality of Petrópolis, and this amount is distributed among the several municipalities of the Basin, according to the number of inhabitants of each municipality.

Several supporting instances exist and are managed by the City Hall in its management of water, sewage and solid wastes. These tasks are carried out by employees of the municipal infrastructure utility company, COMDEP. Consider that one engineer and one technician work specifically providing support to the water, sewage and solid waste sector of the municipality of Petrópolis.

6 - Results and major (?) of the TackFin in the municipality of Petrópolis

The largest part of the data was obtained directly by the National Sanitation Information System (*Sistema Nacional de Informações de Saneamento - SNIS*), managed by the Ministry of the Cities. The data are self-declared in the system by the city halls that collect information from their utilities. Several meetings were held between the project team and members of the different institutions performing in Petrópolis. Let us highlight the Piabanha River Hydrographic Basin Committee as a relevant correspondent in the pursuit of sanitation solutions and in the management of the hydrographic basin where the municipality of Petrópolis is included. Given the specific characteristics of urban and peri-urban concentration in the municipality of Petrópolis, there are no areas considered as rural in the municipality.

Chart 6.1 shows an assessment of the availability of data in the municipality of Petrópolis, in accordance with the TackFin methodology, for the three major WASH services. For the other services of the TackFin tool: Support, water resource, hygiene and health management had no data available, and therefore estimates were used.

Funding source	Data availability			Feedback and data availability
	Water supply	Sewerage	Solid wastes	
Fees charged by the services provided				Water supply and sewerage data were obtained from the National Sanitation Information System (<i>Sistema Nacional de Informações de Saneamento - SNIS</i>) of the Ministry of the Cities.
Expenses of the Self-supplied families				Estimates based on the IBGE's National Household Research in 2010, monetarily restated per the IPCA rate.

Transfer Public Household (Federal Government)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Data obtained from the Federal Government's Transparency Portal and from the Municipality of
Public Household Transfers (State/municipality)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Solid wastes were obtained at COMDEP's website, in its interim balance sheets).
International Public Transfers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None identified International transfer to CAI or COMDEP.
Volunteer Contributions (NGOs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	No donations were identified in CAI's or COMDEP's interim balance sheets.
Reimbursable Funding (Loans)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Data obtained in the BNDES and CEF websites.

Available
 Partially available
 Estimated
 Not identified, Non-existing

Chart 6.1 – Analysis of the availability of data for the TackFin application in the municipality of Petrópolis.

What is the total expenditure of the WASH industry in the municipality of Petrópolis?

Table 6.1 shows the WASH industry indicators in the approach of service costs in the municipality of Petrópolis, during the years of 2014, 2015 and 2016. It may also be observed that a continual growth of the total service costs is seen, and that the capital costs oscillate during the period, according to the payment of interest on the loans acquired by the utility company CAI. The operating and maintenance costs, on the other hand, are the most relevant ones, and the vary along the period, in consideration to the increased tax costs. No large capital maintenance costs or expenses with project expansion (hardware and software) were registered.

WASH Costs	2014	2015	2016
Operating and maintenance costs	85,933,821	103,577,564	99,300,176
Capital costs	6,899,66	12,434,00€	11,003,124
Support or software costs	699,46	749,387	829,615
Tax expenses	11,898,20	12,650,97€	25,208,597
Total	<u>105.431.146</u>	<u>129.411.932</u>	<u>136.341.513</u>

Table 6.1 – Expenses of the WASH industry in the municipality of Petrópolis in 2014, 2015 and 2016.

How are the funds distributed by the different types of WASH services?

Figure 6.2 shows the WASH industry financial flow indicators, using the funding insight, as well as their respective escalation along the years. This is due to the expansion of the network, as well as to the adoption of better technology, which represent higher costs. The largest part of the resources is forwarded to the sub-sector of water supply – S1 (53-57% of the year’s total), while the sewage services – S2 represented approximately 30%, and the solid waste services – S6 had a consistent growth (13-16% of the total), and insignificant percentages to the other WASH services: Support – S3, Water resource management – S4 and Hygiene and health – S5.

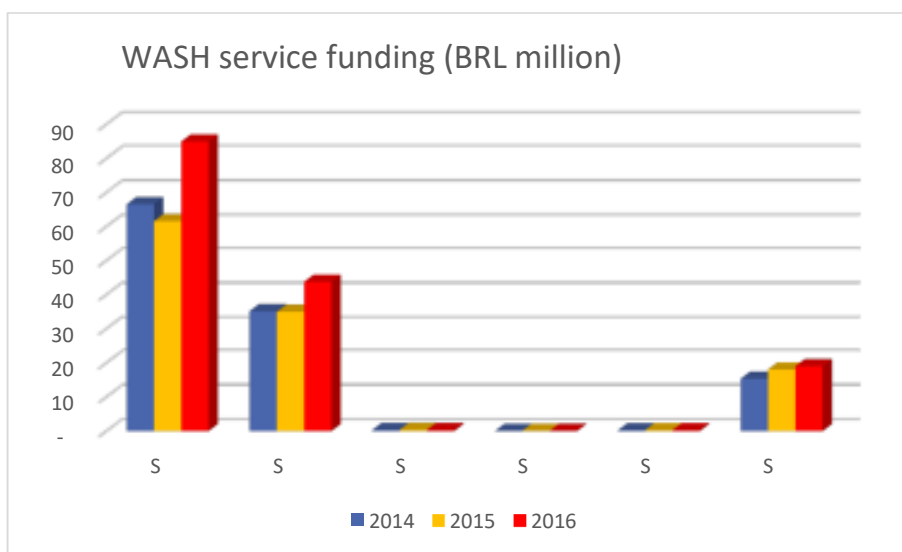


Figure 6.2 – Allocation of the financial resources for WASH services to the municipality of Petrópolis.

The largest participation of the sub-sector Water supply – S1 is consistent with the level of coverage of the service within the municipality, once there is no absolute system separator, nor is all of the sewage collected treated. Likewise, the disposal of solid wastes was carried out in controlled landfills of the municipality, not fully complying with the national environmental legislation and with the collection partially hauled in old trucks of the municipality. The sub-sector of solid waste management slowly increases its expenses and participation in the total WASH industry costs, as the adequate structure is settled

for the collection carried out by private companies with employees and fleet of trucks of their own. As of 2017, the wastes were disposed of in landfills that are part of joint ventures with other municipalities in the region, considerably increasing the cost of sub-sector S6.

Who pays for the WASH services and what is their individual contribution?

When reviewed by the funding sources, as seen in Figure 6.3, considering the three relevant sub-sectors, the main sponsoring players of the municipality of Petrópolis are the users of the sanitation services - FU10, who pay the fees to the operators and also participate with self-supply costs, totaling percentages that range from 85 to 95% during the years of the study. The public domestic transfers carried out by the Local Authorities - FU3 are of little relevance, and no national or international public transfers or volunteer contributions were found during the years of the study. Finally, the corporate utility Companhia Águas do Imperador accrued percentages of the total that vary a lot each year, depending on the amount of the loans obtained from financial institutions.

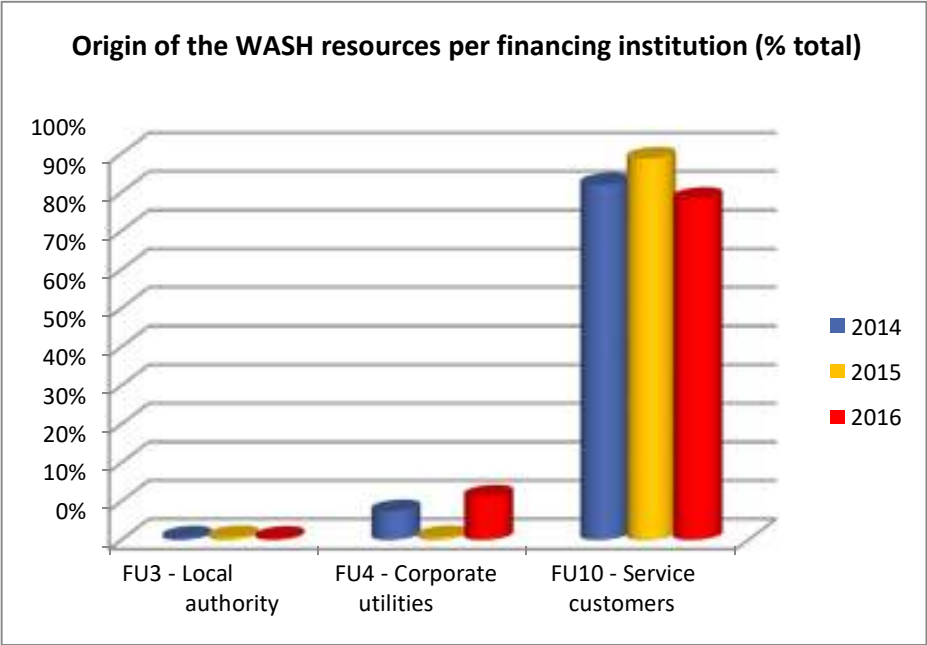


Figure 6.3 – Funding sources of the WASH industry to the municipality of Petrópolis during the years of 2014, 2015 and 2016.

What are the entities that funded the WASH services?

The main financing entity of the WASH industry is CAI, the corporate utility of water supply and sewerage services – P2, with a percentage between 75 and 80% of the total flow in the period surveyed.

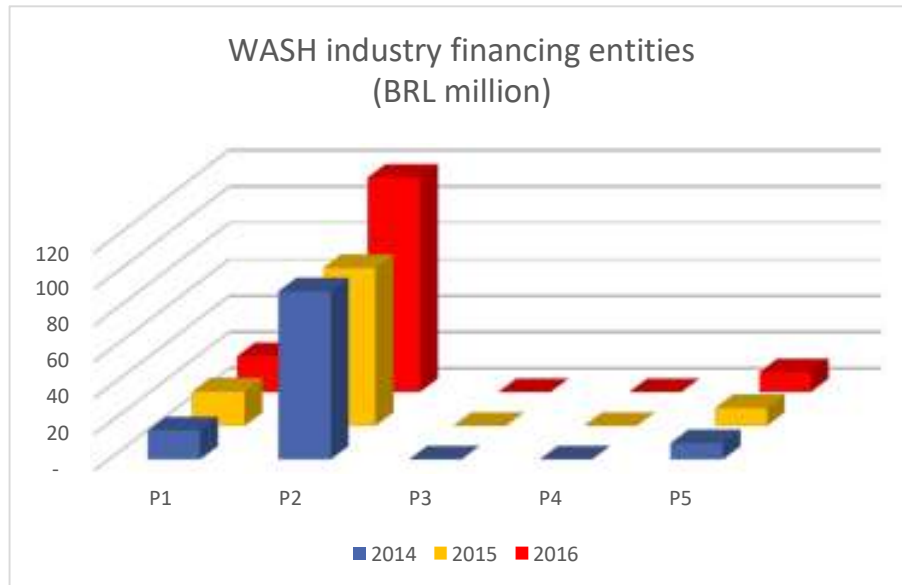


Figure 6.4 – WASH industry financing entities in the municipality of Petrópolis, during the years of 2014, 2015 and 2016.

The largest part of these resources originates from the fees paid by the users, with a small part coming from bank funding. Regarding the local authority – P1, the resources applied in solid waste management originate from the fees paid by the service customers, but the municipal utility company COMDEP performs under deficit and is not able to obtain any funding. The resources originating from the service customers – P5 are related to the disbursements for the installation and operation of wells to pump groundwater and sumps for sanitary sewerage.

Self-supply is directly related to the prices of the fees set forth. Since access to groundwater is quite easy in this region, several families end up using it to supply their households, entirely or in part, in order to reduce expenditures with payments to the corporate utility. The utility grant sets forth a scale of fees, with a minimum fee corresponding to a maximum consumption of 10 m³. This leads to a high percentage of households (58% of the total) that pay the minimum fee to the water supply utility, using it for the consumption of potable water, supposedly using

wells to supplement the demand for other purposes. These wells are not monitored by the Health Surveillance Bureau, and represent a risk to human health.

How are these expenses of the WASH industry in the municipality of Petrópolis compared to the national average in Brazil and that of other sanitation operators?

The use of benchmarking may help analyzing the operations at municipal level. With that in mind, it is possible to compare the data of the municipality with the overall average of the country, as well as other similar operations in Brazil. Table 6.2 shows the WASH industry expense indicators in the approach of service costs in the municipality of Petrópolis in 2016, as compared to the average of the Brazilian municipalities in 2012, when the TrackFin Brazil took place. The comparison is carried out excluding the solid waste management sub-sector in Petrópolis, once the overall Brazilian data did not take this sub-sector into account for the calculations.

Main WASH indicators Indicator (without solid wastes)	Petrópolis 2016	Brazil 2012
Total expenses of the WASH industry, Cost Approach of the	BRL 88 million	BRL 47 billion
Per capita expenses (BRL/indiv)	BRL 296	BRL 239
Total capital cost as a % of the total WASH industry expenses	8.07%	35.13%
Total operating and maintenance costs as a % of the total WASH industry expenses	72.83%	59.29%
Tax-related expenses as a % of the total WASH industry expenses	18.49%	5.45%

Table 6.2 – Some WASH industry indicators in the municipality of Petrópolis compared to the average of the municipalities in Brazil (without solid wastes).

The total per capita WASH expenses in the sanitation industry (water supply and sewerage, not including solid wastes) in Petrópolis are 24% above the Brazilian average. The capital cost shows significant differences, evidencing that either Petrópolis holds a low percentage of indebtedness or the interests it owes are lower than those of the rest of the sanitation operators in Brazil, possibly a blend of both. The operating costs in Petrópolis, on the other hand, are 23% higher than the Brazilian average, which could be a consequence of the specific geographical characteristics and technologies used in Petrópolis.

Regarding the tax expenses, both direct and indirect taxes are taken into account in Petrópolis, and the latter oscillate according to the bottom line of the utility company.

The average water supply and sewerage fee in the municipality in 2016 was that of BRL 4,47/m³, which is 34% higher than the average of the private operators in the southeast region of Brazil, and 31% higher than the average of the regional operators in the same region. The total expenses are also 14% higher, if compared to the private operators, and 25% higher than the regional operators'. Due to the irregular landscape of the municipality, such higher costs are justified. Another hypothesis to be considered is if the neighboring municipalities of the universalization area have costs per m³ higher than those of the municipalities with low levels of servicing.

How could the WASH industry be able to achieve the ODS in Petrópolis?

The consideration between the financial resources obtained, according to the origins and the investments carried out, and to the respective allocations, is not necessarily clear and direct. Figure 6.5 shows the investments carried out in Water Supply and Sewerage by the operator CAI in the Municipality of Petrópolis, along approximately 16 years of utility grant. The amounts were monetarily restated per the annual variations of the inflation rate (IPCA), and are shown in Reals for the year of 2015 (IPCA BRL 2015).

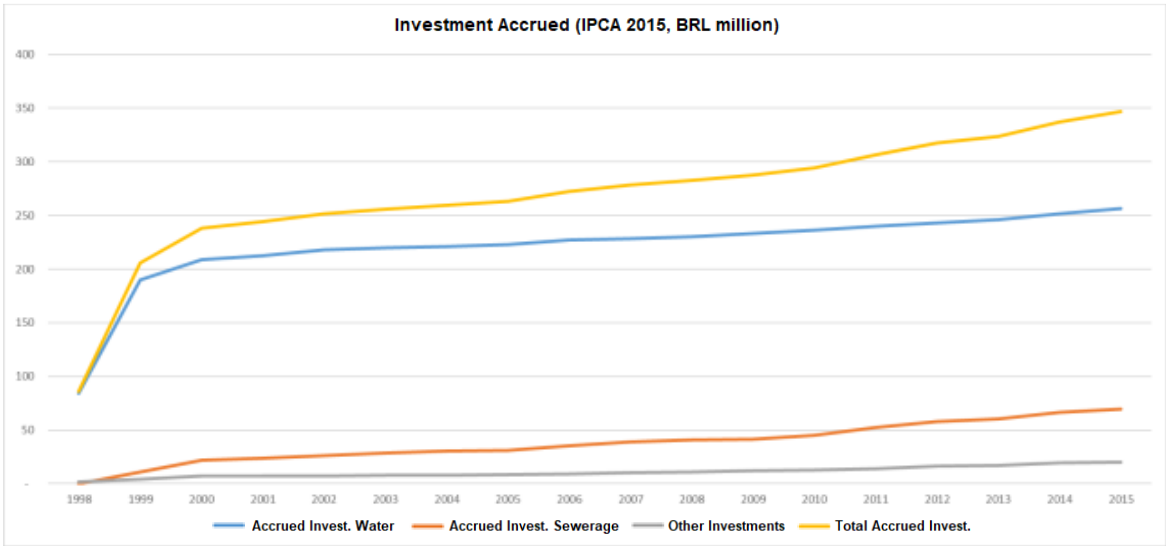


Figure 6.5 – Investments carried out by the operator Companhia Águas do Imperador in water supply and sewerage along the term of effectiveness of the grant, in the municipality of Petrópolis (SNIS Data).

The long-term insight of some of the indicators, such as investments carried out, allow a consistent analysis, free of specific annual variations. Regarding the water supply and sewerage utility of

Petrópolis, we can confirm that the investments were focused in assets of the sub-sector Water Supply, representing approximately 74% in the period, Sewerage at 20%, and other services at 6%. The total in the period from 1999 to 2015 amounts to BRL 346.8 million, restated per the 2015 IPCA rate, with a strong concentration in the beginning of the grant period. Out of these, 72% were obtained by means of burdensome resource loans from private and public banks, with different interest rates. The remaining amount originate from the operator's current assets.

The Municipal Basic Sanitation Plan was executed in 2014, and set forth the following investments:

- Water distribution network: 2042 – 1,072,522 m, with a 96% buy-in and 30% loss.
- Expected investment in PMSB water supply: BRL 234,398,449.52.
- Sewage collection network (60-80%): 2042: 414,357 m
- Expected investment in sewerage (2012-2034): BRL 165,686,394.99
- Investments in waste management for 20 years: BRL 20,625,108.00

It is therefore clear that the municipal plan was extremely optimistic, with a level of buy-in way above the actual current accomplishment of the municipality, where 58% of the active consumers pay only the minimum fee. Therefore, there is no invoicing of sufficient fees to expand the system, both that of water supply and that of sanitary sewerage.

7 - Lessons learned

The municipality of Petrópolis is at an advanced stage of sanitation service coverage, if compared to the other municipalities of Brazil. Yet, it also counts on the water supply and sewerage paying users as its main funding entities for the WASH industry, by means of the fees they pay. Such fees, however, in the specific case of Petrópolis, are not sufficient to fund the expansion of the water supply and sewerage system, once only the operating and maintenance costs spent about 73% of the total flow in 2016. Therefore, the expansion of the water supply and sewerage system has been upheld almost entirely through the acquisition of loans from Brazilian investment banks that offer low interest rates. Regarding the solid waste management, the City Hall shoulders the deficit in the operations carried out by COMDEP, a situation that cannot last for too many years.

At the moment, Brazil walks slowly towards the development of a solid waste management framework that, in the municipalities with low financial resources, are only collected and disposed of in dump yards or controlled landfills in an improper manner. According to the 2015 SNIS Diagnosis, 65% of the municipalities in the country do not charge any fees for the waste management services. In the case of Petrópolis, the waste fee

is charged, but is not sufficient to cover the costs of collecting and disposing of the wastes, generating indebtedness to the municipal utility company every year.

In Brazil, there is a sanitation information system (*Sistema de Informações de Saneamento – SNIS*) that allows analysis of the industry, not only regarding the basic infrastructure indicators, but also the expenses incurred and the investments carried out. Such data may contain a certain level of errors and inaccuracies, but in the specific case of the municipality of Petrópolis, it is mostly comprised of reasonably reliable evidence. However, an assessment at municipal level requires a more detailed insight, which requires other information and data that are not available in the SNIS databases, and must be collected at the institutions of the industry in the municipality. This may represent quite an effort and a lot of time, if the data are not already organized and compiled.

An assessment of the investments at municipal level is recommended along at least five years, so that it will be possible to review the analytics of the investments in the WASH industry. For a longer time span, the limitations of the investments of the local players is pretty much clear, regarding the achievement of ODS goals in the municipality. The long-term vision allows us to envision the readjustments required on the fees, above all considering the need to expand the infrastructure, given the financial limitations. A detailed analysis shall also be carried out in the distribution of the social fees and minimum fees, which may affect the degree of buy-in for the network supply, inadvertently rerouting the most vulnerable population to alternative solutions, with less quality control of the water to be consumed by humans. Likewise, the benchmarking with other municipalities and WASH operators may help in the analysis of the operation, indicating points of potential improvement and cost reduction.

The application of the TackFin at municipal level allows a consolidated vision of the sanitation industry, sufficiently detailed for the decision makers of the industry to plan and control the investments and expenses more effectively, in the pursuit of the universalization with accessible costs to the entire population. The level of detailing shall be set forth according to the municipality and its degree of sanitation infrastructure progress. Hence, the decision making process may be facilitated, above all focusing on improvement (buy-in, social fees, losses) and expansion (focus on most vulnerable areas), resulting in a better use of the resources: better return of the investment carried out to improve the population's health.