Work programme

Increasing Financial Flows for Urban Sanitation

Case study

Blumenau, Brazil

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BLUMENAU CASE STUDY

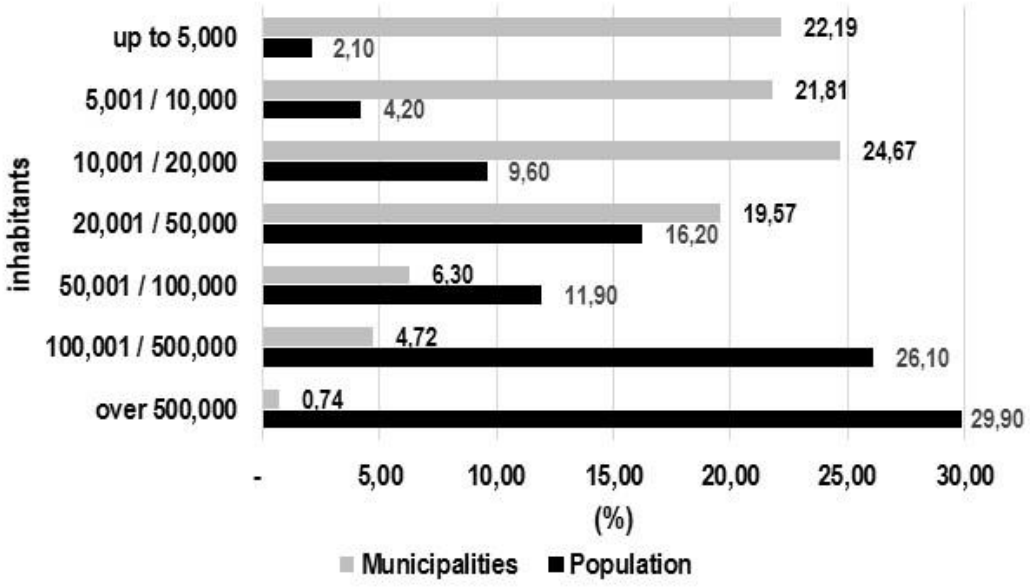
PART A: SHORT BACKGROUND OF THE COUNTRY

1. BRIEF SOCIAL, POLITICAL AND ECONOMIC DATA

Brazil is a Federation Republic, made of 26 States and 1 Federal District, embracing 5 geographical regions, that are: North, Northeast, Southeast, South and Center-West, totaling a comprehensive 8,515,767 km^2 land area.

According to IBGE[1], in 2015 Brazil owned a global population of 204,450,600 inhabitants, distributed throughout 5,570 municipalities, where 84.0% is urban (171,748,500 inhabitants) and 16.0% (32,702,100 inhabitants) is rural. On another hand, more than half population (56.1%) lives in 304 municipalities (5.46%), with over 100 thousand people, as in the Graphic 1 below:

Graphic 1 – Brazil Population Distribution



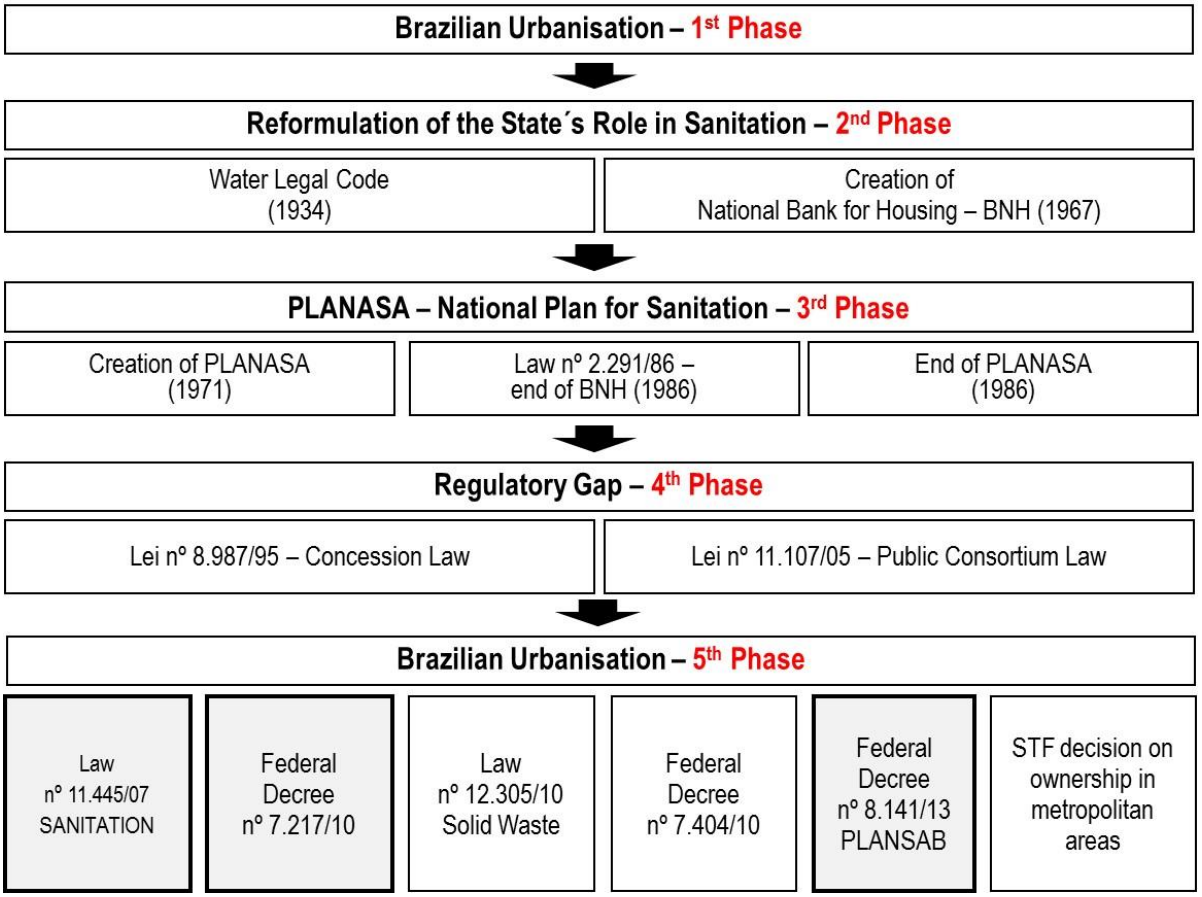
According to IBGE, in 2015 Brazil scored a R$ 5,904 billion GDP (US$ 1,775 billion) by current value, and a R$ 28,876.00 GDP per capita (US$ 8,681.40) by nominal value. HDI was 0.754 ranked at the 79th position worldwide.

[1] IBGE – Instituto Brasileiro de Geografia e Estatística = Brazilian Institute for Geography and Statistics

2. CONSTITUTIONAL STRUCTURE

A brief historical retrospective indicates that until the 60' decade water and sanitation services have been delivered in a deficient way, not only in terms of reduced coverage, intermittent service, poor water quality to the population, as well as of a low score for water and sewage collection and treatment, as described in Figure 1:

Figure 1 – Water and Sanitation Evolution in past 50 years



Unfavourable figures in 1970 indicate that only a little more than 32% of our population (both urban and rural) could have access to piped water and just 13% to sewage collection public network.

Multiplicity of different municipal administration models for management and service supply contributed to its inefficiency. The most adequate model was where state departments were responsible for the entire process, including: (i) production – water catchment, adduction and treatment; (ii) distribution – reservation and distribution network; and, (iii) planning, construction, and operation itself.

When the National Plan for Sanitation – PLANASA arrived in 1971, several state-owned water and sanitation companies were established – CESB. At the same time, the National Bank for Housing – BNH, as central, normative and supervisory body of the Sanitation Financing System – SFS, started issuing rules and conditions to implement PLANASA in

each state, with defined goals, service levels and relative schedules, as well as allocating necessary financial resources, able to implement the whole plan in the States by their water and sanitation companies.

This model ended in 1986, leaving the water and sanitation sector fully headless, without any rules, directions and public policies, with the role and power to finance it transferred to the Federal Savings Bank – CEF, in lieu of the extinct BNH. Service coverage figures in 1991 attest the accomplishments made by the PLANASA model, when compared to 1971, that is 71% of Brazilians were served by piped water and 37% by sewage collection public network.

According to the Brazilian Constitution of October 1988, by its article 30th, municipalities are given the responsibility to decide on matters of local interest, and therefore organizing and providing local interest public services, directly or under a concession or permission regime. Municipalities are also given autonomy and power for self-organization, self-administration, self-ruling and self-management.

Concerning water and sanitation[2], our Constitution also states by its article 21st that the Union has the exclusive power to promote guidelines for urban development. By its article 23rd, it also states about a common power among Union, States, Federal District and Municipalities to "promote programs for housing construction, housing conditions improvement, and water and sanitation"

Nevertheless, water and sanitation sector did not take advantage of a potential offered by several legal acts issued in the 90' and 2000', aiming at infrastructure development, such as: (i) Law 8,987/1995 – concession; (ii) Law 9,074/1995 – concession extension; (iii) Law 11,079/2004 – public-private partnerships; and, (iv) Law 11,107/2005 – public consortium.

A Ministry of the Cities (MC) was established on January 1st, 2001, with the following competence areas: (i) policy for urban development; (ii) policy for housing, water and sanitation, urban transportation and transit; (iii) together with other governmental spheres, private sector and NGOs, promotion of activity and programs for urbanization, housing, water and sanitation, urban transportation, transit and urban development; (iv) policy for subsidizing popular housing, water and sanitation and urban transportation; (v) planning, regulation, ruling and managing financial resource allocation for urban development, urbanization, housing, water and sanitation, urban transportation and transit; and (vi) joint elaboration of general guidelines for urban water systems, and also for adopting the water resource basin as the standard basis to plan and manage water and sanitation.

However, the water and sanitation sector was still lacking a legislation to establish national guidelines able to implement a global federal policy for it. Finally, Law 11,145/2007 was sanctioned on January 5th of that year.

That legislation provided institutional innovations and advances, even though still unable to change existing models for a real infrastructure expansion required by the country.

As a long-range planning tool, a National Plan for Water and Sanitation (PNSB), named PLANSAB, was issued in 2013. It settled W&S guidelines, goals and actions for the next 20 years (2014-2033). Projected investment for that period is

[2] Water and Sanitation – potable water supply; sewage treatment; urban cleansing and solid waste management; drainage and rain water handling.

R$ 508.4 billion. Out of this amount, around R$ 390.3 billion are fully dedicated to water and sewage programs. Financial resources would come from federal agencies (59%) while state and municipal governments and service operators would also have private initiative and international organizations as source, among others (41%).

Plan foresees to attain a service coverage of 99% in potable water supply (100% in urban areas) and 92% in sewage collection (93% in urban areas) until 2033.

An overview on the type of operator providing services of water and sanitation to 5,088 municipalities is shown in the table below, according to SNIS[3] 2015;

Table 1 – Type of Operator

Operator	Number of Municipalities	%
- State-Owned Water and Sanitation Companies (CESB)	4,030	70.0
- Local Municipalities and Micro-regional areas	1,414	25,0
- Private operators	204	5.0
- Subtotal	5,088	100.0
- Did not answer the SNIS questionnaire	482	---
- Total Municipalities	5,570	---

3. NATIONAL – LEVEL DATA ON WATER AND SANITATION

Last SNIS Report – edition 2015, issued on February 2017, presented the following global situation about water and sanitation systems in the country:

Table 2 – Brazilian global water and sanitation profile

Data	Unit	Figures		Δ (%)
		2005	2015	
- Total population having water supply	1,000 inhabitant	138,391.8	164,765.6	19.1
- Water connections	1,000 connection	35,578.3	53,400.7	47.3
- Water network length	km	409,179	602,408	69.2
- Produced water	1,000 m³	13,372,970	15.381.099	15.0
- Water consumption	1,000 m³	7,505,135	9,723,650	29.6
- Total population having sewage	1,000 inhabitant	66,900.5	99,425.7	48.6
- Sewage connections	1,000 connection	15,586.2	28,988.9	86.0
- Sewage network length	km	158,445	284,941	79.8
- Collected wastewater	1,000 m³	3,576,104	5,186,706	45.0
- Treated wastewater	1,000 m³	2,201,880	3,805,022	72.8

[3] SNIS – National Information System on Water and Sanitation by MC

As to rural areas, IBGE data indicate that only 32.8% residences are connected to the water distribution network while the remaining part uses alternative sources with questionable potability many times, such as wells and water springs. As to sewage network, 75% rural residences still use inadequate systems for treatment and final disposal of domestic sewage, most of them being septic tanks, sewage ditches, or even disposal in natura on the ground or on any kind of flowing water.

According to the already mentioned PLANSAB, total investment for the rural area until 2033 is projected to be around R$ 22.7 billion, out of which R$ 7.3 billion for water supply and R$ 15.4 billion for sewage.

4. INSTITUTIONAL RESPONSIBILITY FOR WATER AND SANITATION AT THE NATIONAL LEVEL

Institutional responsibility is shared by several ministries that operate in a coordinated way each one with its own responsibility:

- Ministry of the Cities: supports municipalities with over 50 thousand inhabitants, including the metropolitan regions;
- Ministry of Healthcare: sets and controls water quality standards for human utilization. It also supports and gives assistance to municipalities with less than 50 thousand inhabitants, to rural settlements, to indigenous and other traditional areas, by using FUNASA - National Foundation for Healthcare;
- Ministry of the Environment: acts in water resource management with support from ANA – National Agency of Water;
- Ministry of National Integration: acts in the dry and semi-arid regions of Northeast with the objective of expanding water availability for all uses, especially for human consumption;
- Ministry of Social Development: coordinates implementation of up to 1 million water tanks in the semi-arid regions of Northeast;
- Ministry of Labour: coordinates programs oriented to support cooperatives for recyclable material related to cleansing and solid waste handling sectors.

(see Figure 2 next page)

Figure 2 – Competence of planning by level of government according to the W&S law

LEVEL	PLANNING	REGULATION	OPERATOR	FINANCING
Federal	• Ministry of Cities • Ministry of Healthcare • Ministry of Environment • Ministry of National Integration • Ministry of Social Development • Ministry of Labour	• ANA • IBAMA	• FUNASA	• BNDES • CEF • Multilaterals
State	• State Councils	• State Regulatory Agencies	• CESB • Environmental Agencies	• Multilaterals
Municipal	• Municipal Councils	• Municipal Regulatory Agencies	• Municipal Companies • Private Companies	• Multilaterals

SOURCE: CNI[4]

5. FINANCING MECHANISMS FOR WATER AND SANITATION AT NATIONAL LEVEL

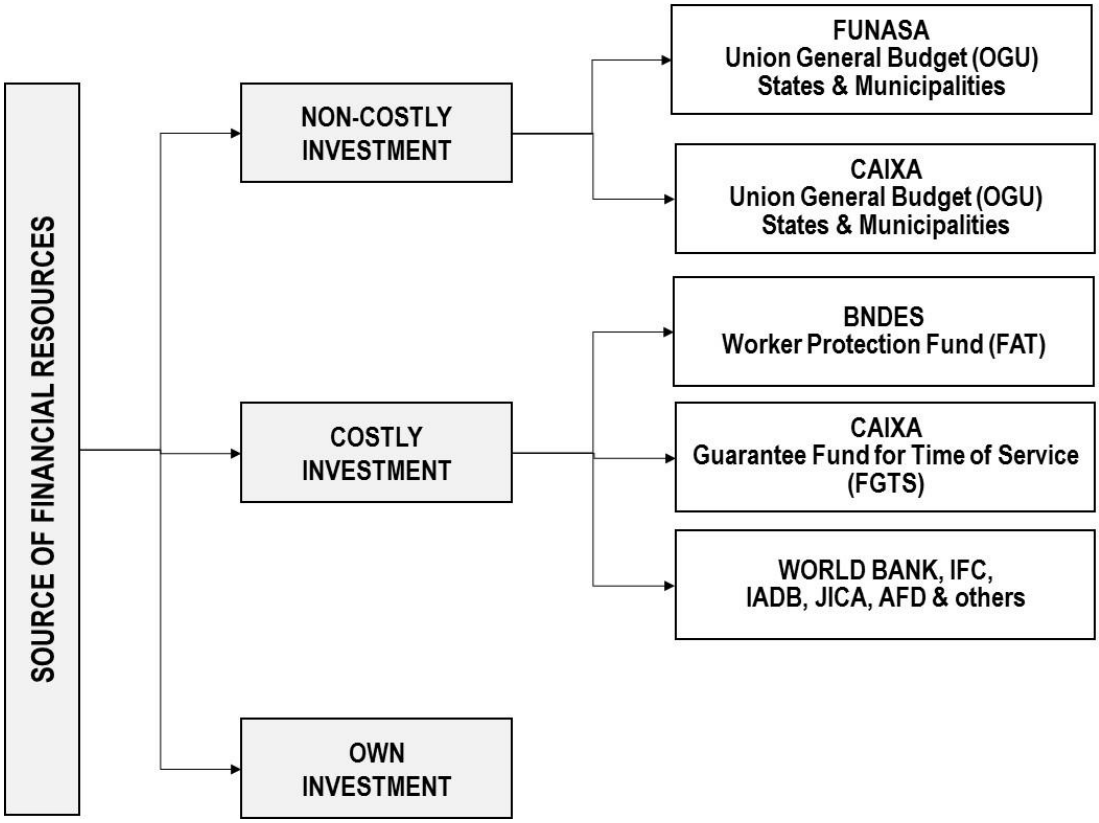
According to the Ministry of the Cities, source of financial resources for application in water and sanitation can be of three kinds: (i) own investment – made with any operator income resources coming from its services provided to users; (ii) costly investment – made with financeable resources to be paid back including all kind of interest taxes; and, (iii) non-costly investment – not returnable financial resources free of interest taxes, also named lost funds.

Available financing resources, either national or international, are: (i) costly-wise –Guarantee Fund for Time of Service (FGTS) and Worker Protection Fund (FAT), under Federal Government management using Financial Agencies such as – Federal Savings Bank (CAIXA) and National Bank for Economic and Social Development (BNDES), respectively. In this segment, there is also availability of resources from multilateral Banks, such as: Inter-American Development Bank (IADB); International Bank for Reconstruction and Development (IBRD) which is a financial institution under World Bank organization, responsible for financing, among others; (ii) non-costly – from the Union General Budget (OGU), from State and Municipalities as well as from operators' self-funds.

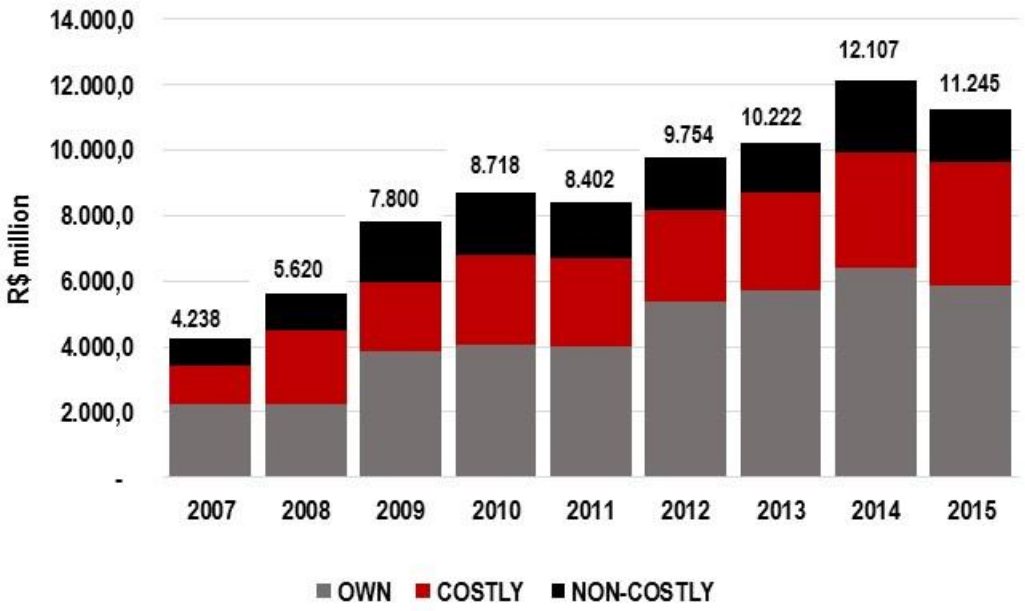
(see Figure 3 & Graphic 2 next page)

[4] CNI = Confederação Nacional da Indústria = National Industrial Confederation

Figure 3 – Source of financial resources



Graphic 2 - Investments

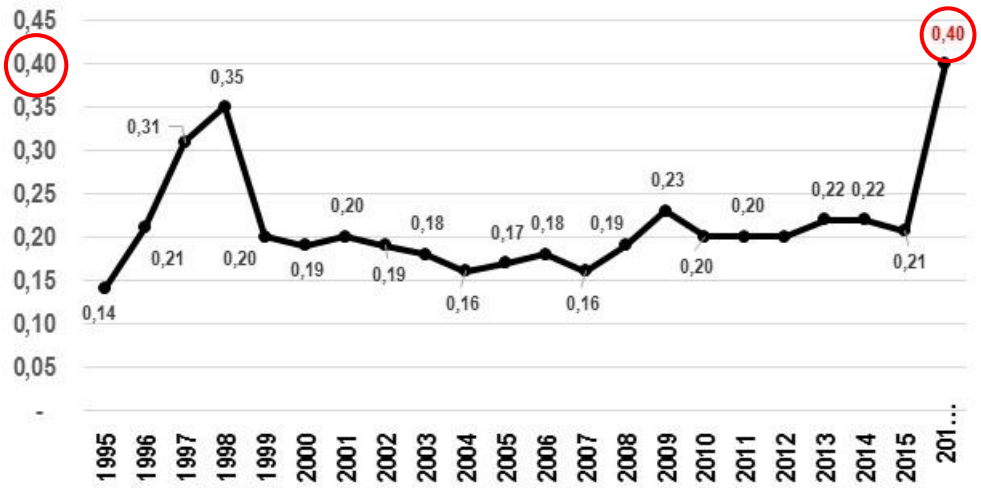


Annual investments in water and sanitation when compared to GDP have shown actual expenditures constantly below the required percentage needed to universalize those services.

Graphic 3 below illustrates the 2005 to 2015 timeframe and shows a projection for the following years, in line with PLANSAB calculation. Required investment in water and sanitation is around R$ 17.0 billion yearly to attain service universalization.

The percentage 0.40% of GDP, which corresponds to the amount required to universalize W&S services, has suffered a significant impact by a GDP slowdown in the past five years, falling back from US$ 2,615 billion to US$ 1,775 billion, around 32%.

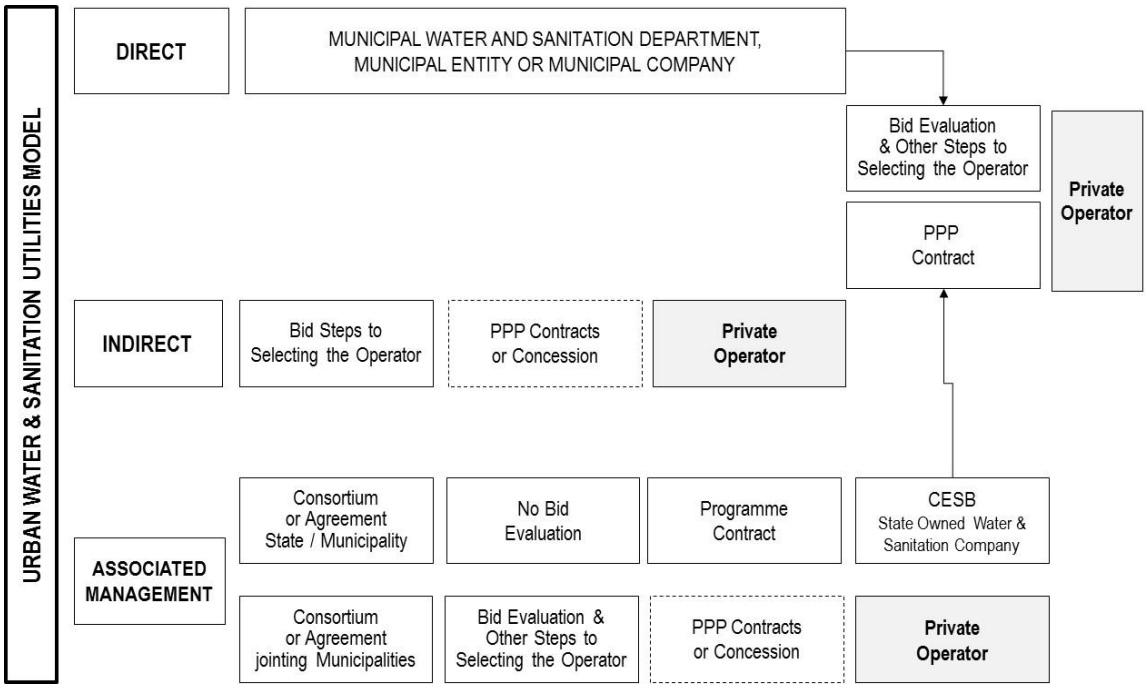
Graphic 3 - GDP x INVESTMENTS



Current feeble economic and financial environment in the country at all levels (federal, state and municipal) is driving hybrid solutions, by applying public-private partnerships (PPPs) - as shown in Figure 4 below. There is a mandatory complementarity by the private sector, mostly for recollection, separation, treatment and adequate disposal of urban sewage, because of its low coverage.

(see Figure 4 next page)

Figure 4 – Urban water & sanitation utilities models



6. CIRCULAR ECONOMY

Circular Economy concept is not well spread out in the country yet. However, some good experiences are already in place. Examples:

Public Area: (i) aerobic granular sludge using Nereda technology to extract alginate, raw material to the pharmaceutical industry and to bioplastic production; and, (ii) transformation of sludge into fertilizer using dehydration and drying. Human excrement is treated in a waste water treatment Plant to produce sludge, which is dehydrated in centrifugal recipients coming dry and inert, turning into a fertilizer for food plantation to be ingested later and turned again into excrement.

Industrial area: conversion of vinasse into reuse water and potassium powder.

In Blumenau city, concessionaire developed study and made attempts to minimize operational costs related to the sludge produced by two waste water treatment plants in line with initial investment agreements.

In the WWTP original project with a larger flow rate, a treatment system using conventional aeration was already foreseen, with subsequent primary sludge digestion in two big anaerobic digesters and sludge drying by using methane gas generated by the bio-digesters. Now, a MBBR-type aeration system is under operation at both WWTPs, with sludge dewatering through a centrifugal equipment and subsequent destination to an industrial sanitary landfill, at 80% average humidity rate.

Concerning the implementation project of the public sewage service, some possible partnerships with potential suppliers have been taken into consideration. Just a few of them are currently viable. They are: (i) utilization of products able to minimize sludge volumes resulting from the treatment process; (ii) utilization of sludge in agriculture; (iii) sludge drying; (iv)

coprocessing on sludge drying; (v) disposal of sludge with different humidity rates; and, (vi) utilization of sludge resulting from the process as a composting system substratum.

Above experiences demonstrated the obstacles found on the search of scale economy for its concrete introduction, considering the countless W&S operators in terms of legal nature, within the objective of consolidating solutions able to reduce operational costs.

BLUMENAU CASE STUDY

PART B: SHORT BACKGROUND ON BLUMENAU CITY

7. BRIEF SOCIAL, POLITICAL AND ECONOMIC DATA

Blumenau, founded in 1850 by German immigrants and settlers, is in the Itajaí valley mesoregion which embraces 53 municipalities, in northeast of Santa Catarina State, latitude 26° 55' 10" South and longitude 49° 03' 58' West, altitude 21 m above sea level.

Along less than 20 years, this city grew up because of countless small factories installation, making a strong footprint in both industrial and agricultural areas, which are representative symbols for the city until these days. Currently, it is the most important city for the textile industry in the country, and a strong technology and university pole.

In Blumenau, cultural shows keep a strong component coming from day-to-day lives and habits of European immigrants, whose highlight is the Oktoberfest for almost three weeks in October, a special German feast "imported" by the German immigration.

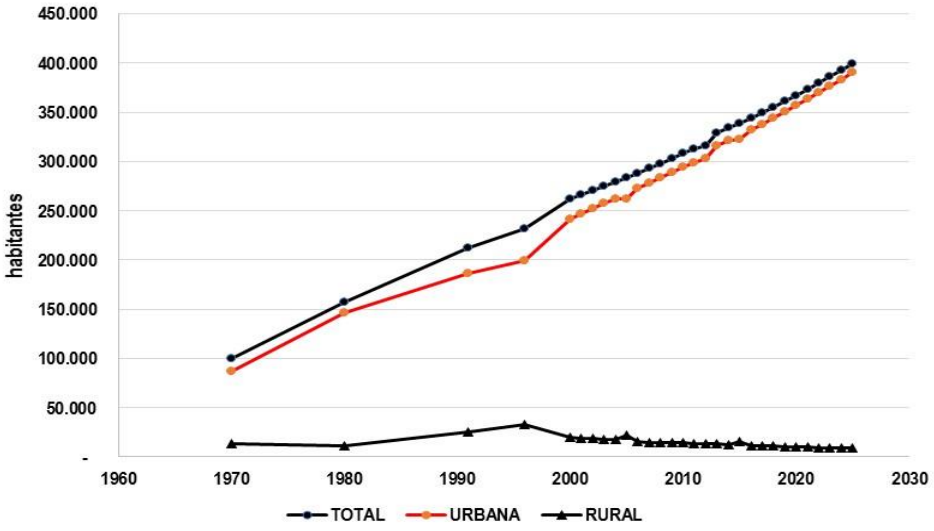
The city owns a global 519.8 km² land area, out of which 206.8 km² (39,8%) are urban area and 313.0 km² (60,2%) are rural. Landscape is rather rugged and hilly with significant variations of heights and slopes. Climate is temperate, warm and humid, with winds coming from East, blending an average temperature from 16 °C to 27 °C.

According to IBGE, its population is estimated around 343,715 inhabitants for 2016, out of which 332,056 inhabitants (97%) live in urban areas while 11,659 inhabitants (3%) in rural ones.

Evolution of Blumenau population until 2025, according to census and IBGE estimate (2011 to 2015 period) and municipal data from 2017 on, is shown by Graphic 4 below, indicating a 1.671% annual growth:

(see Graphic 4 next page)

Graphic 4 – Evolution of Blumenau population



Social and economic indicators have put Blumenau in a comfortable position with relation to Santa Catarina State, to Southern region[1] and to Brazil among the 100 most densely populated cities in the country, notably considering life expectancy (years) and illiteracy rate (%), as shown in tables below:

Table 3 – Life expectancy & Illiteracy rate

Indicator	Blumenau	Santa Catarina	Brazil
Life expectancy (years) – SC 1st place in relation to Brazil	78,6	77,7	75,5
Illiteracy rate (%) – the lowest in Brazil	1,7	3,1	8,3

Evolution of Blumenau 's HDI in relation to Santa Catarina State and to Brazil is presented by Table 4 below:

Table 4 – Human Development Indicator – Municipal (HDI-M)

Human Development Indicator – Municipal (HDI-M)						
	1970	1980	1991	2000	2010	2015
Blumenau	0.674	0.797	0.813	0.855	0.806	Not Available yet
Santa Catarina	0.477	0.734	0.785	0.822	0.774	Not Available yet
Brazil	Not Available	Not Available	0.493	0.612	0.727	0.755

In a developing country with so many and historical social imbalances and poor income distribution, it is relevant to analyze evolution of the GINI indicator on household income per capita (2000-2015 period), especially regarding the indicator decreasing over that period:

Table 5 – GINI Indicator

GINI Indicator				
	1991	2000	2010	2014
Blumenau	0.4776	0.5058	0.4710	Not available
Santa Catarina	0.5482	0.5616	0.4942	0.4510
Brasil	0.6380	0.6460	0.6086	0.4910

As to economic aspects, Blumenau has scored significant results concerning GDP Evolution as well as GDP per capita over 2002 to 2015 period, demonstrating its strong enterprising mind, labour force and industrial pioneering since its foundation, as in following table:

Table 6 - GDP & GDP per capita

Year	GDP (R$ million)	Position		GDP per capita (R$)	Position	
		Regional	State		Regional	State
2002	3,773.7	1st	3rd	13,854.04	4th	21st
2005	5,254.6	2nd	4th	18,826.94	8th	26th
2010	9,908.6	Not Available	4th	32,044.54	Not Available	Not Available
2015	16,767.1	Not Available	Not av.	50,200.62	Not Available	Not Available

8. ITS SIZE COMPARED TO OTHER CITIES IN THE COUNTRY

Blumenau is the most densely populated city in Itajaí valley mesoregion, the 3rd one in Santa Catarina state, the 11th in Southern region, and the 78th in the country.

Colonized by German people, Itajaí valley still preserves its ancestors' habits in gastronomy, in half-timbered architecture or fachwerk – an old German technique for construction - in folklore, in dance and feast.

The city enjoys a good urban infrastructure, and also represents the country in several economic sectors, especially in information technology and textile industry. As to healthcare, it owns four public hospitals and university education.

A comparison with other similar-size cities in Southern and Southeast regions well demonstrates its highlight position, as shown in the table below:

Table 7 – Comparative indicators with other similar-size cities

Indicator	Blumenau (SC)	Pelotas (RS)	Ponta Grossa (PR)	Franca (SP)
Population (inhabitants)	343,715	343,651	341,130	344,704
HDI-M	0.806	0.739	0.763	0.780
GDP (R$ million)	12,893.3	5,920.5	10,280.8	7,342.4
GDP per capita – 2014 (R$)	39,179.51	17,353.20	31,052.10	21,804.80
GINI Indicator – 2010	0.471	0.540	0.540	0.460
Child mortality – 2010	8.6	12.4	12.2	14.3
Life expectancy (years) – 2010	78.6	75.6	75.2	75.5
Illiteracy rate above 15 years old (%) – 2010	1.77	4.12	3.57	3.44

9. SPECIAL FEATURES OF BLUMENAU THAT MIGHT MAKE IT AN ATYPICAL CITY IN THE COUNTRY

One of the positive aspects of the city is personified by the strong German culture, resulting from its colonization and its cultural traditions' maintenance. They are key elements for valuation and attraction of high technology new enterprises, notably for software production, automotive industry and related suppliers.

On another side, its topography with a rugged relief, an unfavourable level of water table forcing the shoring of ditches to lay down pipes, recurrent big water flows causing harmful floods into the city since its foundation in 1852, are all impeditive factors for its full economic development and enough to jeopardize population.

(see Figure 5 next page)

Figure 5 - Blumenau Hydrological Aspects

10. SPECIAL FEATURES OF SANTA CATARINA THAT MIGHT MAKE IT AN ATYPICAL STATE IN THE COUNTRY

Despite the good economic performance in Santa Catarina over the past five years and the above mentioned social and economic indicators, this state presents a visible and worrying deficit in supplying and caring of public sewage services in almost most cities, one of the worst in the country. This fact sounds like a paradox whose reasons and justification deserve an in-depth study in several segments of Society.

Massive investment to recover the existing delay and reverse this disastrous reality will certainly force the state government and all remaining municipalities to search for other external financial resources. These resources will allow to implement, expand and improve public sewage services in both urban and rural areas at the necessary speed, as well as to search for control, management and operational efficiency together with a conscious corporative governance by responsible operators.

According to figures from PLANO NACIONAL DE SANEAMENTO BÁSICO – PLANSAB, over the 20 years' period (2014 – 2033), necessary financial resources would be around R$ 26,926 million for the Southern region, contemplating following activities: (i) replacement of sewage treatment system; (ii) replacement of sewage collection and interception; (iii) expansion of sewage treatment system; and, (iv) expansion of sewage collection and interception.

Because of lack or insecure public sewage system in Santa Catarina, a 4.0 million people deficit is estimated comparing the current population served by water in relation to sewage. Therefore, it is expected that above mentioned investment volume may be strongly oriented to this state.

According to a study promoted by ABES-SC[5] (2008) using data from our State Secretary for Sustainable Development, the required amount to eliminate current deficit would be around R$ 12,690 million.

[5] ABES-SC – Brazilian Association of sanitary and environmental Engineering –Santa Catarina section

PART C: DETAILED INFORMATION ABOUT BLUMENAU CASE

11. DETAILED STUDY OF THE FINANCING MECHANISMS FOR SANITATION

11.1 BACKGROUND

Historically speaking, solution adopted to solve the sewage problem was to disseminate simplified and individual technology by using septic tanks together with anaerobic filters since the 30' decade. That mechanism allowed to achieve a reasonable hygienic utilization even with some releasing in natura into near water flows. That solution was then accepted by the municipal Administration and by SAMAE[6], an Administration's Autarchy, which established it as the standard solution for sewage until the middle of the 80'.

The lack of an effective public sewage system, including collection, removal, treatment and adequate final disposal of urban domestic waste water, have been responsible for some benefit to only 4.84% urban population, still in 2009. In other words, only 9,613 inhabitants from the city central area could be served by an 87 km sewage collection system and a 1,489 km water distribution network, while those people could also enjoy a 1,400-km urban street network. Sewage collected went through a secondary treatment in a specific plant using the RAFA/RALF[7] process providing an output flow volume of 20 liters/s. After a OBD 60% reduction, final flow went into Ribeirão Garcia river within its urban boundary.

Table 8 – Percentage of households per type of hygienic facility

Hygienic Facility (WC or bathroom)	1991	2000	2010
- Sewage network or rain drainage system	0.90	13.30	27.60
- Septic Tank	84.90	75.50	64.60
- Rudimentary Septic Tank	3.70	3.80	4.00
- Cloaca	4.60	3.20	1.70
- River, pond, or sea	Not av.	3.50	1.80
- Another wastewater	4.30	0.40	0.20
- Do not know the kind of wastewater	0.40	Not av.	0.05
- Do not have hygienic facility	1.30	0.30	0.05
T O T A L	100.00	100.00	100.00

SOURCE: IBGE Census & SIGAD

[6] SAMAE – Municipal Autarchy founded in 1966 to provide W&S services
[7] RAFA/RALF – Upward Flow Anaerobic Reactor

That concerning operational environment, including the aggressive environmental pollution impacting all water resources and causing several subsequent diseases, and on another side the impossible financial resource availability to solve that heartbreaking situation, endorsed the fact that sanitation was not a priority for the past municipal administrations. Thus, on December 2008 SAMAE was given authorization by the municipal legislation power to proceed with a service concession for sanitation. That concession should be implemented following a public bid process and a selection made using a parameter combination (lowest tariff with best technique), for a 35-years period.

11.2 THE CONCESSION CONTRACT AND THE SEVERAL CONTRACT'S AMENDMENTS

After a bid process in accordance with all mandatory rules established by legislation, a concession contract was finally signed with a private consortium on February 2010. Concession was set to cover a 519.8 km²area, including commercial management of water supply public service.

According to information from the private concessionaire, the financing loan (CEF 322.172-83) was signed with Caixa Econômica Federal on October 2011 and the disbursements occurred account for 87% (R$ 166.0 million) of the contracted value (R$ 191.0 million).

That contract established a set of guidelines, parameters and targets, by which the public sanitation service was meaning "all activities, infrastructure and operational installations for collection, transportation, treatment and adequate final disposal of sewage, from domestic connections down to the environment".

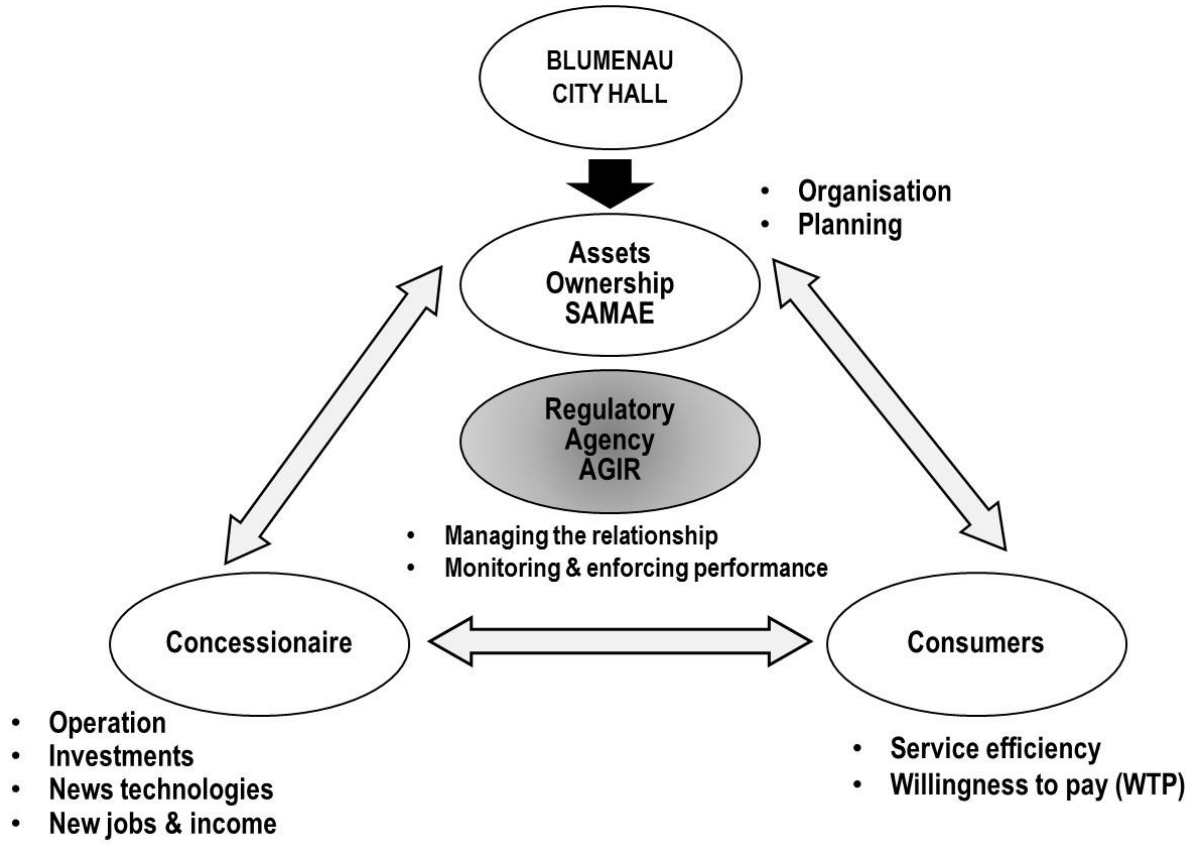
In addition, that contract also clarified that the sewage public service included "planning, construction, operation and maintenance services for the sewage infrastructure and physical, operational and management system. It should also take care of the organization system management, complementary service delivery (please see below), sale of related products and services as well as CONSUMER attendance".

The institutional framework highlighting rights and responsibilities of each intervening player, is shown by figure 6, as below:

- Granting Power (SAMAE) – in line with its Municipal Sanitation Plan (PMSB), it sets local policies regarding sanitation guidelines and standards to be achieved by the Concessionaire;
- Concessionaire – responsible to provide public services, financial resource raise and investment to achieve PMSB defined targets as well as to charge users according to the agreed tariffs;
- Consumers – get all benefits coming by sewage collection, transportation, treatment and adequate final disposal of urban domestic outputs as well as pay monthly tariffs based on corresponding utilization.

- Regulatory Agency (AGIR[8]) – harmonizes relations, approves tariffs, sets regulation and supervises service delivery, in line with the legal agreement, to maintain the necessary economic and financial sustainability of that concession.

Figure 6 – Institutional Framework



Initial Estimated Amount in the 2010 concession contract was R$ 310.0 million. The Private Consortium was also responsible to raise financial resources needed to provide the public sanitation service, moreover to pay R$ 12.0 million to the Granting Power for receiving existing assets capable to cover one quarter of population.

Descriptive Specifications of the Concession Contract (as by its Annex V) contained a summary of works, objectives and targets, as such:

- SEWAGE WORKS

  - ✓ Collection network, main sewer lines and disposal – 1,551 km, out of which 375 km are already implemented (276 km by the Concessionaire);

[8] AGIR –Intermunicipal Agency for Regulation, Control and Supervision of all public services within Itajaí middle valley.

- ✓ Pumping stations (primary & secondary) – construction of 152 units, 50 under operation and 41 implemented by the Concessionaire;
- ✓ Wastewater Treatment Plant (WWTP) – construction of three plants (Fortaleza – 468 L/s, Garcia – 176 L/s and Itoupava – 468 L/s) – final flow rate 1,176 L/s.

- TARGETS & OBJECTIVES

- ✓ Short Term – until 2015, expansion and replacement of obsolete pipe networks together with public service universalization, distributed year by year:
- ✓ Medium Term – until 2030, improvement, modernization and services by sector;
- ✓ Long Term – following vegetative growth in terms of attendance.

Table 9 – Contractual Targets & Objectives

Year	2009	2010	2011	2012	2013	2014	2015
Coverage (%)	4.84	23.2	30.0	35.0	40.0	45.0	50.0
Coverage SNIS/PMSB (%)	Not Av.	Not Av.	5.18	7.57	27.8	30.6	33.0
BOD efficiency (%)	60.0	60.0	70.0	70.0	80.0	80.0	80.0

- MUNICIPAL SANITATION MASTER PLAN – UPDATED DECEMBER 2016

PMSB prepared by a consultancy company presents following projected coverage evolution considering 2009 as the initial step:

Table 10 – Updated Municipal Sanitation Master Plan Coverage

Number	-1	0	1	2	3	4	5	6	7	8	9	10
Year	2016	2017	2018	2019	2020	2012	2022	2023	2024	2025	2026	2027
Coverage (%)	37	39	44	49	67	72	77	82	84	85	86	87

Population (1000 inhabitant)	113.3	121.3	139.0	157.2	218.3	238.3	258.9	280.1	291.5	299.6	309.0	363.8

SOURCE: CONCESSIONAIRE: "Universalization of Sanitation System is projected to be achieved by 2027 only, considering some technical deficit and need for complementary works on physical installations".

In fact, coverage of sewage public service was initially around 4.84% and private concessionaire had to pay R$ 4.0 million in terms of restitution.

There was a need for a detailed report on that implementation, since the concession contract signature on February 2010, within the objective of optimizing the available financial resources, and with no changes in its economic-financial balance.

A 1st Amendment Term was done on November 2010 with following objectives: (i) setting criteria, parameters and standardization with indicators allowing the Granting Power to follow up service quality by the Concessionaire; (ii) change of the estimated contract amount into R$ 2.16 billion; and (iii) ratification of the global investment by the Concessionaire as R$ 310.0 million.

A 2nd Amendment Term was done on December 2012 with following renegotiated clauses: (i) inserting partial measures for contract economic-financial rebalancing; (ii) accountability changes in execution of Works to speed up its implementation in central areas with main people concentration;(iii) implementation by the Concessionaire of an incentive program to connect Social Tariff users' sewage to the public network; and, (iv) tariff review with a 12.0% increase.

A 3rd Amendment Term was done on February 2014 with the central objective as: repair of some flaws in the bidding notice documentation and adequacy to some Concessionaire claims anticipating a tariff review. That Amendment went through a complex review by an Audit company with special skills on concession CAPEX and OPEX, considering the high amounts involved and the severe impacts on the estimated cash flow for that concession and on the internal return rate around 10.54% a year. Those negotiations resulted in a significant reduction of operational costs with no transfer of those costs to population and no relevant tariff increase.

Finally, a 4th Amendment Term was done on December 2014 with the objective of implementing measures already defined within the agreed Reviews, contract terms formatting and improving, and maintenance of the internal return rate, originally agreed on 10.54%. Therefore, following points initially agreed at the 3rd Amendment were also included: (i) extension of concession period for 10 years, that is from 35 to 45 years (2045 to 2055); (ii) ratification to partially return back commercial accountability to SAMAE; (iii) ratification of a new schedule of works; (iv) a tariff review of 17.27% starting March 2015; and, (v) acceptance to pay R$ 2,702.1 million to the Granting Power by the Concessionaire due to penalty and interests for delaying license payment at the very beginning.

11.3 SAMAE & CONCESSIONAIRE TARIFF STRUCTURE

The tariff structure applied by SAMAE (all amounts since January 1st, 2017) meets all requirements established by Law 11,445/2007. On another hand, it is difficult to do a thorough evaluation, since each municipal operator – either public or

private – has its own charging policy, and that depends on a specific model being used to provide services to population – water supply or sewage system. Table 11 illustrates that:

Table 11 – SAMAE water tariff & CONCESSIONAIRE sewage tariff structures

Item	Category	Acronym		Monthly Consumption Range (m³)	Water Amount (R$) & R$/m³	Sewage Amount (R$) & R$/m³
I	Residential (R) Office (E) Doctor´s Office (C)	R E C	1	Up to 10 m³	29.19	31.90
			2	11 – 30 m³	5.31	5.31
			3	31 – 9,999 m³	6.77	6.77
II	Social (S)	S	1	Up to 10 m³	14.41	15,75
			2	11 – 30 m³	5.31	5.31
			3	31 – 9,999 m³	6.77	6.77
III	Commercial (C) Industrial (I) Temporaries (T)	C I T	1	Up to 10 m³	44.24	44.24
			2	11 – 30 m³	6,77	6,77
			3	31 – 9,999 m³	10.16	10.16
	Water truck	X	1	Up to 9,999	2.92	2.92
IV	Public (P)	P	1	Up to 10 m³	29,19	29,19
			2	11 – 30 m³	5.63	5.63
			3	31 – 9,999 m³	10.16	10.16
V	School	E	1	Up to 10 m³	29,19	29,19
			2	11 up to 9,999 m³	5.63	5.63
VI	Hospital	H	1	Up to 10 m³	29,19	29,19
			2	11 up to 9,999 m³	3.67	3.67
VII	Public – Municipal	M	1	Up to 10 m³	29,19	29,19
			2	11 – 30 m³	1.78	1.78
			3	31 – 9,999 m³	3.67	3.67
VIII	Hospital – Social	F	1	Up to 10 m³	29,19	29,19
			2	11 – 1,000 m³	0.36	0.36
			3	1,001 – 2,000 m³	1.78	1.78
			4	Over 2,000	3,67	3,67

SOURCE: SAMAE

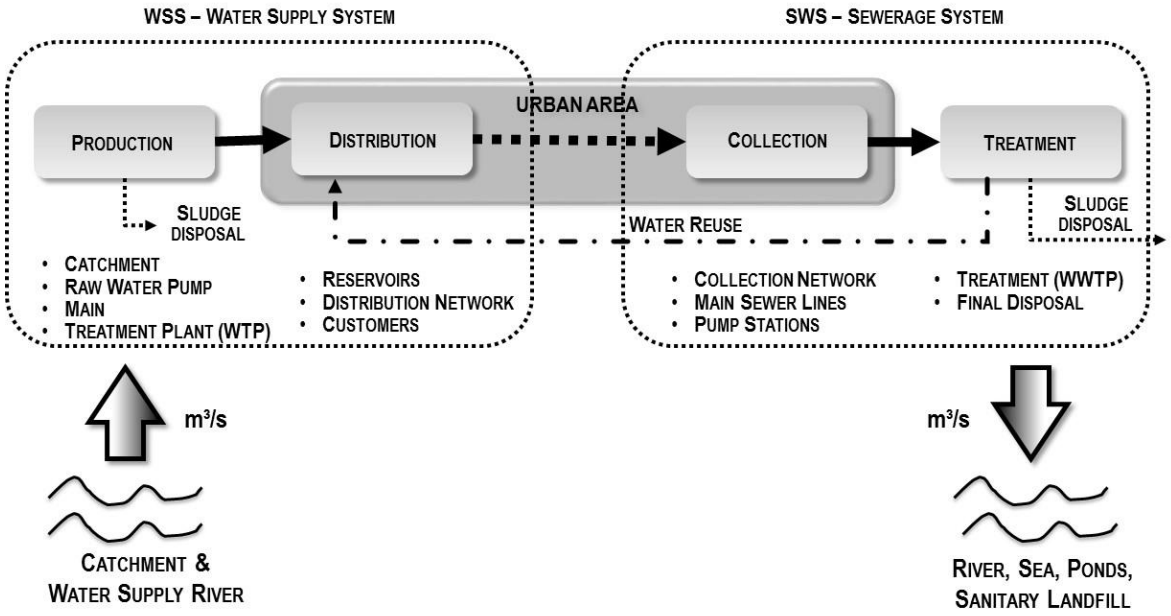
As a benefit policy, many municipalities have adopted a social tariff to households with a very low monthly income, within the purpose of increasing their condition to pay delivered services. By doing so, there is a practical social inclusion for W&S services.

Service costs vary from one municipality to another, considering following technical-operational aspects, such as: (i) closeness to raw water catchment; (ii) existence of collection, transportation, treatment and final disposal of domestic sewage; (iii) evaluation of relief and soil quality in relation to favourable or unfavourable aspects for service implementation, expansion or improvement, notably water distribution and sewage collection networks; and (iv) some other political, economic and financial aspects.

Figure 7 below shows the large variety of components in a water and sewage service system to determine tariffs consequently to a desired level of service. In general, a better technical level and utilization of modern technology imply in a higher tariff.

Therefore, evaluation of service costs in relation to its recovery is a cumbersome and complex exercise by the Granting Power and the Regulatory Agency. Many variables are involved such as level of consumer's income, investment to expansion Works, operational improvements, automation, among others.

Figure 7 – Urban Water Supply & Sewerage System



11.4 CUSTOMER´S WILLINGNESS TO PAY (WTP)

Both consumers' capability and willingness to pay for an installed sewage system directly depends on their family's monthly income, because a little or no aggregate value is considered by those who get benefits with these services.

Unfortunately, obligation of paying monthly bills for W&S services is not also considered a must by most population, mainly in North and Northeast regions resulting in high default indicators.

Urban sewage services are not a priority in a family's budget. In 2014, Blumenau presented a 11.23% default indicator, according to SNIS 2015, in other words one out of ten W&S bills have not been paid on schedule.

According to data from Human Development Atlas, Blumenau scored the following monthly income per capita evolution: (i) 1990 – R$ 733.23; (ii) 2000 – R$ 910,29; and, (iii) 2010 - R$ 1,253.17.

On another side, population percentage with a monthly income per capita below R$ 70.00, which means extreme poverty, presented a shrinkage: (i) 1991 – 0.78%; (ii) 2000 – 0.63%; and, (iii) 2010 – 0.12%.

2010 Demographic Census by IBGE indicated following Families' monthly income distribution in Blumenau, reflected in Table 12 below:

Table 12 – Monthly household distribution income by minimum salary range

Number of minimum salary (R$ 937.00)	R$	Household	%
No wage	---	1,970	1,95
Up to ½ minimum salary	468.50	258	0.26
Over ½ up to 1 minimum salary	469.00 – 937.00	1,993	1.97
From 1 up to 2 minimum salaries	938.00 – 1,874.00	8,960	8.87
From 2 up to 5 minimum salaries	1,875,00 – 4,685.00	37,491	37.54
From 5 up to 10 minimum salaries	4,686.00 – 9,370.00	33,236	32.89
From 10 up to 20 minimum salaries	9,371.00 – 18,740.00	12,438	12.31
Over 20 minimum salaries	18,741.00	4,265	4.22
T O T A L		101,061	100.00

SOURCE: IBGE, 2010 Census

On April 2017, global spared water was 152,402 households, with following distribution by user category: (i) residential (137,448) – 90.15%; (ii) Commercial (11,015) – 7.22%; (iii) office (1,525) – 1.00%; (iv) doctor´s office (475) – 0.31%; (v) social (120) – 0.07%; (vi) public (786) – 0.51%; (vii) industrial (461) – 0.30%; (viii) school (75) – 0.05%; (ix) hospital (24) – 0.02 %; and, (x) temporary (523) – 0.34%.

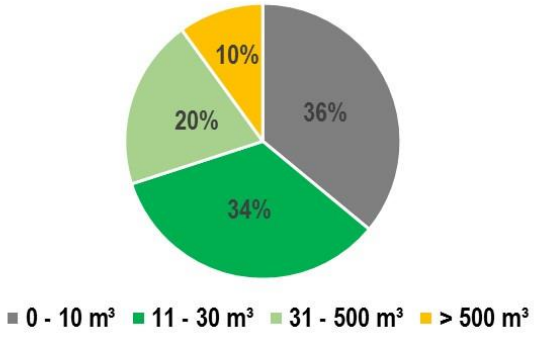
As to global mensal consumption (1,438,634 m³), following distribution by category was: (i) residential (1,297,410 m³) – 90.18%; (ii) Commercial (103,142 m³) – 7.17%; (iii) office (14,609 m³) – 1.02%; (iv) doctor´s office (4,451 m³) – 0.31%; (v) social (1,124 m³) – 0.08%; (vi) public (8,042 m³) – 0.56%; (vii) industrial (4,403 m³) – 0.31%; (viii) school (709 m³) – 0.05%; (ix) hospital (142 m³) – 0.01 %; and, (x) temporary (4,602 m³) – 0.32%.

The concessionaire register confirms 46,026 households attending the following distribution by category: (i) residential – 38,628 (83.92%); (ii) others – 7,359 (15.98%); and, (iii) social – 39 (0,02%).

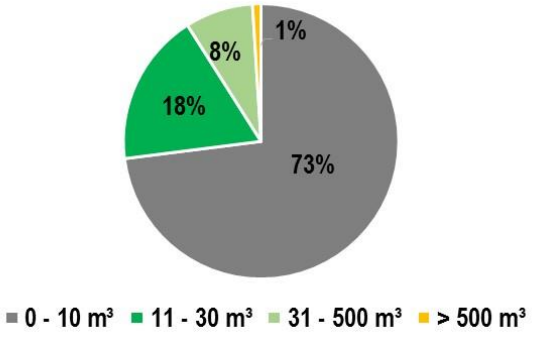
It is verified that residential spare water (90.15%) and respective monthly consumption checked by hydrometers is 90.18% of total consumed volume.

Following graphics demonstrate that 70% of residential spare water indicates a 0 to 30 m³ consumption, and that the highest consumption (73%) varies from 0 to 10 m³.

Graphic 5 – Residential spare effort



Graphic 6 – Residential volume consumption



To calculate an average W&S monthly bill, current tariff structure in place (Table 11) by SAMAE and Concessionaire and following parameters are to be considered: (i) home occupancy rate = 3.06 inhabitants/household; and, (ii) consumption per capita = 150 liters/inhabitant/day (average volume 2010 - 2015, according to SNIS 2015).

Now, for a 10.00 m³ consumption volume, average monthly bill for water supply and for sewage service (same consumption) to residential households is:

RESIDENTIAL TARIFF (10 m³)

- Monthly bill for water = R$ 29.19
- Monthly bill for sewage = R$ 31.90
- Monthly bill for W&S = **R$ 61.09**

SOCIAL RESIDENTIAL TARIFF (10 m³)

- Monthly bill for water = R$ 14.41
- Monthly bill for sewage = R$ 15.75
- Monthly bill for W&S = **R$ 30.16**

On another hand, average monthly volume for residential houses is 13.00 m³. Therefore, considering same consumption also for sewage, final bill for W&S is shown by the new box below:

RESIDENTIAL TARIFF (13.00 m³)

- Monthly bill for water = R$ 29.19 + (3.00 x R$ 5.31) = **R$ 45.12**
- Monthly bill for sewage = R$ 31.90 + (3.00 x R$ 5.31) = **R$ 47.83**
- Monthly bill for W&S = **R$ 92.95**

SOCIAL RESIDENTIAL TARIFF (13.00 m³)

- Monthly bill for water = R$ 14.41 + (3.00 x R$ 5.31) = **R$ 30.34**
- Monthly bill for sewage = R$ 15.75 + (3.00 x R$ 5.31) = **R$ 31.68**
- Monthly bill for W&S = **R$ 62.02**

It appears that above figures and their relationship with Table 11 point out some relevant aspects concerning monthly bill for W&S versus families' income, that is:

- Spare Volume from families with up to 1 minimum salary monthly income is equivalent to 4,221 households;
- Registered data at SAMAE confirm 120 spare water and at concessionaire 39 social spare sewage by April 2017, in compliance with Municipal Decree 10,809/2015, which settled the rules for both SAMAE and private Concessionaire service delivery;
- Involvement of families' income with both water and sanitation services is shown by Table 13 below:

Table 13 – Average Monthly Income x (W + S) Bill

Monthly consumption (m³)	(W + S) Bill (R$/month)		Average Monthly Income (R$/month)		Pledge (%)			
					Regular Tariff		Social Tariff	
	Regular	Social	Up to ½ S.M[9]	½ up to 1.00 S.M	Up to ½ S.M	½ a 1.00 S.M	Up to ½ S.M	½ a 1.00 S.M
10.00	61.09	30.16	468.50	703.25	13.04	8,69	6.44	4,29
13.00	92,95	62,02			13.22	8.82	13.24	8.82

[9] S.M = monthly minimum salary

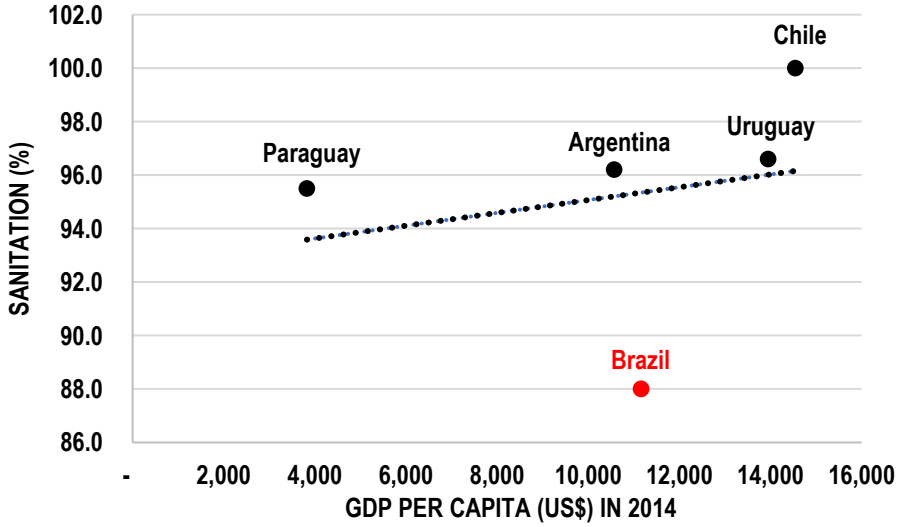
- For families with a monthly income from half to one minimum salary and consumption of 10.00 m³, benefitted by the social tariff, income involvement with W&S services is around 4.29%, considered an acceptable figure by worldwide institution standards (5.00%);
- The monthly household average consumption benefited by social tariff is the quotient of 1,124 m³ ÷120 number of household which is 9.37 m³/household;
- Comparing now average tariffs in whole Santa Catarina region, Blumenau's regular or social tariff platform is slightly above.

PART D: ANALYSIS AND SUMMARY OF BLUMENAU CASE STUDY

12. MAJOR FINANCIAL GAPS AND OBSTACLES

A comparison of W&S service evolution between Brazil and other LA countries, in particular from the Southern Cone – Argentina, Chile, Paraguay and Uruguay, demonstrates the lack of a political policy oriented to healthcare, well-being and quality of life for our population. There are isolated and stratified initiatives, without a common connection and convergent goals among themselves, aiming at service universalization and solving the current unbalances in terms of public healthcare and urban infrastructure.

Graphic 7 - GDP per capita x Sanitation



SOURCE: ECLAC[10]

On another side, there is a full ignorance by both population and public policy makers about following aspects: (i) people health begins with ingesting water of good quality; (ii) implementation, expansion and improvement of a water and sanitation service system are considered a program of physical works by politicians instead of an essential public service to population healthcare; and (iii) people do not give a due importance and priority to these services together with an aggregate value to techniques used to provide potable water as well as collection, transportation, treatment and adequate final disposal of domestic sewage.

Sector indicators issued by SNIS 2015 and reproduced below, attest that water and sanitation keep the same recurrent deficiencies since PLANASA in 1971, reflecting a very severe situation to be overcome, that is:

[10] ECLAC = Economic Commission for Latin America and the Caribbean

- Low sewage treatment coverage – only 42.7% of produced sewage is treated and have an adequate final disposal;
- Reduced people productivity – more than 50% W&S service operators shows an indicator lower than 400 connections / worker;
- High percentage of non revenue water – more than ⅓W&S service operators report an indicator over 30%;
- Low indicator of Cash-collected[11] – almost half W&S service operators report an indicator below 1.00

Above indicators demonstrate not only: (i) fragility of control and technical-operational management; (ii) economic-financial feebleness; (iii) lack of corporate governance, education, capability and qualification of operators' people at three levels (strategic, tactical and mainly operational), notably at CESBs and municipal operators. These facts also prevent access to financing lines.

To better understand the financial mechanisms able to fill up the current gaps and overcome the existing obstacles, it is important that we consider them keeping in mind the "lato sensu" and not the "stricto sensu" concept.

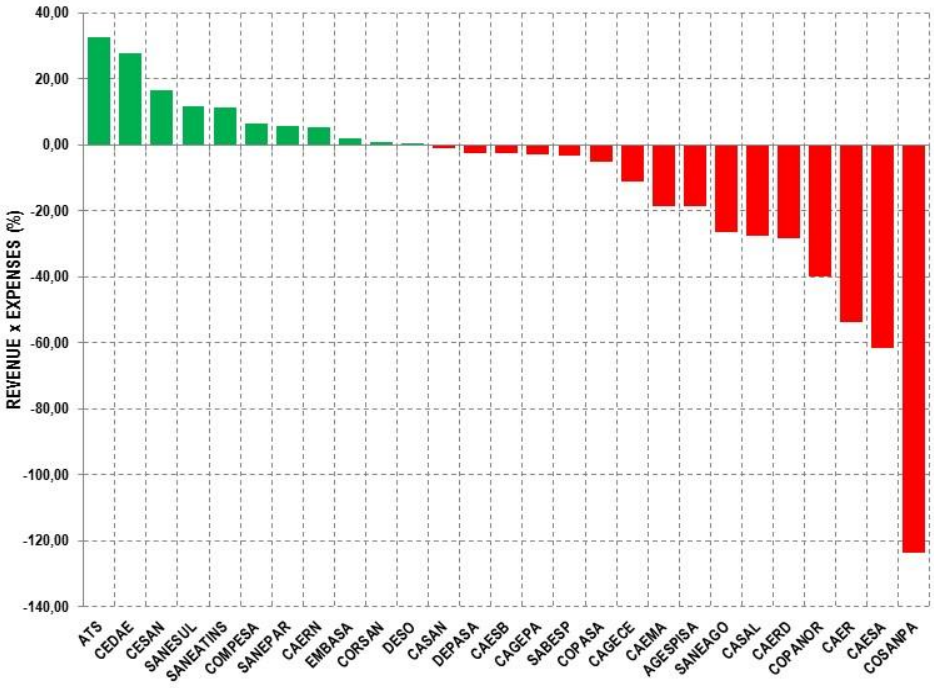
Available financial mechanisms may come from public bank sources (BNDES, CEF), multilateral banks (IADB, WB) or private sources. However, in our environment, their availability does not mean project financing. In fact, many obstacles must be overpassed, such as:

1. Enough guarantee by a company or municipality to get access to financing: (i) out of 27 CESBs, only 8 can do that (besides possible problems with their state economic situation); (ii) very few municipalities with above 50,000 people;

See Graphic 8 (next page)

[11] Cash-collected ÷ (OPEX + Debt Service + Taxes)

Graphic 8 - CESB Revenue x Expenses (%)



According to our population distribution, 88.24% (4,915 municipalities out of 5,570) have less than 50,000 people. In this case, FUNASA – National Foundation for Health – is responsible to provide financial and technical support to them, based on minimum requirements for projects' feasibility. Moreover, FUNASA cannot provide financial support to municipalities for the W&S systems under a private company contract (concession or else) unless several municipal measures guarantee a good financial application and no increase of service tariffs.

2. Low existence of good and sustainable long-term projects;
3. At municipalities, an old remaining ideology against the presence of private resources and lack of economic capability in many cases to fulfill financed projects;
4. Lack of an adequate regulatory system able to assure a good accomplishment to the financing source;
5. Lack of a global priority for sanitation by the Granting Power and by Federal Ministries;
6. Lengthy administrative process to get approval of a financing Project;
7. Country's public financial resources are not enough to reach SDGs goals and W&S service universalization.

In summary: even though traditional financing mechanisms are available, results so far are poor in terms of service coverage, especially for sanitation. Therefore, some "lato sensu" innovative solutions are necessary to make happen the desired urban sanitation.

Considering the city of Blumenau and its expressive social, economic and financial achieved indicators in contrast with its sanitation coverage, this paradox became the symbol for choosing our case study. It had to be investigated to find out all reasons why, all causes and impacts of such a situation.

13. FINANCIAL MECHANISMS

Before going into specific and technical mechanisms for the desired solutions, other activities were considered of fundamental help to achieve success.

Within the scope of starting to revert this unfavourable scenario, the Concessionaire promoted several campaigns over the last seven years with its sanitation system in place. Focus was all society segments with community participation, some of them in a partnership with the municipal government, spreading out information and the importance of sanitation to all of us (for safety, healthcare, environment, among others) programmes:

- Education Campaign on how to use the sewage system
  - Clean River Program begins at home
  - Meetings in Communities
  - Workshops to plumbers
- Campaign on Healthcare and Hygiene
  - WWTP Program – Open Doors
- Education Campaign on the Environment
  - Little Councilmen
  - Mayor for a day
  - Blumenau on board
  - 100 in one day in Blumenau
  - Green June
  - Blumenau meeting on environmental education

For a great social action directly oriented to people's healthcare, communication media used in those campaigns were: (i) posters/flyers handed out to population; (ii) radio, TV, newspapers, among other vehicles; (iii) lectures, courses in schools, churches, and community organizations; and, (iv) home visits by trained agents.

Theoretically, tariff income represents the main financial source to finance and sustain service operators according to Law 11, 445/2007, art. 29th. Moreover, sanitation enterprises can get project financing with available national or international agencies in our capital marketplace. However, all these sources may be negatively affected by: (i) lack of well done and sustainable engineering projects; (ii) financial inability of public operators to borrow new loans; and, (iii) delay time to get financing resources, over 24 months usually.

To overcome the above-mentioned obstacles, including ideological, political and corporate resistances, Blumenau decided to investigate modern and complex business models for sanitation (please see Figure 4) and make decision on a suitable partnership with a private consortium. In other words, a PPP focusing complementarity by a private company could become a financing mechanism and an effective element to solve its situation and historical delays.

In Part C, item 1.4 – Willingness to Pay (WTP), bill payment capability by the low-income people is discussed. Creation of direct subsidies may solve this situation. There are quite successful experiences in Southern America (in Chile for instance) with application of subsidies on demand, not by offer.

Table 14 below shows a comparison between PLANASA relevant topics and current Law on water and sanitation.

Table 14 - PLANASA relevant topics x Water & Sanitation Law

PLANASA	WATER & SANITATION LAW
Self-regulation	External regulation
Public financial resources	Greater emphasis on market financing
More importance on public works	Focus on consumer services
Natural monopoly	Competitive environment
Water as a free utility	Scarcity of water resources and the issue of sustainability awareness
Cross subsidies	Direct subsidies

SOURCE: GO Associates

It is advisable to point out the need of a timely review, modification and modernization of the financing mechanism, in view of the heavy taxation and other key externalities. Good and positive examples are water reuse, desalination, reduction of water losses, recycling of sludge produced by water and sanitation treatment plants, and power generation. Those solutions for the environment should also receive some incentives.

14. POLICIES THAT SHOULD CHANGE TO INCREASE FINANCING FLOW FOR SANITATION

Water and Sanitation sector with its high degree of atomization, in relation to planning and regulation, still causes huge challenges in terms of organization and obedience to each governmental sphere. There is also a pending definition for service ownership in metropolitan regions, where a common responsibility must be shared among the three government spheres (Union, States and Municipalities).

Other obstacle is represented by lack of planning by each municipality. Despite its deadline was established in 2010 by Law, several Decrees have postponed this date. Without a proper planning, it is difficult to get a sign-off by any financial agent.

Multiplicity of Regulatory Bodies without use of a common set of parameters may not help to achieve universalization targets within the established schedule. This aspect also represents an important challenge to be solved if we want to increment and assure an increasing financing flow.

In our case, the Granting Power of Blumenau decided to get the required financing flow to implement, expand and improve the necessary works for a sanitation system by setting a PPP with a private consortium. As to regulation, an agreement was signed between the Granting Power and ARIS – Agência Regulatória Intermunicipal de Saneamento – a very well-known agency in Santa Catarina, regulating more than 177 municipalities.

The key solution does not consist of innovative financing mechanisms alone, or changes of policies for financing of sanitation. We do have those but achieved results have been very poor.

In order to put financing in progress, other policy changes for sanitation are required. As already explained, they are:

1) Service ownership in metropolitan regions. A law is required, since this matter is not clear in our Constitution or an Operational Statement by the Supreme Court.

2) Lack of planning by each municipality. Some national programme must technically support municipalities to plan their future in terms of sanitation and sustainability.

3) Regulation in water and sanitation. An adequate array of agencies, with rules and parameters, through a law.

4) Water and sewage service as a Priority item to population by the Executive and the Congress, including relative public budgets, in a real policy oriented to health and quality of life. Communication to population is mandatory.

5) Priority to water and sanitation projects financing by National Banks such as BNDES, CAIXA (Federal Savings Bank), among others.

6) Promotion of law for PPI – Partnership Programme of Investment, through incentive programmes, and similar ones.

15. INNOVATIVE AND NON-TRADITIONAL FINANCING INSTRUMENTS – CIRCULAR ECONOMY

Within the "lato sensu" concept, the innovative non-traditional financing mechanism consists in a tailored partnership model able to break existing obstacles up.

A model like this owns the necessary conditions to be successful, considering the economic situation of a municipality (this is Blumenau's case) and also the designed project's quality (this is Blumenau's case). Sufficient conditions are represented by a tailored design, instead of adopting a standard PPP for all situations.

This non-traditional financing mechanism is innovative for two main reasons: (i) the mechanism is jointly designed by both parties according to a specific case; (ii) while a typical public-private partnership model has been spread out for roadways, airports and power generation, this mechanism has not been common and also non-traditional for water and sanitation (as explained before, please bear in mind that private presence in this area represents 5% only, quite differently from the other infrastructure areas!).

Circular Economy Concept has been brought up decades ago, but it is still recent in our country. Its birth comes from the solid waste sector addressing the reverse logistics. A radical change has occurred in the usual process - the linear process for utilization of production and consumption has been decreasing. On another hand, circular economy analyses how to explore and increase the economic sustainability of natural resources by planning their re-utilization in a more rationale and efficient way.

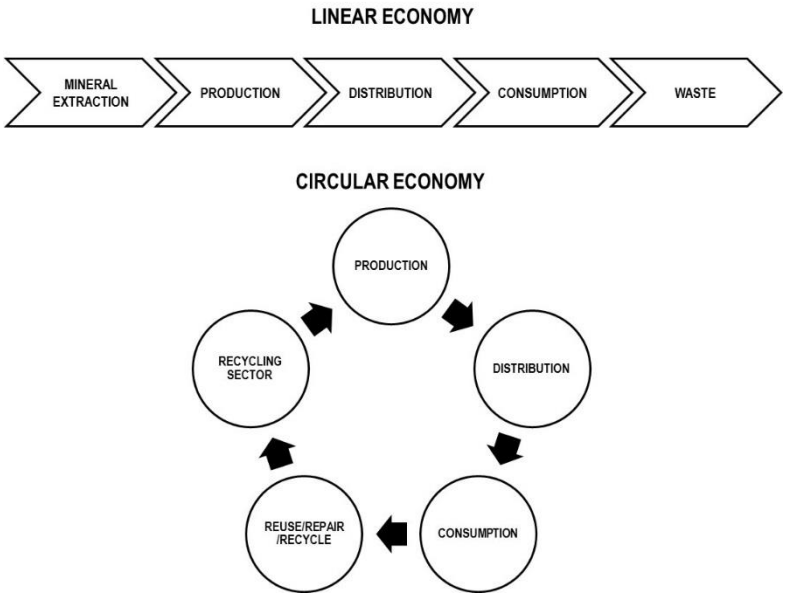
Water and sanitation sectors have already presented pioneer experiences through private companies and some public operators by producing reuse water for industrial purposes, starting from a treated sewage.

A law bill regulating water supply with alternate sources is under discussion at the Congress. Objectives: (i) rational utilization and loss reduction of water resources; (ii) a sustainable use of water resources, with the goal of assuring necessary

water availability to current and future generations; and (iii) reduction of potable water consumption and of produced waste water volumes.

Figure 8, below, presents both mentioned concepts:

Figure 8 - Linear x Circular Economy



16. LIKELIHOOD THAT MORE FINANCE RESOURCE WILL FLOW INTO SANITATION

Household's service coverage without any collection, transportation, treatment and adequate destination of urban sewage was at 4.87% level in Blumenau in 2009. That situation had caused severe environmental problems as well as negative impact on the raw water sources.

A quick and effective solution to recover from that deficit also faced several problems with relation to municipal services, such as: (i) inefficient management and operational control; (ii) reduced cash flow for new investments; (iii) need of high financial investment to expand and modernize its sewage public system; and, (iv) severe limitation or no condition to borrow money, and therefore a poor access to financing banks for sanitation.

Thanks to recent new business models available for sanitation (see Figure 4), Blumenau municipality decided to approve a concession and exploitation of public services in this area to private initiative, according to the general scheme already showed.

According to the concession contract, it was clearly established that the concessionaire was the only one responsible to get and provide financial resources to handle the sanitation public service. This aspect is nowadays very important in our country, being followed by other partnerships.

As to the sources of finance used by the concessionaire, it decided to use CAIXA – COSTLY INVESTMENT, considering a traditional foster programme named "Sanitation for all" (see Figure 3).

To get the necessary financial resources, following specific key aspects were considered in tailoring the partnership Project for Blumenau:

ENGINEERING	ECONOMIC-FINANCIAL	LEGAL
• Design study	• Ability to pay	• Contract
• Basic Project	• Tariff study	• Corporate
• Executive Project	• Risk analysis	• Guarantee
• Specific targets	• Cadastral analysis	• Ownership
• Environmental licenses		

Finally, we do consider this tailored business model (PPP) as innovative, while financial resources almost followed a traditional financing line.

Probability of increasing financial resource flow on a short and medium term is highly dependent on adopting new service delivery models which are available in our marketplace. It is also obvious that without the effective complementary participation by the private sector, desired W&S service universalization will only happen in a remote future.

A Federal Law (no. 13,334/2016) - recently approved on September 2016 - is addressing a Partnership Program of Investment – PPI. Its objective is to expand and fortify interactions between Government and private initiative by partnership contracts for infrastructure public projects and other privatization measures.

This Programme runs very well by using BNDES[12] as the driver of the privatization process, developing projects oriented to PPPs and/or to equity privatization. So far, 18 states have manifested top interest through their CESBs. As shown before in Table 1, CESB's services cover 70% Brazilian population, local and municipal operators 25% and private companies just 5%.

This consideration apparently means low impact. However, firstly, 70% of sanitation services by CESBs does not necessarily mean a good and satisfactory delivery or even a service universalization. Secondly, considering the global situation of the CESBs where only 8 out of the 27 state companies have conditions to invest, most of them are interested in searching innovative tailored models, as Blumenau did. Incidentally, at this moment, BNDES is working with several (16) CESBs (the ones willing to reach SDGs goals and service universalization in a near future) to come up with a specific financing model for each case.

Therefore, most public services will be handled by CESBs either for water supply and especially for sanitation.

[12] BNDES – Banco Nacional de Desenvolvimento Econômico e Social = National Bank for Social and Economic Development

Aiming at water and sanitation service universalization, public policies formulated by Federal Government must go through a full revision of current financial mechanisms. There are too many requirements, which are responsible for countless delays and prevent access to financial resources as well. Most of CESBs and several municipalities do not own ability to guarantee payments (please refer to Graphic 8 - Revenues x Expenses). It is not advisable that current service delivery keeps draining financial resources from States' treasuries in such a ruthless way, since the 70' when CESBs were established.

The continuous financial resource flow oriented to water and sanitation service universalization is a State policy, which also requires short and long-term actions by State governments on CESBS to: (i) encourage improvements in operational control and management; (ii) utilize a strong corporate governance; and, (iii) sign partnerships with private initiative for water loss reduction and system operational efficiency. Reaching W&S service universalization is a duty by each State of Brazil Federation.

If change of most sanitation-related policies (as explained for in the previous pages) is implemented, there are no doubts that more finance resources could flow into this area. Results achieved because of the PPI law's application have already indicated that advance in some other infrastructure areas.

17. OTHER TOPICS THAT HAVE NOT BEEN COVERED

Millennial character of W&S services, since primitive ages up to our days, achieved technology advances for potable water as well as for purification of used water, are examples of mankind creativity to solve day-to-day problems.

However, there are still many continents and regions where water search and catchment to satisfy their basic needs represent a long and dangerous journey. They also still use solutions for waste water and sewage disposal using inadequate ways too dangerous for their health.

If we all do so, we go back to humanity beginnings when governments did not give water and sewage necessary priority. This is an essential service to mankind in all aspects.

In our case study, the city of Blumenau is a symbolic and successful reality, where a partnership between public and private, fully supported by all legal instruments being continuously improved, walks together in search for a desired universalization in a feasible and achievable time.

By the way, an interesting study done and published by CNI (National Confederation of the Industry) suggests following "Priority Agenda for this sector", based upon the Planning, Management, and Regulation tripod:

1. Sector planning improvement, because of our inadequate service delivery for water, and mostly sanitation;
2. Review and modification of current financing mechanisms, not to mention a more rational taxation on a sector with highly positive external impacts;
3. Innovation in CESBs and municipality management;

4. Updating of legislation that could offer more guarantee and legal security, through more robust contracts which may mobilize both public and private resources by using concessions and PPPs;

5. Reduction of regulation risks by re-engineering and institutionally strengthening regulatory agencies;

6. Tailor contract models to foster innovation, efficiency and production chain.

We believe that these suggestions must be addressed to related ministries in each country and also to central Government.

In summary:

- Application of policies for sanitation as explained above (see previous pages 35 and 37).
- Design of innovative tailored models case by case (as Blumenau did), always considering the adequate blending of public resources with private ones as a strong complementary resource, for expansion/modernization of services and use of up-to-date technology for operational efficiency;
- Finally as CESBs have the State Governments as their majority shareholder and any action in relation to public policies of the Federal Government through official development banks (CAIXA, BNDES), there is a need for the intervention of the Governor in order to confer the necessary legitimacy, as currently occurs with the PPI Programme. It is recommended that Governors should be involved in the process as an important and strategical player.

18. BLUMENAU CASE IN SUMMARY

- MAJOR FINANCIAL GAPS AND OBSTACLES:
  - lack of a policy oriented to healthcare, well-being and quality of life
  - full ignorance by both population and public policy makers about benefits
  - several fragilities related to W&S prevented access to financing lines
  - social, economic and financial indicators in contrast with W&S services
- FINANCIAL MECHANISMS
  - Great social actions: Campaigns
  - investigate modern and complex business models for sanitation
  - suitable partnership with a private consortium (a PPP focusing complementarity)
  - direct subsidies for low-income population
  - updating of financing mechanisms in view of using technology solutions
- POLICIES THAT SHOULD CHANGE TO INCREASE FINANCING FLOW FOR SANITATION
  - supporting legislation.

- Definition of service ownership in metropolitan regions
- Activity Planning by each municipality
- Adequate Regulation

- INNOVATIVE AND NON-TRADITIONAL FINANCING INSTRUMENTS
  - Circular economy: from sewage into reuse water

- LIKELIHOOD THAT MORE FINANCE RESOURCE WILL FLOW INTO SANITATION
  - Federal Law (no. 13,334/2016) addressing a Partnership Program of Investment – PPI

- OTHER TOPICS THAT HAVE NOT BEEN COVERED
  - water and sewage service is essential to mankind and needs a necessary priority.