



Ministry of Foreign Affairs

# Business in Brazil's New Sanitation Framework

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# Business in Brazil's New Sanitation Framework

1<sup>st</sup> Final Report – Rev. 4

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Consulate General of the Netherlands

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# Chapter 1 | Objectives and Introduction

## 1.1 Objectives

Encouraged by the New Regulatory Framework, the sanitation market in Brazil has presented, in recent years, a growing demand for investments, causing the market to heat up throughout the entire business chain, from projects and consulting, through construction, to the operation of systems.

Observing the significant Brazilian potential as well as some recent advances verified in the sector by public and private entities, the Consulate General of the Netherlands commissioned a study with the objective of analyzing the current market scenario to identify the possible challenges and opportunities for business development between Dutch and Brazilian companies and institutions, which could generate benefits for both countries.

This study aims to identify opportunities throughout the entire market development cycle. However, as Brazil is a country with substantial territorial extension, it is necessary to understand the diversity of the various regions, each of which generates different specificities and demands.

Figure 01 - The 5 Brazilian Regions



Through an overview of these regions, it is possible to understand the different regional challenges to achieving universal sanitation in Brazil.

This report provides an understanding of the current scenario, addressing the following aspects:

- Physical, geographical and social characterization of each of the 5 regions, presenting the state of sanitation infrastructure in each
- Regulatory aspects
- Estimation of the investments required for universalization
- Main operators in today's national scenario

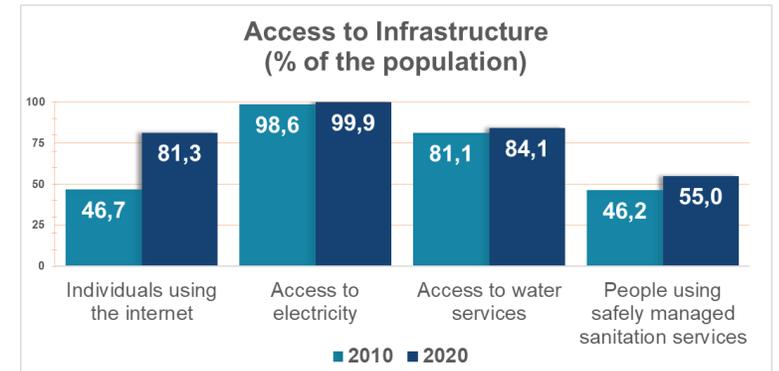
These analyses are essential to understanding the current scenario in Brazil, including its characteristics and trends, and allowed us to create a SWOT matrix featuring the strengths, weaknesses, opportunities and threats of the market while also identifying the main challenges and bottlenecks.

## 1.2 Introduction

Brazil is one of the largest economies in the world and has experienced exponential growth in its urban population in recent years. However, this growth has not been accompanied by investments in sanitation infrastructure, creating a large deficit.

In the last decades, while sectors such as energy, telecommunications and transport managed to reach high levels of coverage of the national population and territory, the expansion of the water and especially sewage networks have followed at a historically slow pace, which is evidenced by examining the sectors' data for the period of 2010 to 2020 in Brazil:

Figure 02 - Access to Infrastructure in Brazil – 2010-2020



Source: SNIS<sup>25</sup> and Word Bank<sup>1</sup>

While access to electricity was already at nearly 99% for the population in 2010, internet access increased from 46.7% to 81.3% over the next ten years, while sewage collection still served less than 60% of the population in 2020.

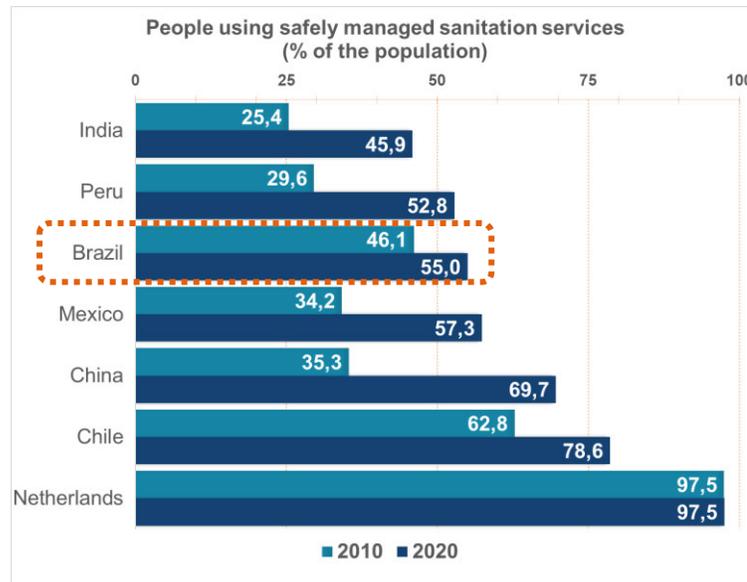
Part of the difficulty of pulling the Brazilian sanitation sector out of this inertia is due to inherent factors: expansion of infrastructure networks involves high costs and time-consuming construction. Despite the obvious benefits for the population, access to sanitation is considered a low-profile investment and of little political value. The sector also presents characteristics of a "natural monopoly" with strong vertical integration between processes and the need for coordinated planning, which in Brazil has historically contributed to the concentration of services in the public sector. In addition to these factors, other national characteristics, such as the previously mentioned size and diversity of the territory and an old legal and administrative structure that is obsolete in many aspects, have discouraged private investment, while at the same time public investment capacity has remained quite limited.



# Chapter 1 | Objectives and Introduction

Several other countries have gone through similar processes of accelerated urbanization and deficit in sewage infrastructure, with some managing to significantly increase the population's access to sewage services during this ten-year period. This occurred in countries with even larger territories and populations than Brazil, such as India and China, as well as in countries that are smaller but with high inequality and similar human development indexes to Brazil, such as Peru and Mexico.

Figure 03 - Investments in Infrastructure in Brazil 2018-2019



Source: SNIS<sup>25</sup> and Word Bank<sup>1</sup>

According to data surveyed by the World Bank, in this ten-year period, India has expanded its sewage coverage from 25% of

the population to 45% (a 20% increase). Among Latin American countries, Peru rose from 29% to 52% and Mexico from 34% to 57% (both advancing 23% in sewage coverage for their populations). Meanwhile, Brazil, which in 2010 served 46% of its population, reached the 55% mark, still far from the goal of universalization.

These examples show that large sewerage network expansions are possible through a combination of targeted and well-designed policies, long-term planning, a secure and stable legal and business environment and a combination of public and private investments.

The next chapters will present an overview of how this expansion is possible in Brazil, and what will be the main demands and opportunities for Dutch companies in this scenario.

## 1.3 Market Overview Parameters

The current state of the Brazilian sanitation sector is diverse and challenging. In all regions, there is a lack of infrastructure, and to represent this, six indicators were listed:

- **HDI<sup>2</sup>**: Represents the average Human Development Index of Countries and Regions, indicating that regions with higher HDI are more developed and, therefore, are expected to have more robust sanitation infrastructure.
- **GDP per capita<sup>3</sup>**: Represents the income availability of the region, indicating that regions with higher GDP per capita may be more advantageous for investments.
- **Water Coverage Index<sup>4</sup>**: Indirectly represents the proportion of water market that is not yet explored.
- **Sewage Coverage Index<sup>4</sup>**: Indirectly represents the proportion of sewage market that is not yet explored.
- **Total Loss Index<sup>4</sup>**: Indirectly represents the need for investments in the existing water market.
- **Sewage Treatment Index<sup>4</sup>**: Indirectly represents the need for investments in sewage treatment technologies.

Another relevant factor in understanding the current scenario is the availability of water and the demand for water consumption in the basins where the municipalities are located. This water risk is represented by the indicator “**Overall Water Risk**” from **WRI<sup>5</sup>**, which measures water risk from a quantitative, qualitative, and regulatory perspective.

Finally, graphical representation is included depicting the proportion of state, municipal and private operators for each region and for the country overall.

# Chapter 2 | Water Market Overview

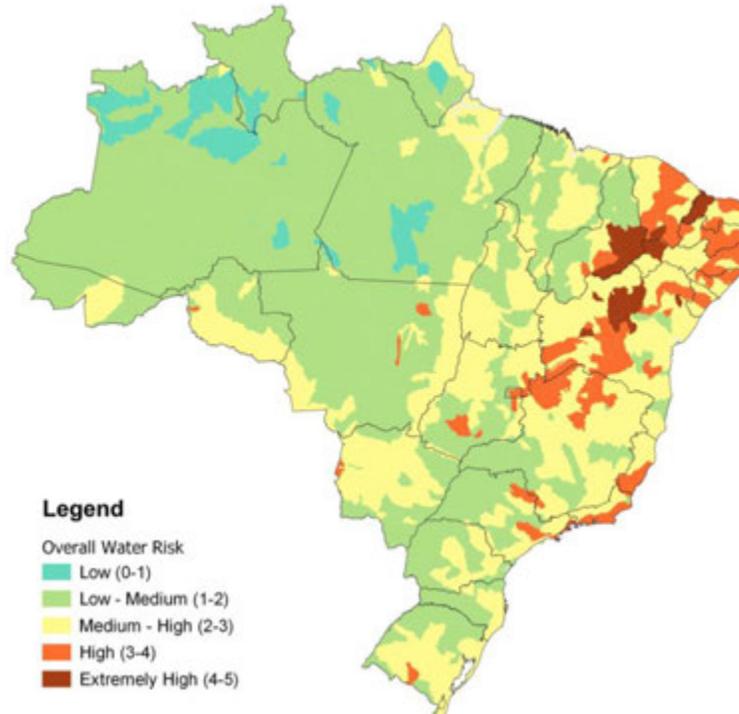
## 2.1 National Scenario

Brazil's HDI of 0.766 places it in the "High Development" category. However, sanitation indicators reveal a deficient and inefficient infrastructure with low coverage and high water loss. Sanitation operators are mostly state-owned, while the private sector covers only 14% of all municipalities.

According to [ABCON](#)<sup>6</sup>, in 2018 the participation of private companies was only 5.8%, while state companies operated in 76% of municipalities. Thus, there has been a recent and notable movement in the operator type of sanitation services, with increasing participation of private companies to the detriment of state-owned companies.

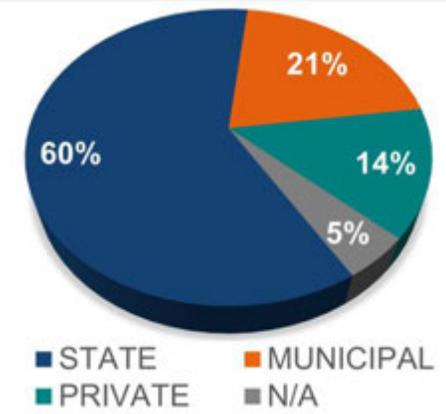
The average water risk is quite variable, being lower in the northern region and higher in the northeastern region and areas with high population density. In the case of the Northeast region, this risk is high mainly due to the semi-arid climate and the lack of rainfall. In the metropolitan regions, the main cause for the increased risk results from high demand for consumption compared to local water availability.

Figure 04 - Brazil – Overall Water Risk



Source: [WRI Aqueduct](#), accessed on Feb 25 2023<sup>5</sup>

National Data	
Human Development Index <sup>2</sup> 0,766	GDP per capita (2020) <sup>3</sup> R\$35.936
Water Coverage Index <sup>4</sup> 84,2%	Total Loss Index <sup>4</sup> 40,3%
Sewage Coverage Index <sup>4</sup> 55,8%	Sewage Treatment Index <sup>4</sup> 51,2%
Service by No. of Municipalities – National <sup>7</sup>	





# Chapter 2 | Water Market Overview

## 2.2 North Region

With the highest water availability among all regions, the north region, containing the majority of the Amazon River basin, concentrates 80% of the entire volume of surface water in Brazil<sup>8</sup>, with an average flow rate of 210,000 m<sup>3</sup>/s and more than 1,100 tributaries.

Despite being the largest region in the country, with an extension of 3.9 million km<sup>2</sup>, the north region has a population of only 18.7 million inhabitants (8.8% of the national population), presenting a low demographic density with a large area of preserved forest.

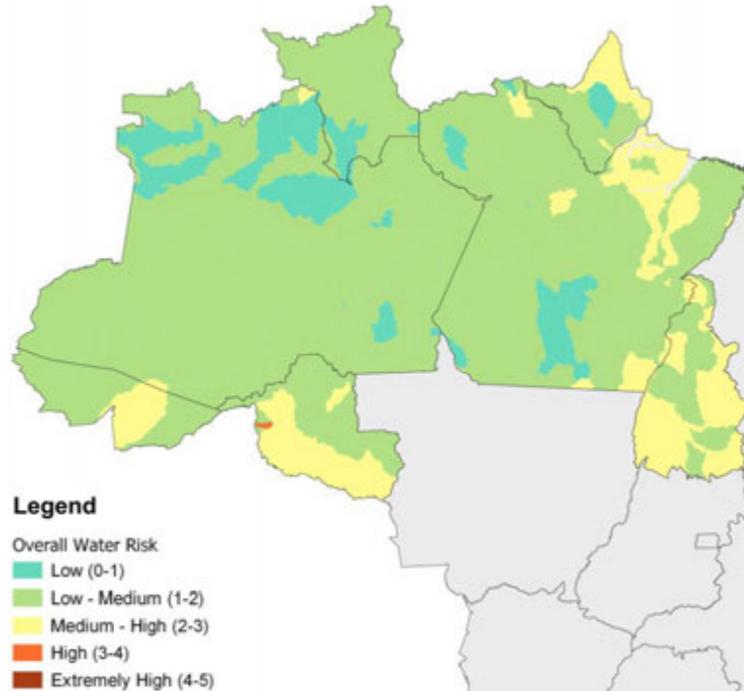
The region's economic development is considered low due to lack of investments, logistical difficulties and, consequently, low industrialization, representing only 6.3% of the national GDP.

The region's basic sanitation indicators reveal the proportion of the population without access to water is 42.6%, the worst rate of the nation's regions, according to data from [Painel Saneamento Brasil](#), which uses the base of SNIS (2019).

The sanitation infrastructure in the North Region is precarious, with low water and sewage coverage and high water losses. The operators are mostly municipal, and it is the region with the lowest relative participation by investments compared to the other regions.

Thus, it is a region in need of basic services, with the expansion of service coverage being its biggest challenge.

Figure 05 - North Region – Overall Water Risk

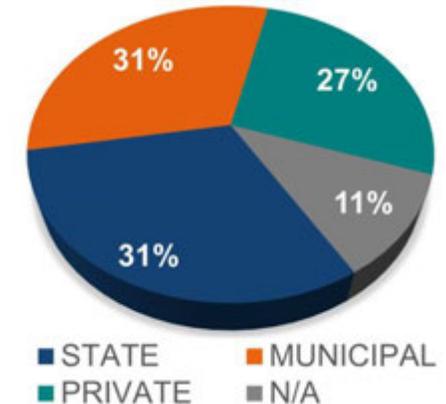


Source: [WRI Aqueduct](#), accessed on Feb 25 2023<sup>5</sup>

### North Region Data

Human Development Index <sup>2</sup>	0,698	GDP per capita (2020) <sup>3</sup>	R\$25.608
Water Coverage Index <sup>4</sup>	60,0%	Total Loss Index <sup>4</sup>	51,2%
Sewage Coverage Index <sup>4</sup>	14,0%	Sewage Treatment Index <sup>4</sup>	20,6%

### Service by No. of Municipalities - North Region<sup>7</sup>





# Chapter 2 | Water Market Overview

## 2.3 Northeast Region

The northeast region has the least amount of water resources in Brazil, and on the other hand, has a high demographic density, making water supply difficult. There is also much divergence among the states within this region, both in its socio-economic and water availability characteristics.

The São Francisco River Basin is formed by the São Francisco River and its 158 tributaries, of which 90 are perennial rivers and 68 are temporary rivers. Despite the semi-arid climate, predominant in many parts of the region, there are enough underground water reserves (aquifers) to solve most of the supply problems. In many places, however, the brackish quality of this water makes its use difficult. In other locations there are no natural water sources available, requiring water to be supplied by water trucks.

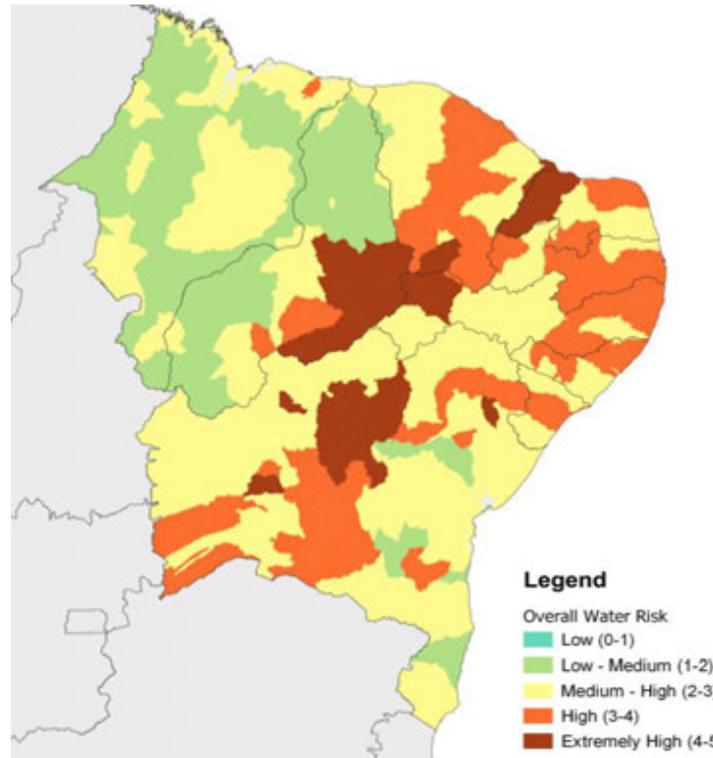
The northeast is the least economically developed region of the country, with little industrial activity and much of the population living in extreme poverty.

The sanitation infrastructure in this region is precarious, with low water and sewage coverage rates and high water loss. It is among the regions with the largest number of state operators, of which the following stand out: EMBASA (state of Bahia) and COMPESA (state of Pernambuco). Of the private companies, the following stand out: Aegea (sewer PPP auctioned in 2022 in part of the state of Ceará) and BRK (concession of part of the state of Alagoas, auctioned in 2020).

CAGECE, a large state operator (Ceará), has just approved a concession for the construction of the largest desalination plant in the country. The plant will be constructed in the state capital, Fortaleza, and will produce 1 m<sup>3</sup>/s of clean water.

Therefore, the northeast region shows great potential for the use of alternative water supply sources, such as desalination (as this region has the largest available coastline) and atmospheric water generation (AWG). There is also potential for water reuse technologies, though these are highly complex from a socioeconomic perspective.

Figure 06 - Northeast Region – Overall Water Risk



Source: [WRI Aqueduct](#), accessed on Feb 25 2023<sup>5</sup>

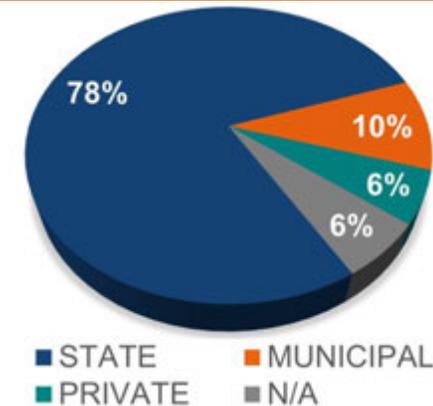
### Northeast Region Data

Human Development Index <sup>2</sup>	0,703	GDP per capita (2020) <sup>3</sup>	R\$18.812
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Water Coverage Index <sup>4</sup>	74,7%	Total Loss Index <sup>4</sup>	46,2%
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Sewage Coverage Index <sup>4</sup>	30,2%	Sewage Treatment Index <sup>4</sup>	35,5%
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### Service by No. of Municipalities - Northeast Region<sup>7</sup>





# Chapter 2 | Water Market Overview

## 2.4 Midwest Region

The midwest region comprises portions of three significant hydrographic basins: the Amazon, Tocantins-Araguaia, and Platina. This region harbors the origins of vital rivers in the country, characterized by the prominent presence of the Cerrado biome. The Cerrado accounts for 23.6% of all Brazilian water sources and is widely recognized as the birthplace of abundant water reserves.

The midwest experiences specific problems with droughts in the eastern Brasília and Rio Verde portions of the region, which occur mainly due to the high demand for water compared to the volume of water available.

The region has a low demographic density, with the exception of the federal capital region of Brasília and the metropolitan region of Goiânia.

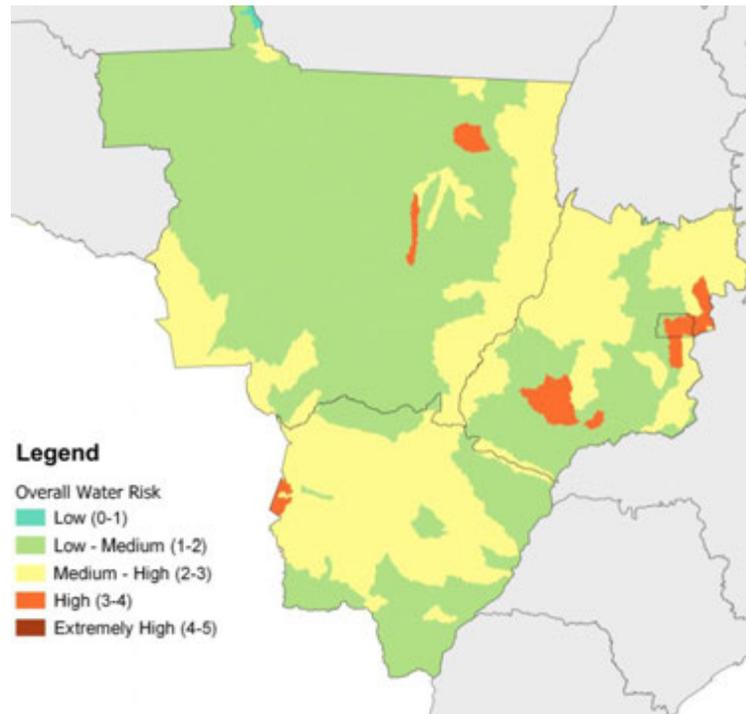
It is also the region with the highest GDP per capita, with an economy focused on agriculture and mineral extraction.

All states in this region provide access to clean water for most of their inhabitants. On the other hand, sewage collection and treatment, particularly, have low coverage in these states.

This region demonstrates a smaller presence of state companies, with an emphasis on SANEAGO (state of Goiás). Of the private companies, Iguá stands out – with six operations in the region, including the capital of Mato Grosso; and Aegea, with a sewage PPP with SANESUL (a state company from Mato Grosso do Sul) as well as concession of other cities in the interior of the state of Mato Grosso.

Basic sanitation infrastructure in the region remains insufficient, particularly in terms of sewage collection and treatment. This could lead to an increase in the involvement of private sector companies in the midwest region in the years ahead. This scenario presents an opportunity for these companies to improve their operational efficiency practices.

Figure 07 - Midwest Region – Overall Water Risk



Source: [WRI Aqueduct](#), accessed on Feb 25 2023<sup>5</sup>

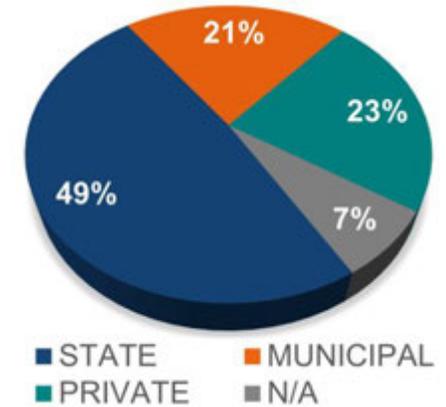
### Midwest Region Data

Human Development Index <sup>2</sup>	GDP per capita (2020) <sup>3</sup>
0,752	R\$47.942

Water Coverage Index <sup>4</sup>	Total Loss Index <sup>4</sup>
89,9%	36,2%

Sewage Coverage Index <sup>4</sup>	Sewage Treatment Index <sup>4</sup>
61,9%	60,5%

### Service by No. of Municipalities - Midwest Region<sup>7</sup>





# Chapter 2 | Water Market Overview

## 2.5 Southeast Region

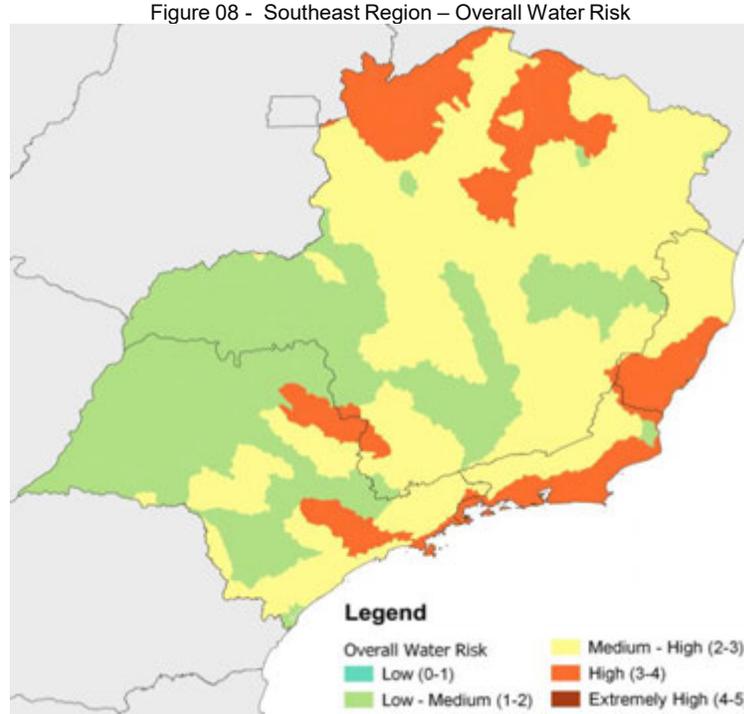
The southeast region boasts the highest HDI in the country, is the richest region (51.9% of GDP) and has the highest demographic density, representing 42% of the national population. It is the most urbanized and industrialized region, with the three largest metropolitan areas in the country – São Paulo (1st), Rio de Janeiro (2nd) and Belo Horizonte (3rd). Despite being the most developed region, it also contains the most slums, with these areas being a major challenge for the universalization of sanitation.

In terms of sanitation infrastructure, this region has the best water and sewage coverage indices, in addition to presenting low water loss and high sewage treatment indices compared to the national average.

As the southeast is a region with a high population density, there are supply risks in some places, especially in the metropolitan regions of São Paulo and Rio de Janeiro. The northern portion of the region, close to the northeast, presents water supply risks due to droughts. The dam failure disasters of [Mariana \(2015\)](#) and [Brumadinho \(2019\)](#) also affected the quality of rivers in Minas Gerais, increasing the need to seek alternative supply solutions in the region.

Although the region has high levels of water and sewage coverage, in absolute terms, it is one of the regions with the greatest need for investments due to the population size and the need to replace assets. Historically, it is the region that invests most in sanitation (according to SNIS data, more than half of the sanitation investment was made in this region).

Most municipalities are operated by state companies (63%), the main ones being SABESP (State of São Paulo) and COPASA (State of Minas Gerais). Although only 7% of the municipalities



Source: [WRI Aqueduct](#), accessed on Feb 25 2023<sup>5</sup>

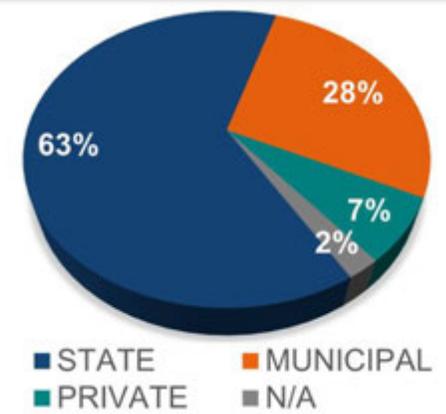
are operated by private companies, it was in this region that the largest full concession in the history of the country occurred, when in 2021 there was the auction of CEDAE (Rio de Janeiro state company), where the companies Aegea, Iguá and Águas do Brasil currently operate.

Therefore, despite being the most developed region of the country with operation of the main sanitation companies in Brazil, the southeast will possess the most opportunities for investments in expansion and improvement of operational efficiency. Industries in this region will also have increased interest in water reuse solutions as part of their processes.

### Southeast Region Data

Human Development Index <sup>2</sup>	GDP per capita (2020) <sup>3</sup>
0,788	R\$44.406
Water Coverage Index <sup>4</sup>	Total Loss Index <sup>4</sup>
91,5%	38,0%
Sewage Coverage Index <sup>4</sup>	Sewage Treatment Index <sup>4</sup>
81,7%	58,6%

### Service by No. of Municipalities - Southeast Region<sup>7</sup>





# Chapter 2 | Water Market Overview

## 2.6 South Region

The southern region is considered the second-most developed region of the country, following the southeast region, with a GDP per capita similar to that of the southeast and midwest regions, considered high compared to the the national scenario. It is the smallest region in Brazil in area and has a high population density, being known for its high social indicators and high industrialization.

In terms of sanitation infrastructure, the south has high water coverage and a low rate of water loss, thus proving to be a region with good water supply structure. However, sewage coverage and treatment rates are quite low, indicating the need for investments in this area.

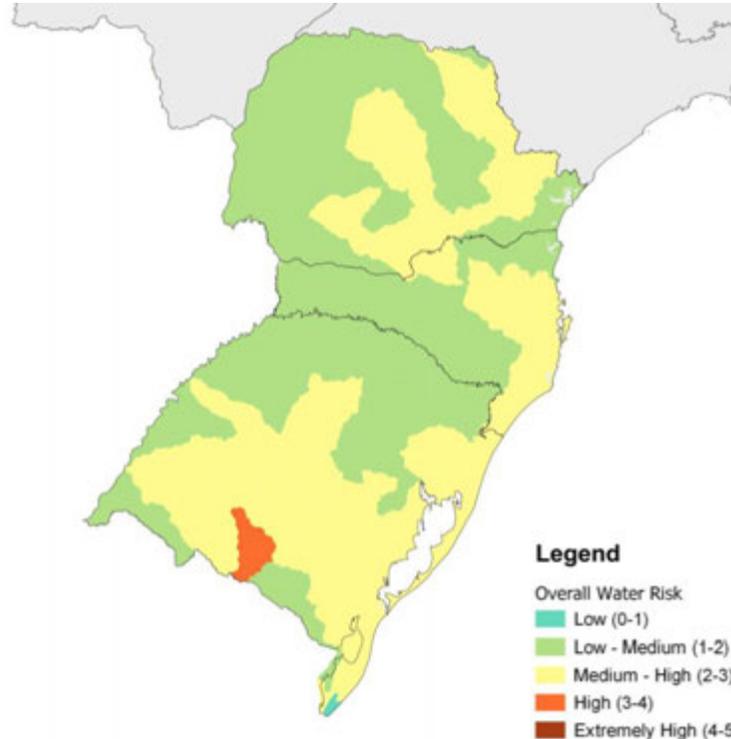
The region shows adequate indicators of water availability, without very high risks. Regarding water stress in the region, it is noted that in general there are no high risks, with the exception of the southern portion of the region, where demand variation of supply and the climatic risk of drought increase the probability of water unavailability.

As this is the second most populous region in the country and has such a low sewage coverage rate, it is understood that this region will need high investments in expansion of sewage services in order to achieve universal access. As for water, most of the investments should be directed towards maintaining and improving operational efficiency, since the current water coverage is higher than the Brazilian average.

Most of the operators in this region are state companies, with emphasis on SANEPAR (State of Paraná). This region has the highest percentage of municipalities operated by private companies, which occurred after the privatization of CORSAN

(State of Rio Grande do Sul), which took place at the end of 2022 and was acquired by Aegea.

Figure 09 - South Region – Overall Water Risk



Source: [WRI Aqueduct](#), accessed on Feb 25 2023<sup>5</sup>

Therefore, as the south has high levels of development as well as the presence of large sanitation companies, it is well understood that there will be great opportunities in this region for the sanitation market in the coming years.

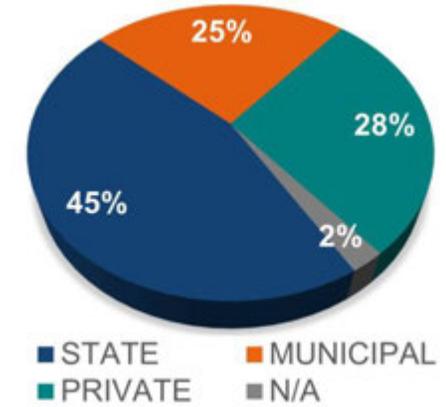
### South Region Data

Human Development Index <sup>2</sup>	GDP per capita (2020) <sup>3</sup>
0,775	R\$43.327

Water Coverage Index <sup>4</sup>	Total Loss Index <sup>4</sup>
91,4%	36,9%

Sewage Coverage Index <sup>4</sup>	Sewage Treatment Index <sup>4</sup>
48,4%	46,7%

### Service by No. of Municipalities - South Region<sup>7</sup>





# Chapter 3 | Regulatory Framework

## 3.1 Regulatory History in Brazil

The organization of basic sanitation services in municipalities began in 1940, with isolated projects and a lack of structured coordination at the state or federal levels.

Only in the 1970s was the National Sanitation Plan – PLANASA (1971) established, which aimed to reduce deficits in water supply and sewage through centralized planning at the federal government level. It was during this time that the federal government encouraged the creation of state-owned sanitation companies, such as SABESP (1973), COPASA (1974) and SANEPAR (1972), thus promoting state-level sanitation. Due to the political and economic crisis that Brazil experienced in the 1980s, the goals established in PLANASA were not achieved, and this plan was terminated in 1991.

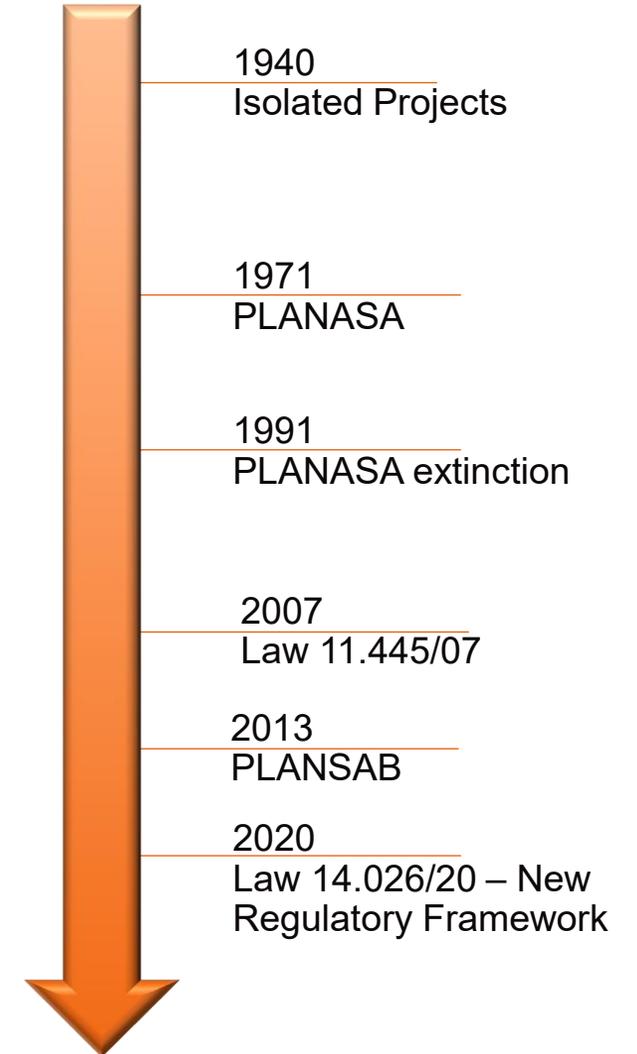
With the termination of PLANASA, there was a period of absence of public sanitation policies. At this time, some state companies consolidated themselves, while other municipalities began being operated by the private sector (at a time when there was still a large degree of legal uncertainty about the contracts signed). At this time, the first regulatory agencies were created in the country.

In 2007, Law 11.445/07<sup>21</sup> was enacted, establishing the National Policy for Basic Sanitation. As a result of this law, the National Basic Sanitation Plan – PLANSAB was created in 2013, which established clearer guidelines for the provision of service and recreated a national plan for the universalization of water and sewage services.<sup>9</sup>

Up to this point, there had been no federal entity to issue norms for sanitation. Municipalities could enter into contracts directly with state-owned companies without need for bidding, known as “Service Agreements”. Bidding was required only if the municipality wanted a private company as a service provider.

In 2020 the New Sanitation Regulatory Framework was enacted, law 14.026,20<sup>12</sup>, which among other actions established<sup>10</sup>:

- **Universalization goals:** Requirement that every concession contract contains universalization goals by 2033. The water coverage index must meet 99% of the population while the sewage coverage index must reach 90%.
- **Concessions through public tenders:** Prohibits the signing of Service Agreements (direct hiring of the state-owned company), making bidding via PPP or concession the only hiring model for either public or private operators.
- **Regulation:** Establishes that the National Water Agency (ANA) has the power to standardize oversight and regulation, creating guidelines at a national level to give more legal security to the sector.
- **Sanitation blocks:** Establishes that every State must create blocks of municipalities to allow regionalized provision of water and sewage services.



## Chapter 3 | Regulatory Framework

### 3.2 Current Regulatory Framework

According to the Federal Constitution of Brazil, public sanitation services are the responsibility of municipal governments, which can provide this service directly or indirectly. In indirect provision, the municipal government grants the concession of water and sewage services based on a concession contract with a public company (usually state, not municipal) or a private company. The bodies involved in this sector, therefore, are: Service Owner, Service Provider, Regulatory Agency and the National Water Agency.

#### 3.2.1 Service Owner

The service owner is the public body that has the ownership, that is to say, the rights to manage the sanitation service. **In Brazil, this body is the municipality or municipalities together with the state**, in the case of regional provision.

The New Sanitation Regulatory Framework favors the regionalized provision of services to the detriment of the isolated provision of the municipality with the view of generating gains in scale and guaranteeing the universalization and technical, economic and financial viability of sanitation services. Thus, it is understood that the State becomes an important figure as a holder of services, together with the municipalities.

One of the products of the New Sanitation Regulatory Framework was the obligation of States to delimit their regional blocks. Currently, all states in the country have completed or are in the process of this regionalization.<sup>11</sup>

#### 3.2.2 Service Provider

The service provider is the body that effectively operates the municipal water and sewage systems. This provider can be of three types: municipal, state or private.

**Municipal service provider:** The service provider of the municipality itself, which can stem from a department of the city hall or through the creation of a municipal autarchy. For this type of service provision, it is not necessary to carry out bidding processes, and it is up to the city hall itself to manage its services.

**State service provider:** The service provider created by the state, usually in the 1970s after the creation of PLANASA. Before Law 14.026/20, a municipality could hire a state company to provide a service without the need for a bidding process (through a service agreement). Currently, the existing service agreements continue to be active until their termination, when it will then become necessary to undergo a bidding process for the concession of the service, where state and private companies will compete under equal conditions.

**Private service provider:** The provider of services of a private legal nature, which can only operate in a municipality based on a PPP bid or service concession.

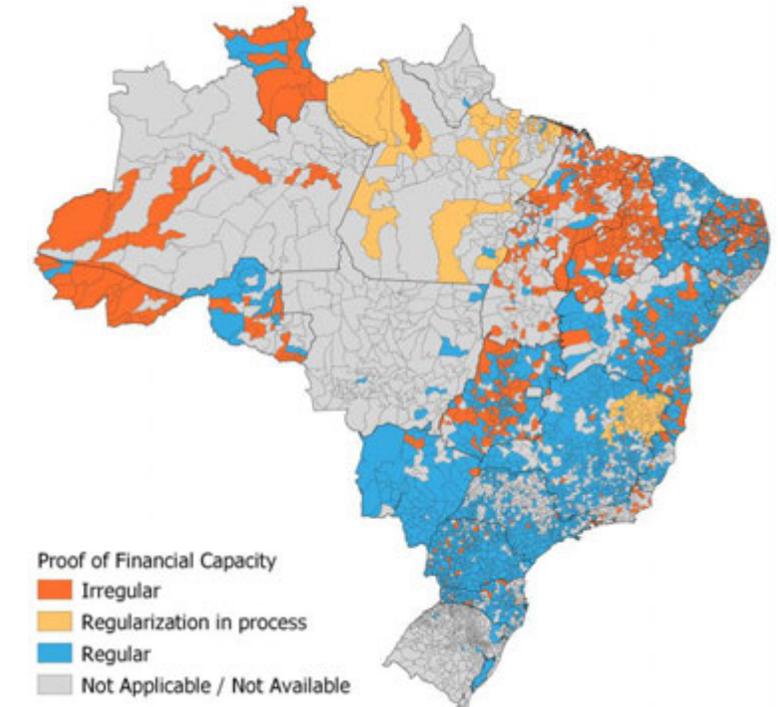
#### 3.2.3 Regulatory Agency

The regulatory agency bodies is made up of municipal, inter-municipal or state agencies whose function is to supervise and regulate the contracts entered into between the Owner and the Service Provider. Currently, ANA recognizes 89 regulatory agencies in the country: 47 municipal, 16 intermunicipal and 26 state<sup>14</sup>.

One of the roles of the regulatory agencies is to inspect whether all concession contracts have clear universalization targets, as established in the New Regulatory Framework. Another task of these agencies is to analyze whether service providers with a current concession contract have the economic and financial capacity to comply with the established goals. Of the 5,570 municipalities in the country, 2,418 municipalities have regular contracts, 148 are in the process of regularization and 960 are

irregular, according to ABCON<sup>13</sup>. The other municipalities have a direct operation (municipal provider) and therefore do not need to demonstrate economic and financial capacity. As shown in the Figure below, most municipalities with irregular contracts are located in the north and northeast regions.

Figure 10 - Municipalities with proof of financial capacity for investments



Source: ABCON<sup>13</sup>



# Chapter 3 | Regulatory Framework

## 3.2.4 National Water Agency - ANA

The ANA is a federal agency linked to the Ministry of Cities, with the function of editing reference standards for the inspection and regulation of the sector. These general notes should be taken into account by sub-national regulatory agencies. Although regulation is the role of regulatory agencies, providers that follow the guidelines presented by ANA will have preference for receiving federal public investments. To date, two important reference standards have been published by the ANA:

- **Standardization of Negotiating Instruments**<sup>15</sup>, published in 2021, it presents the minimum content of amendments to program and concession contracts for water and sewage (including universalization targets).
- **Regulatory Governance**<sup>16</sup>, published in 2022, it presents the requirements and procedures to be observed by the regulatory agencies to prove the adoption of the reference standards issued by the ANA

There are several other rules that will be edited by ANA, according to the calendar presented by the Agency and monitored by **ABCON**<sup>13</sup>.

## 3.2.5 Political Uncertainties

It is important to mention that the current federal government that took office in January 2023 has a more statist bias than the previous government, which has generated uncertainties about the Brazilian sanitation market.

On the first day of the new government, there was a change in ANA's hierarchical structure, which became subordinated to the Ministry of Cities (previously it was subordinated to the Ministry of Regional Development). In addition, [an amendment to the Sanitation Regulatory Framework is under discussion](#)<sup>17</sup> to reduce ANA's regulatory role and enable the return of service agreements, which allow municipalities to sign contracts with state companies without the need for a public tender.

Despite the government showing signs that it likely will not make major changes to the Regulatory Framework, [these movements generated an increase in legal uncertainty in the sector](#)<sup>18</sup>, causing a [delay in new auctions and an increased risk of entry](#)<sup>20</sup> into this market by the private sector.

Main Changes Established by the New Regulatory Framework of Sanitation		
Topic	Previous scenario	New Framework
<b>Universalization objectives</b>	No defined targets for universalization or requirements to achieve them	Objective of achieving nationwide basic sanitation by 2033 with 99% drinking water coverage and 90% sewage treatment. These are mandatory goals for all operators.
<b>Regulatory standards</b>	Many different regulatory agencies, while ANA had a limited role to set national standards	ANA (National Water Agency) gains new responsibilities to regulate the sanitation sector in Brazil, including setting national quality standards and unifying regulations for tariffs and contracts.
<b>Concession tenders</b>	Municipalities were allowed to sign direct contracts with public companies, with no competition	All new concessions should be made through tenders, where public and private companies may compete in the same terms, with obligation to invest for universalization.
<b>Sanitation blocks</b>	There were no joint concession modalities	Possibility of sanitation blocks, encouraging public consortia and cooperation agreements for better service access and economy of scale.

Source: Trata Brasil Institute and GO Associates <sup>10</sup>



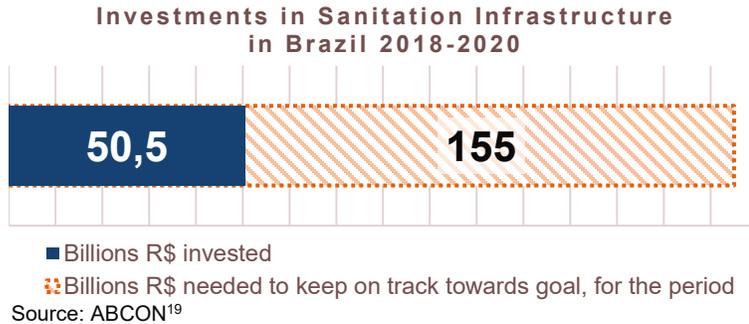
# Chapter 4 | Overview of the Main Investments

## 4.1 Main Investments in the Last Years

Investments in sanitation infrastructure in Brazil have accumulated many years of deficit, with low investment capacity by companies and public entities responsible for services.

For the period between 2018 and 2020, investment in sanitation in Brazil was **R\$ 50.5 billion**, or **32.5%** of what was needed for the period, according to a survey released this year by the association representing private sanitation companies (ABCON<sup>19</sup>).

Figure 11 - Investments in Sanitation Infrastructure 2018-2020 (invested vs. projected)



This stands in stark contrast to the investments needed to meet targets in water and sanitation, estimated at over 74 billion a year. The result is a deficit to the country's current sanitation infrastructure investment schedule.

In recent years, the Brazilian government has made efforts to attract investments in the sector, which has been occurring since 2020 with the alteration of the legal framework for sanitation. Since then, more than 20 auctions have been held for sanitation service concessions, which will reach a population of more than 30 million users<sup>24</sup>.

By 2021, R\$ 43 billion in sanitation investments have been guaranteed, according to the Ministry of Regional Development<sup>23</sup>. Most of the funding came from concessions, with CEDAE being the main investor, raising R\$ 31.5 billion. The federal government invested just over R\$ 3 billion during the same period. Many other auctions for concessions are planned or under discussion, which could significantly increase the participation of private operators in the market.

All these new concessions bring mandatory compliance with the universalization targets, where the operators will be responsible for expanding the infrastructure while also receiving the operational revenues.

### The difference between Concession and PPP

**Concession contract:** In this type of contract, assets are transferred to a private operator and the regulatory agency is responsible for overseeing and regulating the provision of the service. The concessionaire is remunerated by charging users a fee. A concession can be full or partial (water or sewage only). At the end of the concession, the assets are returned to the public authorities.

**PPP Contract:** Public-Private Partnership (PPP) contracts consist of the delegation of the provision of the service through bidding (without the transfer of assets). Remuneration is usually through government contributions and, in some cases, through a portion of the tariff. A common combination is the sewage PPP, in which the private partner invests in management and infrastructure, in addition to operation and maintenance, while the public company continues to take care of the water system, end user service, inspection of services and administration of resources obtained from the tariff.

Main Sanitation Concession Auctions, 2020-2022			
Year	Project	Pop. (MM)	Winner
2020	Alagoas Block A	1,4	BRK
	SANESUL/MS – PPP	1,7	Aegea
	Cariacica/ES – PPP	0,4	Aegea
2021	CEDAE Block 1/RJ	2,8	Aegea
	CEDAE Block 2/RJ	1,2	Iguá
	CEDAE Block 4/RJ	7,0	Aegea
	Amapá	0,7	Marco Zero Consortium (Equatorial+SAM)
	Alagoas Block B	0,6	Alagoas Consortium (Allonda+Conasa)
	Alagoas Block C	0,4	Mundaú Consortium (Cymi+Aviva)
2022	CEDAE Block 3/RJ	3,0	Águas do Brasil
	Cagece Block 1/CE - PPP	1,3	Aegea
	Cagece Block 2/CE – PPP	3,3	Aegea
	CORSAN/RS – Privatization	6,0	Aegea
<b>TOTAL</b>		<b>+32</b>	<b>Million People</b>



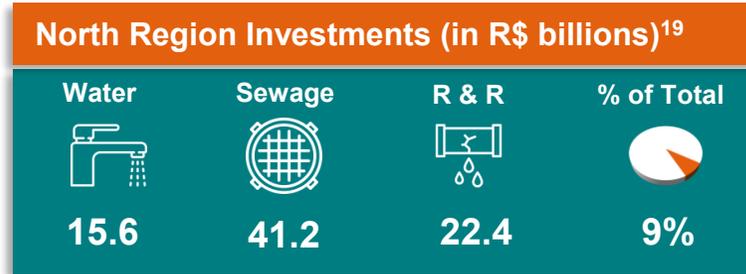
# Chapter 4 | Overview of the Main Investments



## 4.2 Estimative of Investments Required to Reach Universalization

As previously presented, the challenge of universalization of services for the Brazilian population by 2033 is immense, requiring strong integration between public and private entities to meet this goal. According to ABCON<sup>19</sup>, **if investments remain similar to those that occurred before the approval of the Sanitation Regulatory Framework, the universalization of services will only occur in 2055.** Therefore, the need to increase investments in the sector is evident.

In this context, ABCON<sup>22</sup>, together with KPMG, carried out a study in 2018 estimating that this value would be R\$753 billion (December 2018 values) between the years of 2018 and 2033 (average value of 50.2 billion per year). In 2022, ABCON<sup>19</sup> presented a follow-up study that updated the necessary investment, considering values invested between 2018 and 2020 and the monetary restatement. This study shows that it is necessary to invest R\$893 billion between 2022 and 2033, of which **R\$164 billion would be for water universalization, R\$437 billion for sewage universalization and another R\$293 billion for asset recovery and replacement (R&R)**, at 2022 values.



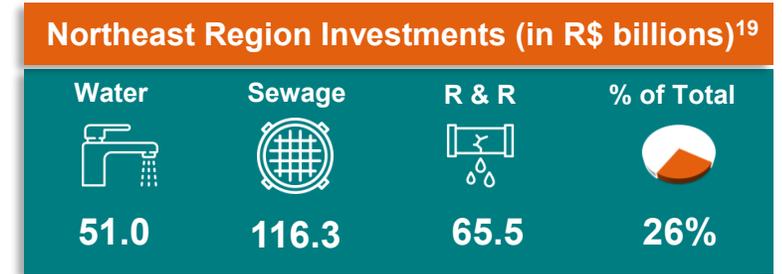
### 4.2.1 North Region

Despite being the region with the worst water and sewage coverage indices in the country, the investment required for universalization in the region represents only 9% of the total. This is mainly due to the low demography of the region.

Most of the investments in this region should be for the implementation of sewage collection networks, sewage treatment stations and replacement of assets. The geographical barriers in the region, which include dense forests and wide rivers, make it difficult to implement traditional sanitation infrastructure, such as large WTP or WWTPs. Therefore, the solution for the universalization of this region must occur through the use of decentralized water and sewage treatment systems, such as artesian wells (ground water treatment), septic tanks and small-scale treatment stations, among others.

It is a region rich in biodiversity and with fragile ecosystems, being highly sensitive to pollution and environmental degradation. The expansion of sewage collection and treatment will contribute to the protection of these resources. Therefore, investments in sustainable treatment technologies should be the focus for expanding services in this region.

As the north is a region with little integration with other areas of Brazil, the supply of material and logistics for the execution of works will be the region's greatest challenges.



### 4.2.2 Northeast Region

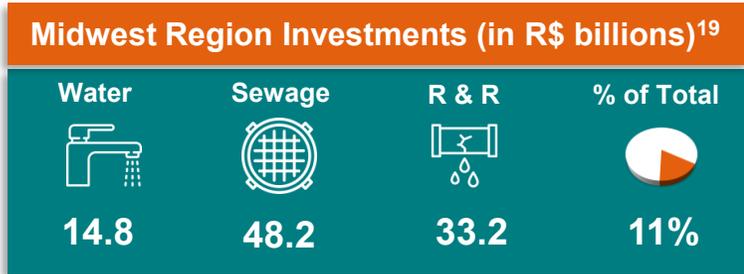
The northeast is the second-most region in need of investments for the universalization of both water and sewage, being greater than the value foreseen for the north and midwest regions together and representing 26% of the investments in the country.

The semi-arid climate conditions have been causing very long drought periods in the region which contribute to water scarcity, making water reuse, alternative water sources like desalination and atmospheric water generation (AWG), and reduction of water losses, all essential solutions. The northeast is the region with the highest predicted value for the implantation of domestic rainwater collection systems, or cisterns (98% of the value of this item is foreseen for this region). For sewage, the highlight is the implementation of septic tanks (43% of septic tanks will be implemented in the northeast).

The most urbanized areas in this region are located on the coast, and in these regions, more centralized water and sewage treatment solutions should be provided to promote efficiency gains. The interior of the region has less-urbanized villages (fewer than 5,000 people) and a poorer population, which will require the implementation of decentralized and low-cost solutions for water and sewage treatment.



# Chapter 4 | Overview of the Main Investments

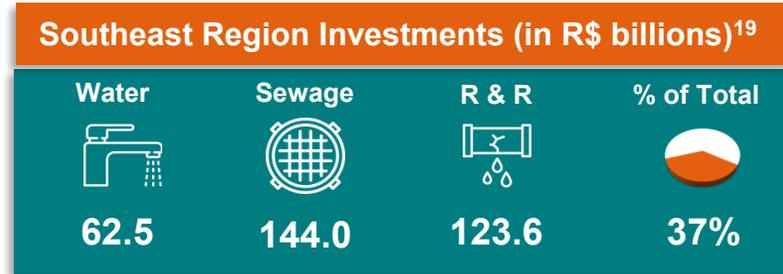


### 4.2.3. Midwest Region

The midwest is the region with the lowest forecasted investments in water supply systems and the second lowest in sewage systems, representing only 11% of the national investment. This low level of investment is explained mainly by good rates of water supply and the low population density of the region.

Due to the great distances between the municipalities, decentralized water and sewage treatment solutions will be necessary for the region. As the midwest is a region with high agricultural production, there is an opportunity for reuse solutions in irrigation. On the other hand, the presence of pesticides in the water supply will require the implementation of more advanced treatment technologies, especially in the region's rural areas.

The metropolitan areas of Brasília, Goiania and Campo Grande are undergoing an accelerated urbanization process in recent years, requiring the implementation of robust and efficient sanitation infrastructure for these areas that are experiencing water shortages due to climate and pollution of the watersheds.



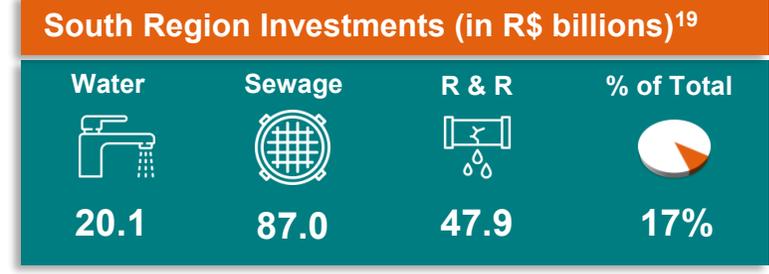
### 4.2.4 Southeast Region

Despite being the region that is closest to universalization, the southeast needs the most investments in order to achieve it, representing 37% of all the investments foreseen for the country. This is mainly due to the high demographic concentration in the region and the greater need for asset replacement.

In water infrastructure, most of investment needs are concentrated in the implementation of water supply networks (pipelines), while for sewage most of the investments will be in the implementation of sewage collection networks and sewage treatment plants.

One of the biggest challenges in this region is the irregular distribution of sanitation infrastructure, which is influenced by factors such as income, urbanization and development. In metropolitan regions, especially São Paulo, Rio de Janeiro and Belo Horizonte, water supply and sewage collection in slums will be a challenge for universalization, which will require innovative engineering solutions and decentralized sewage treatment solutions. This region, with a more mature sanitation infrastructure, will also require energy efficiency solutions, reduction of water losses and use of digitalization and smart data for operational improvement.

The high industrialization of the region should provide opportunities for the use of innovative and sustainable treatment technologies.



### 4.2.5 South Region

This region displays a peculiarity in relation to the other regions: the infrastructure of water supply systems is good, being more similar to the southeast and central-west regions. However, the sewage infrastructure is quite precarious, similar to the north and northeast regions. This results in the planned investments in sewage in this region being almost four times higher than the investment in water.

In the large metropolitan areas of this region, especially Porto Alegre, Curitiba and Florianópolis, there is adequate water and sewage coverage but a lack of more robust sewage treatment infrastructure. Therefore, these areas will require sewage treatment solutions and the implementation of solutions for operational improvement, such as energy efficiency, reduction of water losses and use of digitalization and smart data. The region's high industrialization should also provide opportunities for the use of innovative and sustainable treatment technologies.

The interior of this region, composed of several small cities, will require decentralized water and sewage treatment solutions to reach universalization.



# Chapter 5 | Main Service Providers

## 5.1 Main Service Providers

The largest providers of sanitation services in Brazil are the state companies of the largest states, as well as the private companies that have recently won the largest concessions and PPPs carried out to date. The top six state companies serve approximately 76 million inhabitants, while the top five private companies serve approximately 59.5 million inhabitants. Taking the population served as a reference, it is concluded that the main operating companies in the country are SABESP, Aegea and BRK, which will be presented in detail below.

(company in the southeast region with 12 MM of population served) made a concession to the private sector.

This shows the strength of the market in the south and southeast regions when compared to the others.

Unlike state companies, which concentrate their operations in one state, private companies have a more geographically diversified portfolio, operating from the north to south of Brazil and in a variety of contracts (full concessions, sewage concessions, public-private partnerships, etc.).

### 5.1.2 New Service Providers

With the approval of the New Regulatory Framework that brought more legal certainty to contracts, investment funds and large foreign and national business groups began to see the potential in this market.

National groups from other areas of infrastructure, Vinci Partners, Pátria and Equatorial, have already entered this sector, setting up business divisions dedicated to sanitation and studying the opportunities that are emerging in the market, mainly referring to large metropolises.

Among foreigners, American (Macquarie), Canadian (CPPIB) and Middle Eastern funds, as well as groups such as the Spanish Acciona and the Chinese CGGC (Gezhouba Group) and CREC 4 (CTCE Group), have all shown interest in concessions in the sector.

The ideal model would be to form joint ventures with operators or consortia to participate in tenders that are already open or that have advanced projects.

#### Main state-owned sanitation companies in Brazil

Name	Population Served – (million)
SABESP (Southeast - São Paulo)	30,5
COPASA (Southeast - Minas Gerais)	11,5
SANEPAR (South - Paraná)	10,3
EMBASA (Northeast - Bahia)	10,3
COMPESA (Northeast – Pernambuco)	7,8
SANEAGO (Midwest – Goiás)	5,9

Source: AG001 – SNIS 2021<sup>25</sup>

Analyzing the state companies, it is noted that the three largest are concentrated in the south and southeast regions. In addition, CORSAN (a company in the south region with 6 MM of population served) was recently privatized, while CEDAE

#### Main private sanitation companies in Brazil

Name	Population Served – (million)
Aegea <sup>26</sup>	+30
BRK <sup>27</sup>	+16
Iguá <sup>28</sup>	+7
Águas do Brasil <sup>29</sup>	+4
GS Inima <sup>30</sup>	+1,5

Source: Institutional site from companies<sup>26, 27, 28, 29, and 30</sup>

These service providers are funded by public banks, multilateral agencies and foreign development banks. The main Brazilian public banks are [Banco Nacional de Desenvolvimento Econômico e Social \(BNDES\)](#), [Caixa Econômica Federal \(CEF\)](#) and [Banco do Nordeste \(BNB\)](#). Main multilateral agencies operating in Brazil are [Inter-American Development Bank \(IDB\)](#), [International Finance Corporation \(IFC\)](#) and [International Bank for Reconstruction and Development \(IBRD\)](#). The main foreign development banks operating in Brazil are [KfW Bankengruppe \(KfW\)](#) and [Japan International Cooperation Agency \(JICA\)](#).



# Chapter 5 | Main Service Providers

## 5.2 SABESP

SABESP<sup>31</sup> is a publicly traded mixed capital company founded in 1973, controlled by the state of São Paulo and present in 375 municipalities in the State of São Paulo (70% of the urban population), being one of the largest water and sewage service providers in the world based on number of customers.

According to company data, investments made by SABESP between 2010 and 2020 represent 33% of all investments in the sector (SNIS<sup>25</sup>). Its main operational indicators are:

Main operation indicators		
Indicator	Water	Sewage
Connections (million)	10,1	8,6
Coverage (%)	98	92
Treatment (%)	-	81
Pop. Served (million)	27,9	24,7
Network extension ('000 km)	91,2	63,2

Source: [SABESP 3Q22 presentation](#)<sup>32</sup>

With a virtually universal coverage infrastructure, the company's [current focus](#)<sup>33</sup> is to increase its operational efficiency and expand its area of operation, participating in some strategic auctions inside and outside the state of São Paulo.

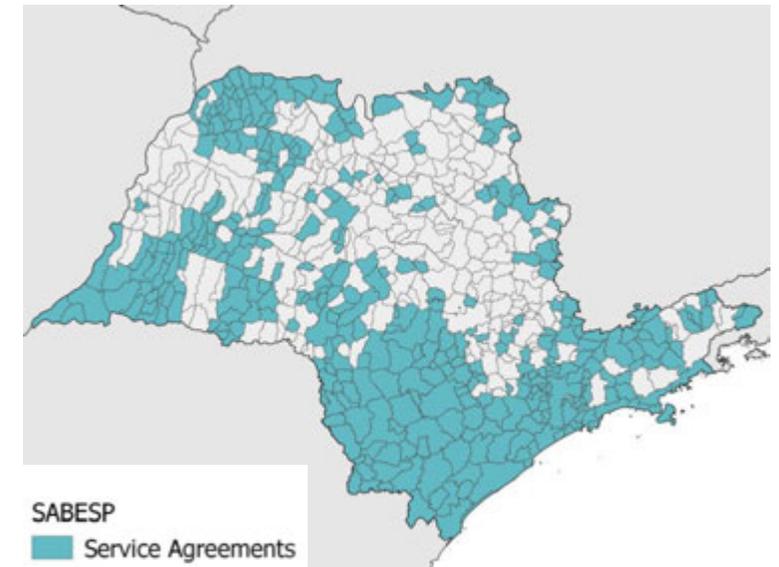
According to its Business Plan<sup>32</sup>, SABESP intends to invest R\$26.2 billion between 2023 and 2027, comprising R\$4.8 billion in sewage treatment, R\$12.4 billion in sewage collection and R\$8.9 billion in water supply.

The company's main programs are:

- Metropolitan Water Program, which aims to increase water production capacity to supply the metropolitan region of São Paulo.
- Tietê Project, which aims to universalize sewage collection coverage in basins of the metropolitan region of São Paulo that are tributaries of the Tietê River.
- Water Loss Reduction Program, which aims to carry out actions aimed at maintaining networks, renewing assets, managing pressure and combating fraud.
- Córrego Limpo Program, which aims to clean up and monitor the quality of streams in the metropolitan region of São Paulo.
- Onda Limpa Program, which aims to expand the collection and treatment of sewage in the coastal municipalities of São Paulo.
- Novo Rio Pinheiros Project, which aims to revitalize the Pinheiros River by reducing the amount of sewage discharged and improving the quality of the river's water.

It is important to mention that in April of 2023, the state government of São Paulo released a statement announcing the [hiring of IFC to advise it in the privatization process](#)<sup>34</sup>. The state governor is evaluating the [possibility of privatizing the company in 2024](#)<sup>35</sup>.

Figure 12 - Municipalities where SABESP operates (São Paulo State)



Population served: 30,5 millions



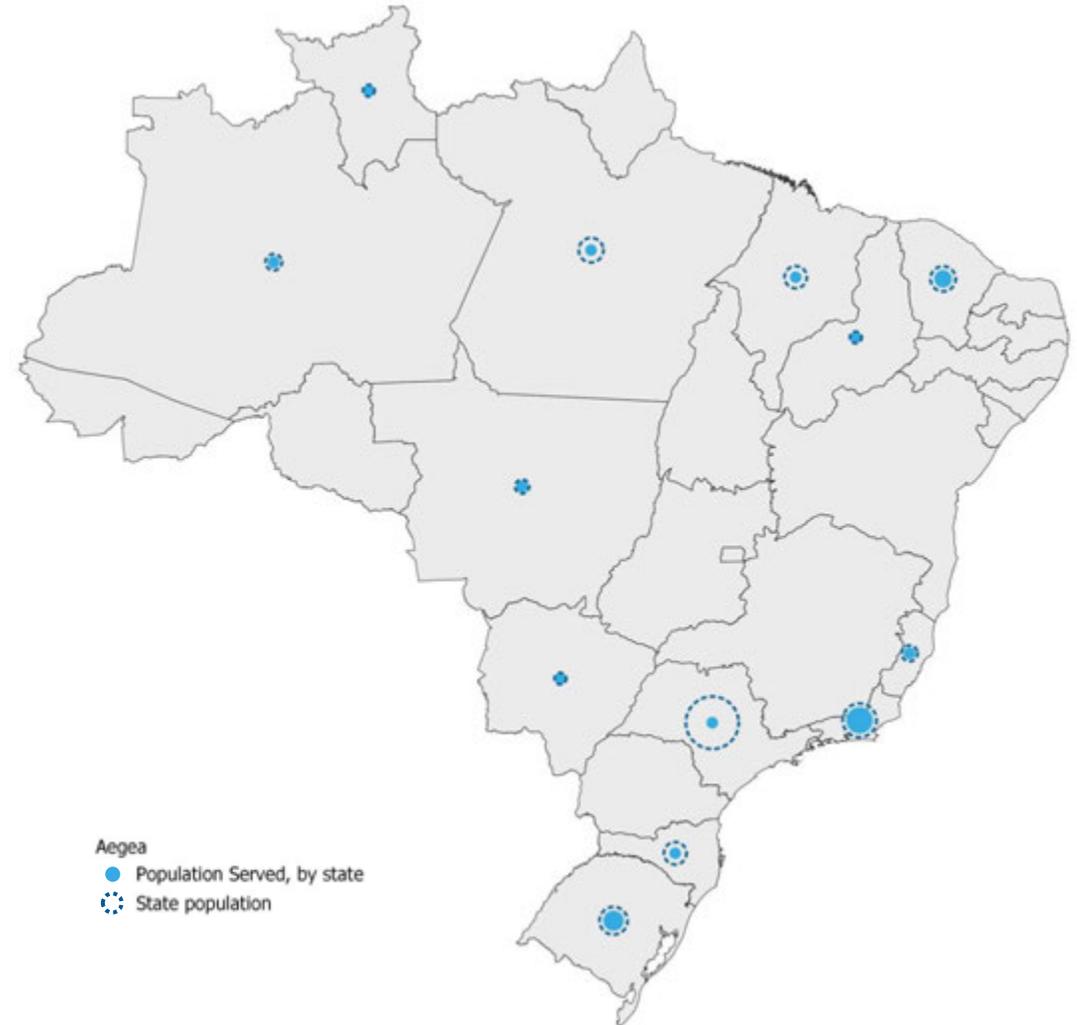
# Chapter 5 | Main Service Providers

## 5.3 Aegea

Aegea<sup>36</sup>, a private company founded in 2010, is present in more than 500 cities through concessions and PPPs and is the largest sanitation private company in the country (with 56% of the market share of the private sector). The holding's shareholding structure is made up of [Equipav](#), [GIC](#) and [Itaúsa](#). In the recent acquisition of CORSAN, Aegea teamed up with investment companies [Perfin](#) and [Kinea](#).

According to company data<sup>26</sup>, Aegea currently serves more than 30 million people, and its contracts have an average term of 30 years. As shown in the figure, Aegea operates municipalities in all regions of the country, with a stronger presence in the south, southeast and central-west. Its three largest contracts in terms of population served (Águas do Rio, CORSAN and Ambiental Ceará) were recently signed, which indicates that the company has an aggressive growth policy.

Figure 14 - States where Aegea operates, and state population served



Main concessions or PPP of Aegea				
Name	Region	Population Served (million)	Operational Startup	Term
Águas do Rio	Southeast	9,8	2022	2057
Aegea CORSAN	South	6,0	2023	2062
PPP Ambiental Ceará	Northeast	4,6	2023	2053
Águas de Manaus	North	2,3	2018	2045
PPP Ambiental MS Pantanal	Midwest	1,7	2021	2051
Águas de Guariroba	Midwest	0,9	2005	2060
Águas de Teresina	Northeast	0,9	2017	2047
Prolagos	Southeast	0,4	2006	2041

Source: [Aegea institutional site](#)<sup>36</sup>

According to the [company's institutional presentations](#)<sup>37</sup>, it remains attentive to new opportunities for large concessions, indicating as potential projects of interest the concessions or privatizations of Sergipe, Bahia, Metropolitan Region of Belo Horizonte, Teresópolis (RJ), Porto Alegre and PPP SANEPAR. The company plans to grow even more in the coming years with the help of partner investors, as [recently reported](#)<sup>38</sup>.



# Chapter 5 | Main Service Providers

## 5.4 BRK

**BRK Ambiental**<sup>39</sup> is a private sanitation company, operating in more than 100 cities in Brazil and serving more than 16 million people. BRK is made up of two shareholders: **Brookfield**, a Canadian group present in more than 30 countries and operating in infrastructure in Brazil for over 120 years, and **FI-FGTS** (Investment fund of the national Length-of-Service Guarantee Fund), the largest infrastructure investment fund in Latin America.

It operates through different contractual models, such as concessions and Public-Private Partnerships with state companies, among others.

Main concessions or PPP of BRK				
Name	Region	Population Served (million)	Operational Startup	Term
Zona Oeste Mais Saneamento	Southeast	1,7	2022	2057
SANEATINS	Midwest	1,2	1989	2029-2049
PPP BRK Pernambuco	Northeast	6,0	2013	2047
BRK Alagoas - Block A	Northeast	1,5	2021	2056

Source: [BRK institutional site](#)<sup>39</sup>

Like Aegea, BRK has a geographically diversified portfolio, thus reducing the political risk in its operations. Regarding its contracts, it is noted that the company has a greater number of municipal concessions in relation to regional ones as well as a greater number of older, and therefore more mature, contracts. Even so, the latest tenders won by BRK, with emphasis on the Zona Oeste Mais Saneamento and Block A of the state of Alagoas, brought the company to another level of operation.

The company is currently undergoing a shareholder restructuring process. In 2022 the company [informed its interest](#)<sup>40</sup> in going public on the São Paulo stock exchange but [withdrew](#)<sup>41</sup> due to the uncertain market scenario after the elections.

Figure 15 - States where BRK operates, and state population served





## Chapter 6 | SWOT Analysis

### 6.1 Strengths

One of the main strengths of the Brazilian water market for Dutch companies is the high expected demand for infrastructure expansion due to the current low water and sewage service levels and the aggressive targets proposed in the New Sanitation Legal Framework (90% sewage coverage and 99% water coverage). This will increase the demand for equipment, services and consulting in the coming years, opening spaces for Dutch companies to enter the market.

Another strength of the Brazilian water market comes from the increase in private operators acting as concessionaires in the country, which was encouraged by the New Sanitation Framework. As presented above, private companies operating in Brazil are growing exponentially. Today, two of the three largest sanitation companies in the country (in terms of served population) are private (AEGEA and BRK). The growth of private companies in the sector is a strong point for Dutch companies that wish to provide services in Brazil for two main reasons: reduced bureaucracy and increased investments in operational efficiency.

Brazilian public companies require increased bureaucracy when hiring, which can make it difficult for companies that do not operate on Brazilian soil to enter. Private companies, on the other hand, have more flexibility.

Naturally, private companies seek to improve operational efficiency by implementing new technologies, being more agile and versatile in hiring and using these technologies. Public companies are generally slower in implementing new technologies and services.

The last strong point highlighted here concerns the possible privatization of the largest public utility companies in the coming years. As presented above, both SABESP and Copasa have privatization plans, which may bring even greater private investment into the country and make the market increasingly attractive for Dutch companies.

### 6.2 Weaknesses

A disadvantage of the Brazilian water market for Dutch companies is the deficiency of the existing infrastructure, making logistics, mobility and connectivity difficult in a large part of the country. In the south and southeast regions, this problem is reduced. Still, in the north and northeast regions the large distances between municipalities and the precariousness of the transport infrastructure are points that need to be considered. In locations farther from large urban centers, logistical and telecommunications problems need to be considered in the case of service providers or equipment suppliers for these locations. Dutch companies that want to operate in the country may face problems hiring qualified labor due to the low number of skilled labor available in Brazil.

Another point that Dutch companies must consider is the complexity of tax and labor rules in Brazil, with several regulations and requirements that can make it difficult to import equipment or hire local labor.

It is essential to point out that concessionaires in Brazil seek to hire services and acquire equipment from companies with a physical presence in the country to guarantee efficient post-sales support. Therefore, Dutch companies that intend to establish themselves in Brazil without offering this support may face significant difficulties, especially those that work with equipment supply.

### 6.3 Opportunities

Most of the recent opportunities created in the Brazilian water market came from the approval of the New Sanitation Legal Framework, which should bring a large volume of investments in the coming years and facilitate the entry of the private sector into the concessions market, which prior to the framework was negligible.

As presented in the previous chapter, private companies have gained space as operators in recent years and the trend indicates that they will have an even bigger market share in the coming years. The largest public sanitation company in the country (SABESP) is studying its privatization as well as several other state and municipal utility companies.



# Chapter 6 | SWOT Analysis

This scenario creates a range of opportunities for Dutch companies that want to operate in Brazil through the provision of services, equipment supply or consulting, since private companies are more flexible in the hiring process, have a greater appetite for risk and are more prone to effective processes with gains in operational efficiency.

In addition, the regulatory framework has also established requirements for operational improvements (reduction of water losses, energy efficiency, etc.) for public and private companies. With this, trends indicate that in the coming years technologies that promote this type of efficiency or automation will experience an increase in demand. The requirement for increased coverage will demand innovative solutions for water and sewage treatment in remote locations and adverse conditions.

## 6.4 Threats

Political instability is among Dutch companies' biggest threats in the Brazilian water market. Although the New Regulatory Framework was approved in 2020, the new government has declared its interest in changing some regulatory points in the sector, which could drive away the interest of private investors. However, so far, few changes have been made.

As the Brazilian government is discussing the possibility of tax reform, it is important to highlight the possibility of tax changes in the coming years. However, as this discussion is still at an early stage, it is not known what impacts this reform may have on the taxation of foreign companies operating in Brazil.

The last threat highlighted here is the country's economic stability, as a developing country it may face negative fluctuations, including high influence, exchange rate volatility and fiscal imbalances.

## 6.5 SWOT Matrix

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>▪ Large demand for infrastructure expansion</li> <li>▪ Increase in private operators acting as concessionaires</li> <li>▪ Possible privatization of the largest public utilities in the coming years</li> </ul>	<ul style="list-style-type: none"> <li>• Deficiency of the existing infrastructure</li> <li>• Low amount of skilled labor available in Brazil</li> <li>• Complex tax and labor rules in Brazil</li> <li>• Concessionaries' fear of purchasing equipment from companies that do not have local support</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>▪ Simplification of the equipment supply and services due to the greater presence of private companies acting as operators</li> <li>▪ The need for more efficient operations imposed by the sanitation framework</li> </ul>	<ul style="list-style-type: none"> <li>▪ Political instability</li> <li>▪ Possibility of tax changes in Brazil due to the tax reform</li> <li>▪ Economic instability, such as high inflation, exchange rate volatility and fiscal imbalances</li> </ul>

# Chapter 7 | Main Opportunities Mapped

## 7.1 Water Market Drivers

This chapter presents the main market opportunities mapped for the short, medium and long term in the Brazilian water sector, specifically for Dutch companies wishing to enter the country. In addition to the previously presented diagnosis, the following sources were consulted to map these opportunities:

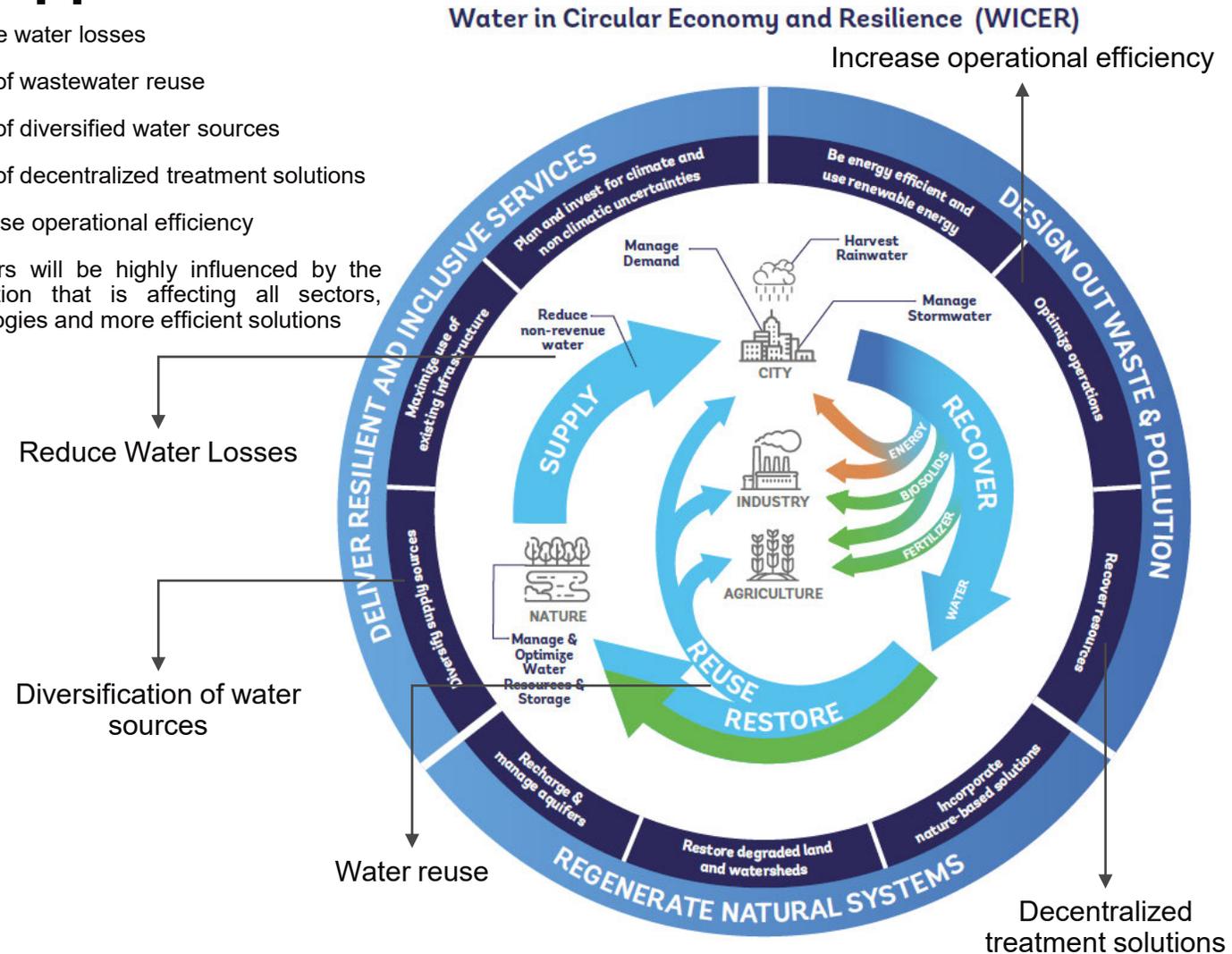
- Interview with the National Water Agency (ANA) to understand the main regulatory aspects that must be observed by foreign companies wanting to operate in Brazil
- Interview with the National Association and Union of Private Concessionaires of Public Services of Water and Sewerage (ABCON SINDICON) to understand what are the main investments projected and expected opportunities for foreign companies
- Interview with the construction company Passarelli, which operates in Brazil, seeking opportunities to supply equipment or associate with foreign companies
- Consultation and discussion with experts at the Water Technology research group from NHL Stenden University of Applied Sciences in Leeuwarden
- Internal technical expertise of the Arcadis team

The analysis of opportunities was based on the [World Bank's WICER initiative](#)<sup>42</sup>, which established a common understanding of the definitions and applications of circular economy principles and resilience in the urban water sector.

This research indicated the following main drivers of the national water market for the coming years:

- Actions to reduce water losses
- Implementation of wastewater reuse
- Implementation of diversified water sources
- Implementation of decentralized treatment solutions
- Actions to increase operational efficiency

Each of these drivers will be highly influenced by the increasing digitalization that is affecting all sectors, bringing new technologies and more efficient solutions



Source: [World Bank](#)<sup>42</sup>



## Chapter 7 | Main Opportunities Mapped

The following is a comprehensive selection of business opportunities mapped for Dutch companies interested in operating in the sanitation sector in Brazil. These opportunities were carefully identified, taking into consideration the advantages and attractiveness for Dutch companies, prioritizing opportunities that offer an enabling environment for participation and valuing businesses that require technical expertise, specialized knowledge and technological innovations.

It is important to emphasize that although local labor is essential for the success of sanitation projects and the existence of a local office for post-sales support is a great differentiator for foreign companies wanting to operate in Brazil, this survey focused on opportunities which minimize dependence on intensive labor and on supply of more usual equipment that already has local suppliers, factors that would make it difficult to compete in the market. The study aimed to map opportunities that are naturally more favorable to the entry of Dutch companies into the Brazilian market, taking advantage of their specific skills and potential for technological contribution.

Driver	Business Opportunity
Reducing water losses	Digitalization of the registry
	Supply of equipment to reduce water losses
	Digital solutions for reducing real water losses
	Digital solutions for reducing apparent water losses
Diversification of water sources	Supply of equipment for diversification of water sources
	Consulting services for diversification of water sources
Water reuse	Supply of equipment for water reuse
	Consulting services for water reuse
	Complete water reuse solutions for individual clients
Decentralized treatment solutions	Supply of equipment for decentralized treatment
	Consulting services for decentralized treatment solutions
	Complete decentralized treatment solutions for individual clients
Increase operational efficiency	Supply of equipment for operational efficiency
	Energy efficiency solutions
	Workforce optimization solutions
	Chemical product optimization solutions



# Chapter 7 | Main Opportunities Mapped – Reduce Water Losses

## 7.2 Reduce Water Losses

A great need of the Brazilian sanitation market for the coming years is the control of water losses, both real and apparent.

The reduction of water losses plays a crucial role for sanitation companies in Brazil. These losses present several challenges and negative impacts that directly affect the efficiency and sustainability of water supply services.

Real water losses occur mainly due to leaking pipes, damaged connections, burst pipes, and other structural problems. These losses represent a direct reduction in the amount of water available for public supply and an increase in wasted water resources. In a country such as Brazil, which faces periods of water scarcity in some regions, it is crucial to reduce these losses to guarantee an adequate supply of drinking water to the population.

Apparent losses refer to water theft, billing error, revenue meter under registration and other factors that result in an inadequate accounting of water consumption. These losses have a significant financial impact on sanitation companies, as they represent a decrease in expected revenues from the provision of both water and sewage services. The control of these losses is essential to guarantee the economic sustainability of the sanitation companies, enabling investments in infrastructure and improvements in the quality of the services provided.

It is important to emphasize that apparent losses are often of great significance in Brazil, unlike in developed countries with low water loss levels, where the real losses are significantly higher than apparent losses. A [study by the World Bank](#)<sup>43</sup> estimates that in developed countries 80% of total losses are real and only 20% are apparent. For developing countries, the same study estimates that 60% of the losses are real and 40% are apparent.

In Brazil, the portion of apparent losses is high primarily due to the following three reasons:

- The use of old and low-precision hydrometers (velocimetric) makes the undermeasurement of water higher when compared to more developed countries, which use newer technologies and follow a more constant replacement of their equipment
- In Brazil, the widespread use of individual water tanks results in a reduced inlet flow rate at the water meter, leading to water sub-metering. One study<sup>81</sup> showed that the sub-metering in connections using water tanks was 25%, while the sub-metering of connections with direct water consumption was 7%.
- There is a more significant low-income population in the country, thus increasing the incidence of clandestine connections

According to a [study by the Instituto Trata](#), reducing losses from 40% to 25% in 2033 would bring the country an estimated gross gain of R\$ 53.6 billion.

Besides the impacts already mentioned, the reduction of water losses can also allow sanitation companies to postpone or even eliminate the need for investments in infrastructure, such as the construction of new water intakes and treatment plants, as reducing losses increases the amount of water available for public supply, potentially making investment in new structures unnecessary. These reductions make companies more profitable and allow them to invest in other essential areas, such as improving the quality of service provided.

Another relevant aspect is the environmental concern. Water losses contribute to the waste of a vital natural resource. Although Brazil is known for its abundant water, it is fundamental to highlight that water is a finite resource and that

Estimates of non-revenue water ratio worldwide		
Type of country	Real losses (%)	Apparent losses (%)
Developed Countries	80	20
Eurasia (CIS)	70	30
Developing Countries	60	40

Source: [World Bank](#)<sup>43</sup>

wasting it is an unsustainable practice. In addition, water treatment and distribution require considerable investments in energy and resources, and reducing losses is one way to minimize the environmental impact associated with these processes.

Therefore, reducing water losses, whether real or apparent, plays a key role for sanitation companies in Brazil. In addition to ensuring an adequate supply of potable water, reducing these losses brings financial, social and environmental benefits to the companies.

Both types of losses will need to be tackled more robustly in the future. Currently, water loss in Brazil is 40.3%, and the New Sanitation Regulatory Framework has stipulated mandatory loss reduction targets in all concession contracts (now, contracts are specifying a target of between 25% and 30% by 2033). To meet these losses, suppliers will need the support of companies that specialize in four primary areas of business:

- Digitalization of the registry
- Supply of equipment to reduce water losses
- Digital solutions to reduce real losses
- Digital solutions to reduce apparent losses



# Chapter 7 | Main Opportunities Mapped – Reduce Water Losses

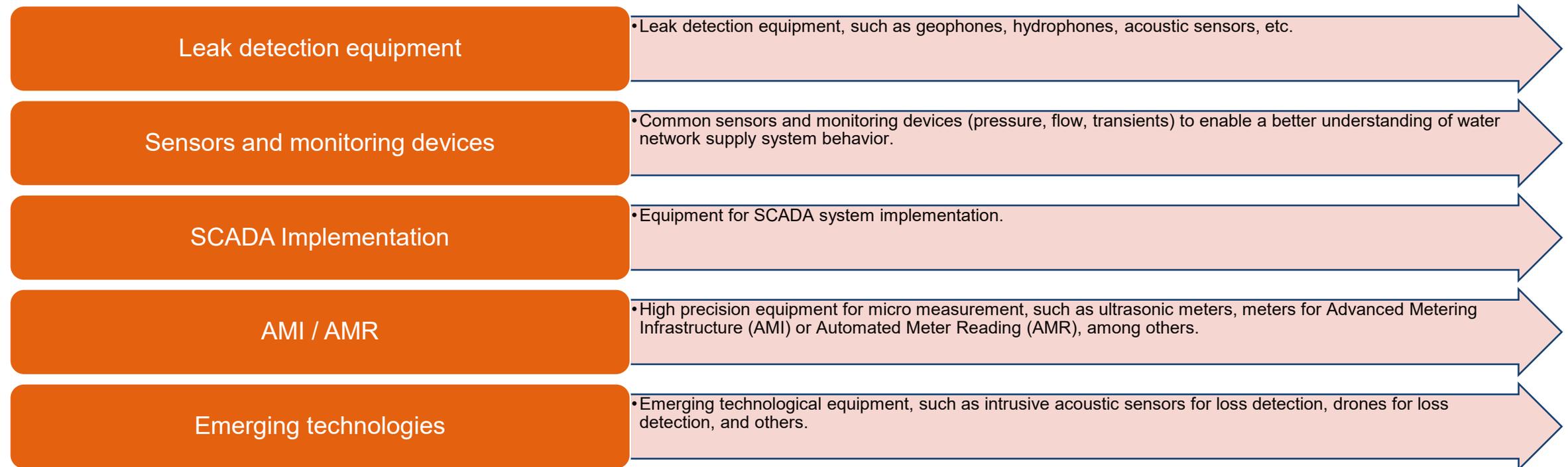
## 7.2.1 Digitalization of the registry

Digitalizing the registry and sanitation infrastructure allows companies to offer solutions that improve the efficiency and management of water distribution and sewage treatment systems. Through georeferencing software, it is possible to register the location and basic information of water distribution networks and auxiliary equipment such as water meters and valves.

In this area, the demand for solutions for mapping water networks, registering hydrometers and locating operational units should increase since this is the first step to be implemented for actions that combat losses.

## 7.2.2 Provision of equipment to reduce water losses

The demand for efficient and innovative equipment to detect and repair leaks and deteriorated infrastructure creates opportunities in the Brazilian market. Within measurement and repairing control technologies and inspection tools, there are several opportunities in advanced solutions to help reduce real losses, such as:

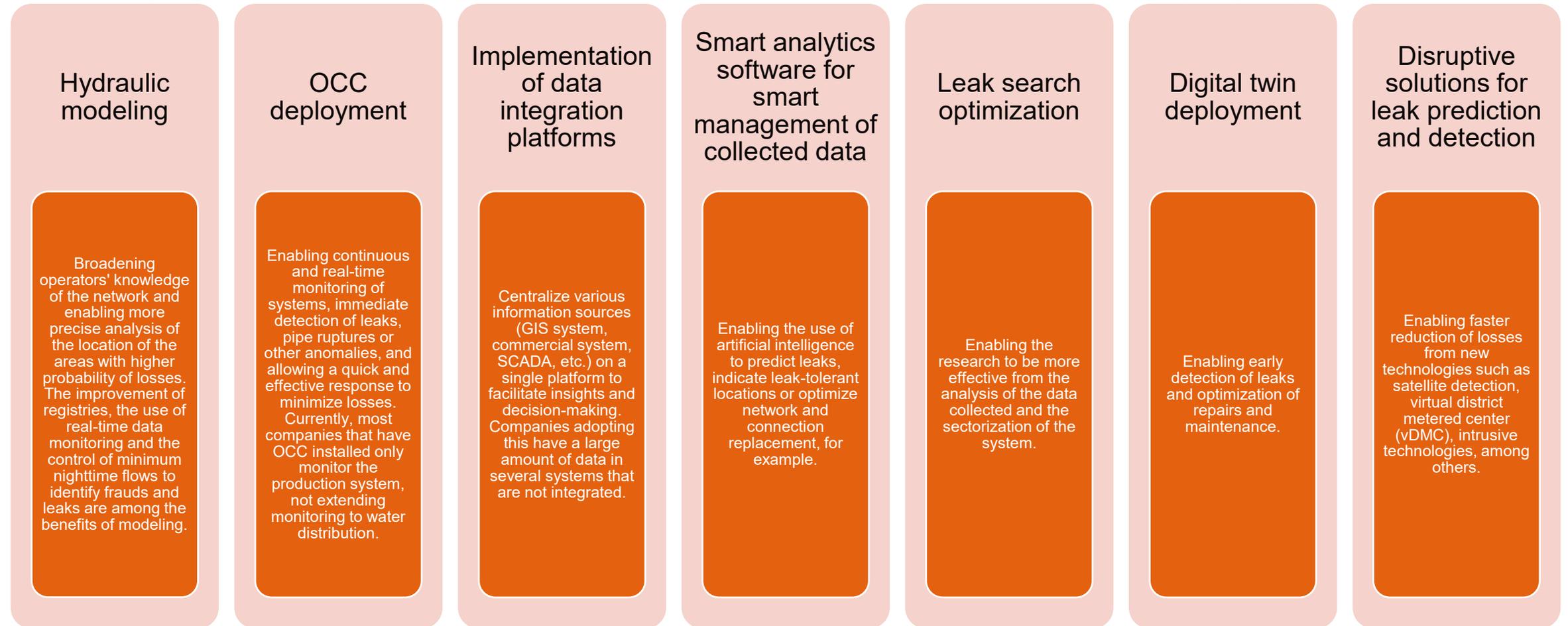




# Chapter 7 | Main Opportunities Mapped – Reduce Water Losses

## 7.2.3 Digital solutions to reduce real losses

Implementing digital solutions is key to addressing the challenge of real losses in the sanitation sector. Companies can provide advanced technologies such as telemetry systems, real-time data analysis and artificial intelligence to optimize leak identification, diagnosis and resolution, ensuring a faster and more effective response. These solutions can be (among others):

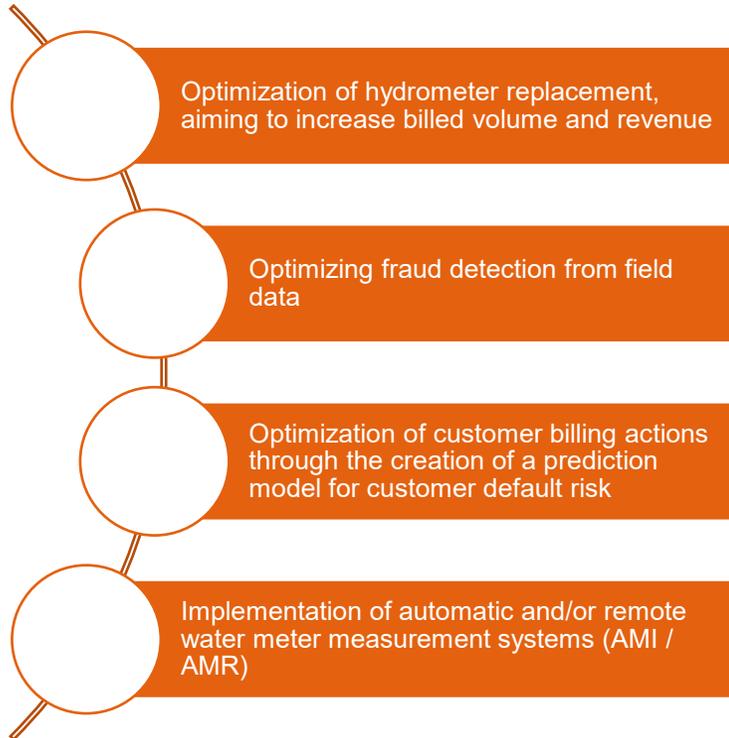




# Chapter 7 | Main Opportunities Mapped – Reduce Water Losses

## 7.2.4 Digital solutions for the reducing of real losses

Apparent water losses related to poor metering and billing failures represent a significant challenge. Companies can offer digital solutions, such as smart metering systems, data analysis for irregularity detection, and customer awareness programs, aiming to reduce losses in this area. These solutions can be (among others):



## 7.2.5 Case study examples of reduction in water losses by Dutch companies (not exhaustive)

### Acquaint

- [Acquaint](#)<sup>45</sup> offers Pipescanner, a software to perform comprehensive pipeline condition assessments in a non-invasive process. This tool is used for intelligent and data-driven replacement decisions.

### Takadu

- [TaKaDu CEM](#) is a tool that supports water network management by centralizing data and automatically detecting leaks.

### Arcadis

- Arcadis created the [Non-Revenue Water Digital Twin \(NRW-DT\)](#)<sup>46</sup> technology. This tool enables water utilities companies to leverage live data and technology for rapid location of leak sources and to minimize costly, time-consuming efforts to manually survey their water infrastructure.

### Royal HaskoningDHV

- [Aguasuite](#)<sup>48</sup> is an AI-powered analyst and autopilot for utilities and industries. It monitors, analyses, visualizes and controls the performance of water and wastewater infrastructure through predictive analytics and machine learning.

### Spatial Insight

- [Spatial Insight](#)<sup>49</sup> is an independent Dutch data science consultancy that applies proprietary algorithms and software aiming to save CAPEX/OPEX, reduce leakage and contribute to strategic asset management goals.

# Chapter 7 | Main Opportunities Mapped – Diversification of Water Sources

## 7.3 Diversification of Water Sources

Diversification of water supply sources is a theme of global relevance for the coming years. In an expansive country like Brazil, with different geographic and climatic regions, it is essential to seek alternatives to ensure water supply sustainably and safety.

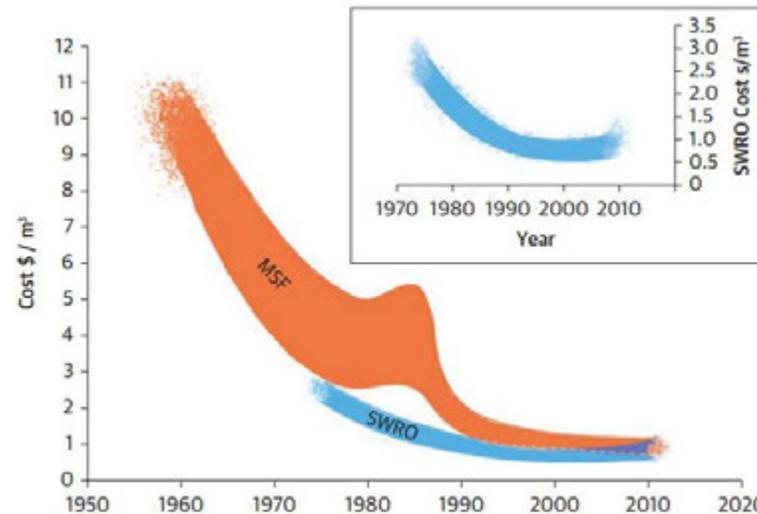
Traditionally, water supply in Brazil has been based primarily on surface and groundwater sources. However, growing population demand, accelerated urbanization, and climate change have put pressure on these sources, leading to the need to diversify the available options. In this context, technologies to diversify supply sources have been developed and are gaining prominence. Among the most common alternatives are rainwater, wastewater reuse, and seawater desalination. Additionally, other possibilities have been presented in recent years, such as capture of atmospheric moisture.

Due to Brazil's vast coastal extension, the country presents a significant potential for exploring desalination as a future solution for water supply. This process becomes even more relevant, especially in the coastal regions of the northeast, where natural freshwater sources are scarce. Therefore, a focus will be given to this technology for the diversification of supply sources in Brazil.

There are two main types of desalination. Thermal desalination uses heat to turn the water into steam, separating it from mineral salts. The second is mechanical membrane desalination, commonly called reverse osmosis. Under high pressure, saltwater passes through a semi-permeable membrane, the pores of which are too small for the salt molecules to pass through.

The main barriers to using these technologies are the high cost of operation, primarily due to the energy required, and the need to dispose of the brine removed from the water.

However, in recent years these methods have been updated with more durable membranes, increased energy efficiency, salt removal and more, resulting in cost reductions for the treatment processes. A [World Bank study](#)<sup>50</sup> presents the cost ranges of desalination methods Multistage Flash Desalination (MSF, a thermal process) and Sea Water Reverse Osmosis (SWRO, a mechanical process) from the 1970s to 2014.



Source: [World Bank](#)<sup>50</sup>

Besides the cost reduction of existing technologies, in recent years a range of promising innovations for desalination have emerged, such as nanostructured membranes, carbon nanotubes, forward osmosis (FO), membrane distillation (MD), dewvaporation, adsorption desalination, electrochemical desalination, capacitive deionization, electrodialysis, etc.



# Chapter 7 | Main Opportunities Mapped – Diversification of Water Sources

In Brazil, the most emblematic cases of water desalination plants are presented below:



**Fortaleza - under construction**

A reverse osmosis desalination plant with a capacity of 1000 L/s is under construction in Fortaleza, capital of Ceará (Northeast). This will be the largest desalination plant in Brazil and is scheduled for completion in 2026.

**Fernando de Noronha**

This tourist island located in the state of Pernambuco (Northeast) uses 126 reverse osmosis membranes to desalinate 20 L/s of water, 30% of all the water consumed on the island.

**Programa Água Doce**

A Brazilian federal government program to install small reverse osmosis brackish water desalination systems in rural communities in Brazil's semiarid region. Currently there are about 600 systems in operation.

**ArcelorMittal**

In 2021, this steel corporation located in Espírito Santo (Southeast) built the largest desalination plant in the country, with capacity to treat 140 L/s using 294 ultrafiltration membranes and 1085 reverse osmosis membranes.

The use of alternative supply sources in Brazil is still in the early stages, but there has been significant investment in this field in recent years. Due to the need for complex and innovative treatment technologies, it is evident that the Brazilian market will need to rely on foreign expertise in this sector, thus creating opportunities to operate both in equipment supply and in consulting and technical expertise.

### 7.3.1 Supply of equipment

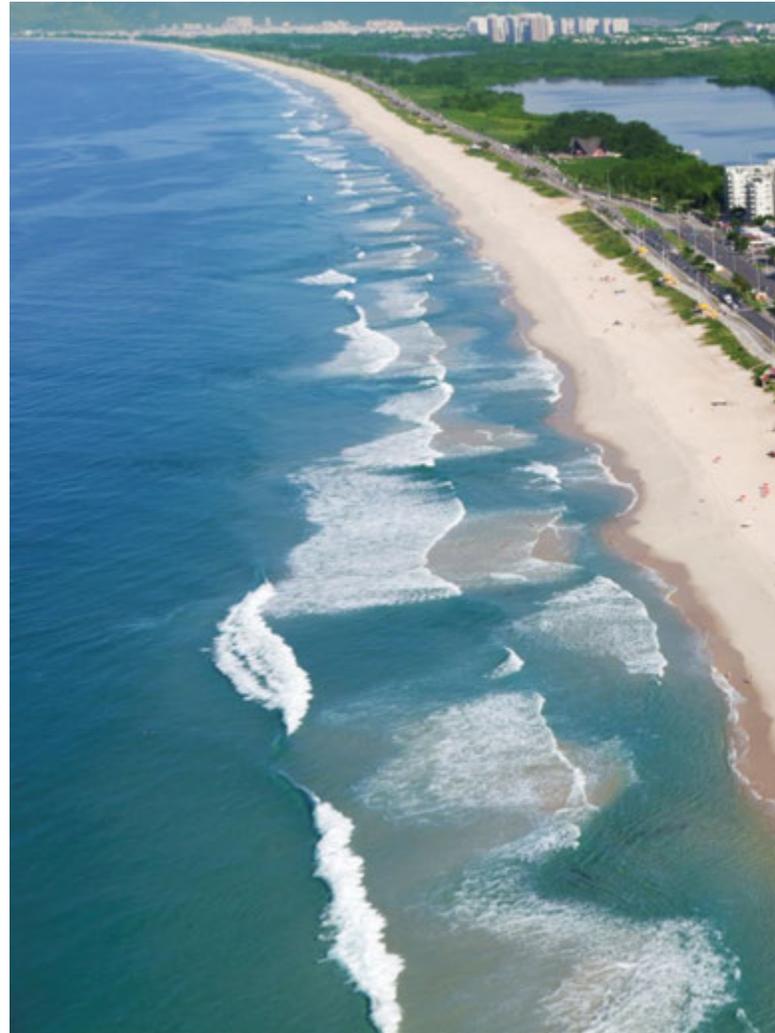
Companies can provide specialized equipment and technologies for water treatment from alternative sources, mainly brackish and saltwater. It includes membrane, thermal treatment systems, or more innovative solutions such as electrochemical or capacitive deionization. These companies could offer efficient and innovative equipment, contributing to the expanded use of alternative supply sources for sanitation operators in Brazil.

### 7.3.2 Consulting services and technical expertise

Dutch companies can offer specialized consulting services and technical expertise to assist in implementing alternative water source and treatment solutions. This involves assessing technical and economic feasibility, preparing environmental impact studies, defining treatment strategies and developing management plans. In addition, technical expertise can be provided to train local staff to ensure efficient operation and proper maintenance of the systems.



## Chapter 7 | Main Opportunities Mapped – Diversification of Water Sources



### 7.3.3 Case study examples of alternative water source use by Dutch companies (non-exhaustive)

#### Rainmaker Holland

- [Rainmaker's Air-to-Water](#)<sup>51</sup> units produce drinking water from air – no other water source is required. Their proprietary technology is disrupting the water market.

#### Solaq

- [Solaq](#) developed WaterWin, an affordable Air-to-Water device that can be used anywhere, even in dry areas. There are already pilot devices being used by CACEGE and FUNCEME (Brazil)

#### NX Filtration

- [NX Filtration](#)<sup>52</sup> offers sustainable solutions for filtration applications, such as direct nanofiltration, ultrafiltration and microfiltration that can be used for desalination.

#### Aquastill BV

- [Aquastill](#)<sup>53</sup> is the global technology leader in the supply of membrane distillation. Their innovative technology can desalinate water on a medium (1000 m<sup>3</sup>/day) scale at competitive costs and with minimal environmental impact, using waste or solar heat to power the process sustainably.

#### Oisann Engineering BV

- Oisann Engineering has developed [Waterfountain](#)<sup>54</sup>, an offshore desalination system that surpasses the environmental and economic efficiency of conventional reverse osmosis desalination methods. In comparison to standard desalination plants, Waterfountain boasts an estimated 35% reduction in CAPEX and a 50% decrease in OPEX. This innovative system has the capacity to produce a volume of fresh water ranging from 10.000m<sup>3</sup> to over 100.000m<sup>3</sup> per day. Furthermore, Waterfountain offers a smaller unmanned unit option, capable of generating 50-500m<sup>3</sup> per day, catering specifically to the needs of small communities, islands, military applications, emergency response scenarios, and more.



# Chapter 7 | Main Opportunities Mapped – Water Reuse

## 7.4 Water Reuse

Water reuse represents a growing opportunity in Brazil, offering promising prospects for Dutch companies in the coming years. This practice consists of treating and using wastewater that would otherwise be discarded for beneficial purposes, such as irrigation of green areas, industrial uses, and aquifer recharge. The table below shows examples of treatment plants that generate water for industrial and urban reuse. It is important to note that Brazilian legislation currently does not allow the direct reuse of water for potable purposes.

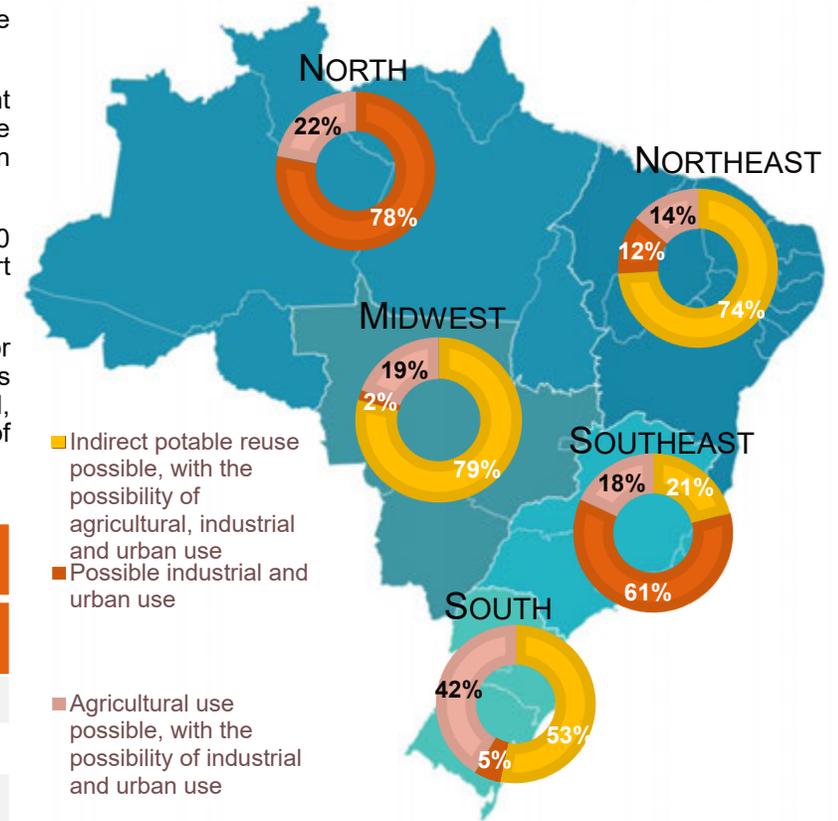
The biggest obstacle to developing this market in Brazil is the lack of standardized regulation for reused water. However, in recent years there has been a significant evolution in regulation, either with state definitions of required water quality standards or by the New Sanitation Regulatory Framework, which has given ANA a role as a regulatory inspection agent, which may facilitate the creation of more standardized regulations on water reuse in the country.

ANA estimates that in 2021 there was an installed capacity of 2 m³/s for water treatment for reuse across Brazil and that by 2030 there is potential to increase this capacity to 13 m³/s. The map shows the estimated potential for water reuse, by region, in the short and medium term.

Therefore, in the next few years, the demand for consulting services and supply of equipment for advanced wastewater treatment for reuse is expected to increase, thus creating opportunities for Dutch companies to operate in Brazil. As with the trend towards decentralized treatment solutions, the potential clients for consulting or reuse equipment are sanitation concessionaires and industrial, residential and commercial condominiums. The main businesses mapped for Dutch companies within this trend were: supply of equipment, consulting services and technical expertise, as well as supply of complete solutions for individual clients.

### Estimation of the reuse potential in the short and medium term

By region, considering only urban effluent



Source: [CEBDS](#)<sup>55</sup>

Examples of existing recycling projects in Brazil					
Name	Region	Operator	Capacity (L/s)	Type of use	Start of operation
WWTP Jesus Neto <sup>55</sup>	Southeast	SABESP	29,5	Industrial	1998
AQUAPOLO <sup>57</sup>	Southeast	SABESP	1000	Industrial	2010
EPAR Capivari II <sup>58</sup>	Southeast	SANASA	360	Industrial and Urban	2011
WWTP Iberostar <sup>59</sup>	Northeast	EMBASA	35	Urban	2006



## Chapter 7 | Main Opportunities Mapped – Wastewater Reuse

### 7.4.1 Supply of equipment

Companies can provide specialized equipment and technologies for water reuse, including advanced treatment systems, filtration units, disinfection systems and other solutions that meet the quality standards required by Brazilian regulations. These companies have the opportunity to offer efficient and innovative equipment, contributing to the expansion and improvement of water reuse in the country for sanitation operators.

### 7.4.2 Consulting services and technical expertise

Companies can offer specialized consulting services to assist in implementing water reuse projects. This may involve assessing technical and economic feasibility, preparing environmental impact studies, defining treatment strategies and developing management plans. Additionally, these companies can provide technical support, training and capacity building for professionals involved in the water reuse sector.

### 7.4.3 Complete solutions for individual clients

There is a growing demand for customized water reuse solutions that meet clients' specific needs. Dutch companies can stand out in the market by developing solutions adapted to the particularities of different sectors, such as various industries (food, petrochemical, paper and cellulose, beverages, etc.), hospitals, residential condominiums, shopping malls, and commercial establishments, which often demand a specific treatment technology for their effluents.

### 7.4.4 7.3.3 Case study examples of wastewater reuse by Dutch companies (not exhaustive)

#### Blue-tec

- [Blue-tec](#)<sup>56</sup> is focused on developing the commercial use of forward osmosis. Forward osmosis differs from traditional membrane filtration technology in its resistance to fouling and doesn't use any mechanical pressure or heat for the separation.

#### Bluecon

- Bluecon engineers [developed a treatment process](#)<sup>60</sup> that convert sewage water of domestic origin into clean reusable water. "Blueconizing" is an innovative physical technology to treat wastewater without use of bacteria. In a few steps domestic wastewater is converted into clean surface water or irrigation water. This is a 100% physical wastewater treatment that achieves a high degree of purity.

#### Brightwork BV

- [Brightwork](#)<sup>61</sup> offers a range of highly standardized and proven products for wastewater reuse. Their portfolio consists of modular continuous sand filters, coagulation, flocculation, lamella settlers, disc and cloth filtration and dedicated monitoring and control tools, such as Sand-Cycle for continuous sand filters. They also offers consultancy on (waste) water treatment, water reuse, sludge and energy management.

#### Logisticon Water treatment

- [Logisticon](#)<sup>62</sup> supplies high-quality and fully automated plug & play installations in line with the very latest technologies to wastewater reuse, such as ultrafiltration, reverse osmosis, chemical dosing, etc.

#### NX Filtration

- [NX Filtration](#)<sup>52</sup> offers sustainable solutions for filtration applications, such as direct nanofiltration, ultrafiltration and microfiltration that can be used to wastewater reuse solutions.

#### Dupont

- Dupont is a supplier of cutting-edge equipment for sustainable water treatment that is already active in Brazil. It supplied [MABR Oxymem technology](#)<sup>64</sup> equipment to treat the effluent of a condominium in Santana do Parnaíba, which became the first condominium in Latin America to use reuse water.

#### Hydroloop

- [Hydroloop Cascade](#) is a decentralized greywater recycling system that promises to enable a reduction of up to 45% in both water consumption and wastewater emissions by households.

# Chapter 7 | Main Opportunities Mapped – Decentralized Treatment

## 7.5 Decentralized Treatment Solutions

Decentralized water and wastewater treatment solutions are gaining prominence as an area of significant growth and opportunity in the Brazilian market in the coming years. These solutions refer to implementing smaller-scale treatment systems (from a few dozen to around 5,000 inhabitants) in locations close to the points of consumption and generation (or within industries/condominiums). In the coming years, this demand should grow due primarily to the following factors:

- Need for universalization of the treatment systems in rural areas and dispersed villages (especially in the north and northeast, where a larger share of the population lives in these areas, as shown in the map to the right).
- Need for sewage treatment in irregular areas and slums, where it is difficult to build collecting systems due to lack of space.
- Increased demand for customized water and wastewater treatment by industries with effluents that have specific characteristics.

The main benefits of implementing decentralized treatment solutions are<sup>65</sup>:

- Positioning plants close to the supply source can reduce the cost of pipelines to bring water from distant surface sources.
- Decentralized systems are more scalable and portable than traditional plants. Their quick construction limits the risk of “white elephant” plants.
- Smaller-scale projects may bypass politically challenging negotiations across diverse regions and facilitate local control of community water treatment systems.



Source: [IBGE](#)<sup>66</sup>

- In industry, decentralized treatment can provide quality control for individual sites and improve community relationships by reducing ecological impacts and competition for local water resources.

In addition, other positive points of using these technologies are that these units usually can<sup>65</sup>:

- Be pre-engineered for quick, plug-and-play commissioning.
- Be packaged in standard shipping containers for minimal site prep and construction.

- Have small footprints, low-odor, and low-noise operation.
- Be portable, allowing easy transport by ship, rail, or truck.
- Be readily scalable by adding or removing units, which can then be redeployed or sold.
- Minimize energy requirements, in some cases to the point where alternative energy sources are viable in off-grid applications.
- Feature smart technology that allows for remote monitoring and operation.

The growing demand for decentralized water and wastewater treatment solutions is driven by the need to complement existing sanitation infrastructures, especially in areas that are difficult to access or have limited infrastructure.

These solutions offer benefits such as increased operational efficiency, expanded treatment capacity, and better control over the treatment process.

Dutch companies can exploit this growing demand by bringing their expertise and innovative technologies to this expanding market. Through consulting services, supply of specialized equipment, development of customized technologies and technical support, Dutch companies can play a key role in implementing and operating decentralized water and wastewater treatment systems.



## Chapter 7 | Main Opportunities Mapped – Decentralized Treatment

### 7.5.1 Supply of equipment

Dutch companies have the opportunity to supply innovative equipment and technologies for decentralized water and wastewater treatment. These may include compact treatment systems, anaerobic and aerobic reactors, biodigesters, constructed wetlands, solutions for low water availability, e.g., grey water reuse, AWG, and removal of emerging and/or difficult to remove contaminants. By offering such state-of-the-art equipment, companies can improve operational efficiency, reduce costs and minimize the environmental impact of sanitation operators.

### 7.5.2 Consulting services and technical expertise

Dutch companies can offer specialized consulting services and technical expertise to assist in implementing decentralized water and wastewater treatment solutions. This may involve assessing technical and economic feasibility, preparing environmental impact studies, defining treatment strategies, and developing management plans. In addition, technical expertise can be provided to train local staff to ensure efficient operation and proper maintenance of the systems.

### 7.5.3 Complete solutions for individual clients

There is a growing demand for customized wastewater treatment solutions that meet customers' specific needs. Dutch companies can stand out in the market by developing solutions adapted to the particularities of different sectors, such as industries, hospitals, residential condominiums, shopping malls, and commercial establishments, which often demand a specific treatment technology for their effluents. Mining and agriculture are other sectors to be highlighted as potential large individual customers.





## Chapter 7 | Main Opportunities Mapped – Decentralized Treatment



### 7.5.4 Examples of case studies using decentralized treatment solution technologies by Dutch companies (not exhaustive)

#### Nijhuis Industries

- Nijhuis designs, builds and implements [MODULUTIONS](#)<sup>67</sup> in prefabricated containers, on skid or/and boxframe ensuring flexibility to create a plant with low total cost of ownership.

#### Desah

- [DeSaH BV](#)<sup>68</sup> develops sustainable, cost-effective innovations that can be used within the decentralized water chain in collaboration with universities, knowledge institutes and other parties with a high degree of know-how.

#### Jotem

- [BluElephant](#)<sup>69</sup> is a cost-efficient solution for locations with no centralized wastewater treatment. For example, local communities, residential areas, business parks, recreational areas or remote sites. With BluElephant, a circular water supply is created.

#### Landustrie

- [Landustrie](#) offers a wide variety of equipment with diverse applications, including solutions in the field of water reuse. Their portfolio covers a range of products such as archimedes screw pumps, sewage pumps, surface aerators, brush aerators, flow boosters and weedscreen cleaners, and more, which can be utilized in this context.



# Chapter 7 | Main Opportunities Mapped – Increase Operational Efficiency

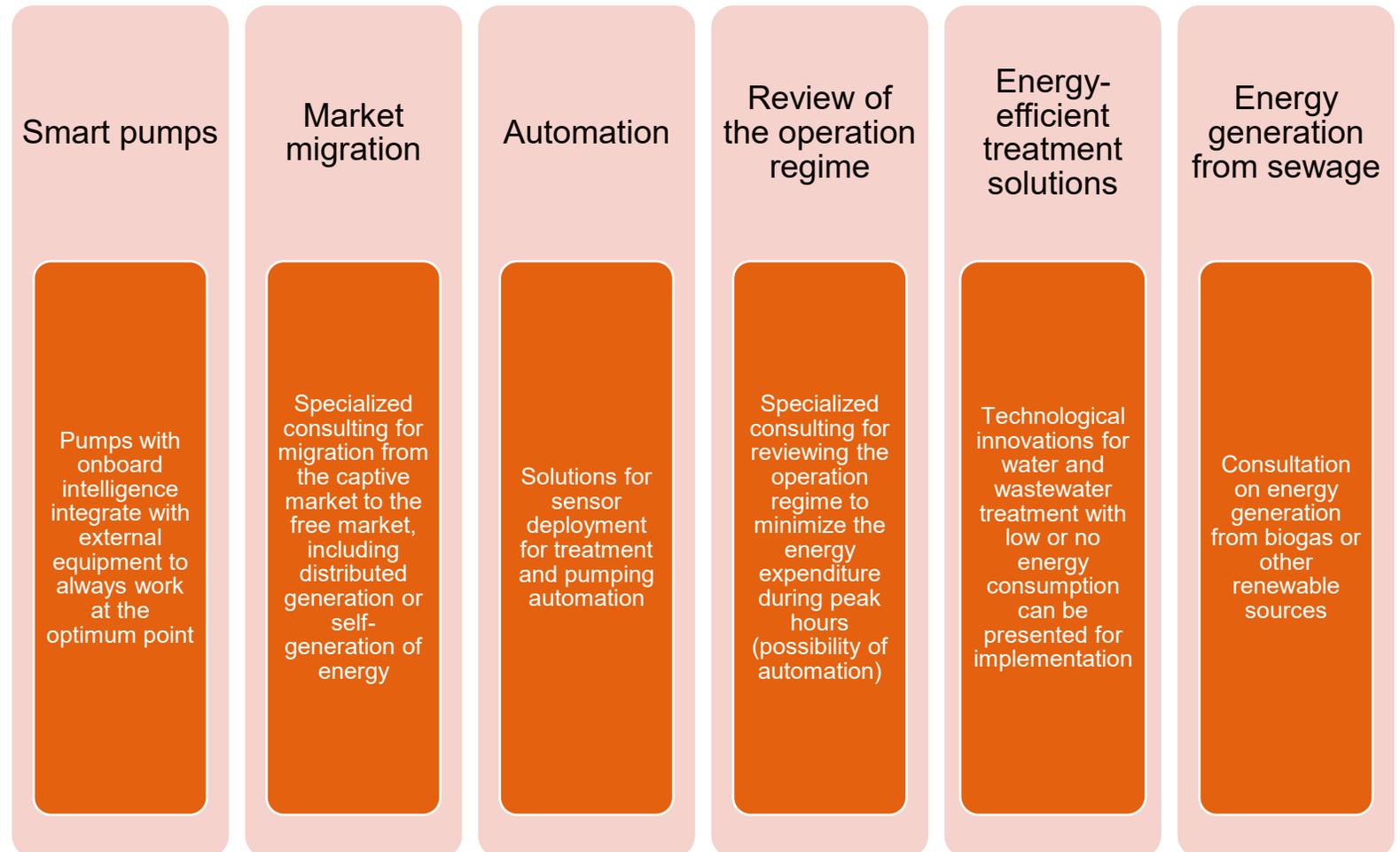
## 7.6 Increase Operational Efficiency

The sanitation market in Brazil is undergoing a significant transformation, offering several opportunities for Dutch companies wishing to enter this growing sector. In recent years, the country has recognized the importance of improving the quality and coverage of water and sewage services, resulting in regulatory changes and openness to foreign investment. In this context, one of the most promising aspects for companies is the search for operational efficiency, emphasizing energy efficiency, reduced workforce costs and reduced use of chemicals.

### 7.6.1 Energy efficiency solutions

Sanitation companies currently consume between 2 and 3% of all the energy produced in Brazil, representing, next to the cost of labor, the sector's largest operational expenses. Therefore, one of the main opportunities in the sector is the adoption of energy efficiency initiatives. Dutch companies can offer innovative technologies and solutions that reduce energy consumption in water and sewage treatment plants or pumping stations, contributing to the reduction of operational costs and environmental impacts. They can, for instance, exploit more efficient pumping systems, consult for renewable energy such as solar and wind, migrate to the free market and energy self-production, and perform intelligent automation.

A [study](#)<sup>71</sup> conducted by the International Energy Agency indicated that if Latin American sanitation companies generated energy only from their sewage, they would be able to generate 1.5 times their own demand.





# Chapter 7 | Main Opportunities Mapped – Increase Operational Efficiency

## 7.6.2 Workforce optimization solutions

Another interesting opportunity for Dutch companies is to offer solutions to reduce workforce costs for sanitation operators. Investing in technologies or processes that increase the durability and reliability of structures, such as piping and equipment, can significantly reduce spending on frequent repairs and replacements. In addition, implementing real-time monitoring and preventive maintenance systems can prevent failures and improve process efficiency. Machine Learning and Artificial Intelligence tools can perform predictive maintenance from pRCM, dynamic RCA or RAM. There is also a demand for low-cost technologies (sensors) that enable real-time determination of water quality parameters with data acquisition and GSM transmission in hard-to-reach places (without Wi-Fi availability) or in confined spaces using drones or specific equipment such as Remotely Operated Vehicle (ROV) for inspection of submerged structures or large diameter networks.

### Real-time monitoring

- Consultancy for real-time monitoring systems to optimize customized maintenance plans from methodologies such as pRCM, dynamic RCA or RAM.

### Equipment rental

- Rental of specialized equipment such as remotely operation vehicles, which speed up equipment inspection in confined, submerged or difficult to access spaces and increase the safety of employees.

### Automating processes

- Consultancy for implementation of process automation solutions, which could range, for example, from simple manual processes to the use of artificial intelligence to optimize system or treatment plant design.

### Field team support

- Consultation on optimization of field services employing new technologies, such as the use of augmented reality or the integration of mobile software with BIM, accelerating the acquisition of information.

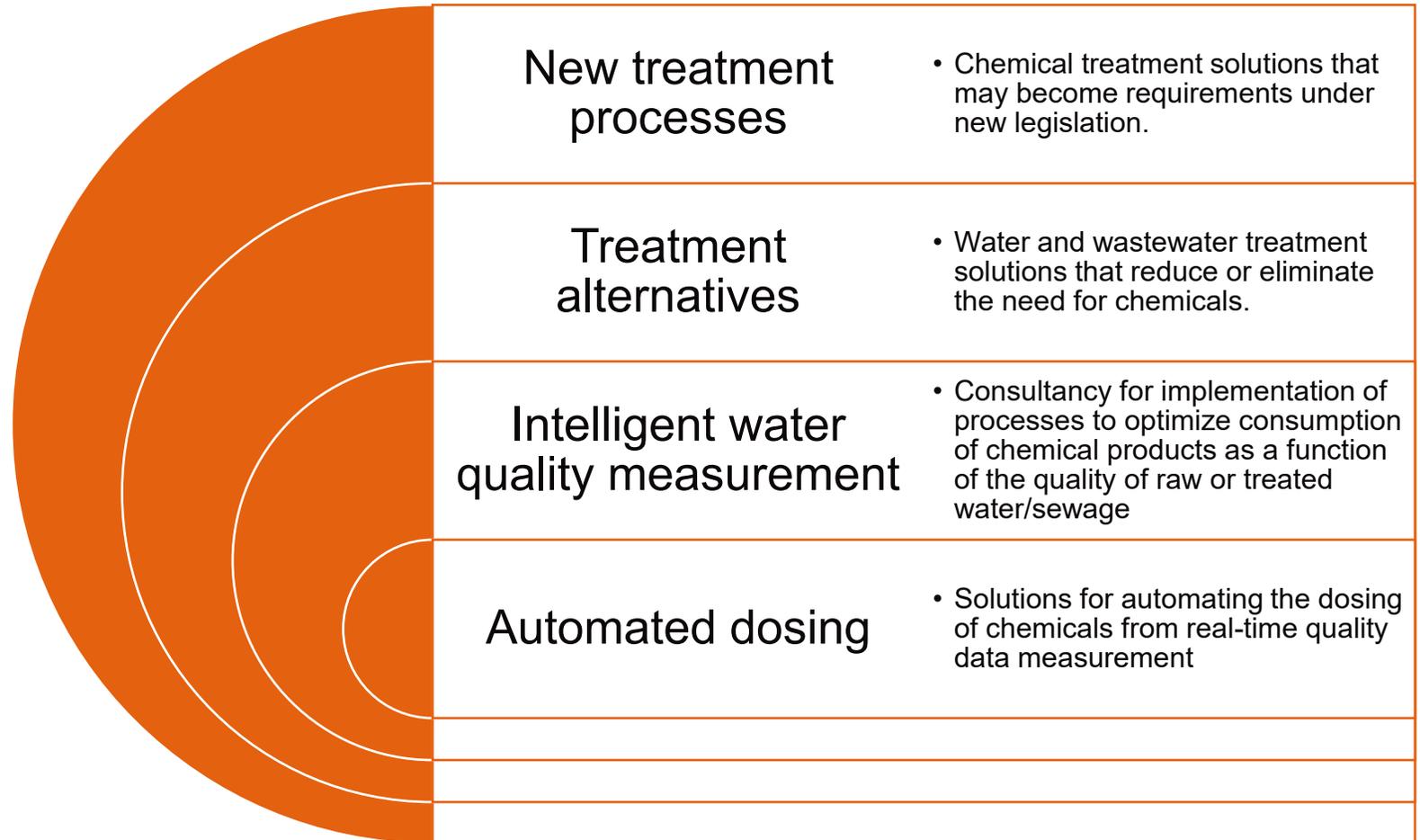




# Chapter 7 | Main Opportunities Mapped – Increase Operational Efficiency

## 7.6.3 Chemical product optimization solutions

Concern over sustainability and environmental preservation has driven the search for solutions that reduce or eliminate the use of chemicals in water and sewage treatment processes. In addition, Brazilian legislation has changed in recent years, becoming more restrictive regarding the quality of treated effluent, such as the concentration of ammonia nitrogen, which is now controlled by some state laws (COPAM CERH/MG nº8/2022 in Minas Gerais, for example, restricts this indicator to 20 mg/L). The need to comply with new legislation compels operators to look for technologies often unavailable in the domestic market. In this sense, Dutch companies can offer advanced technologies that allow the use of more sustainable methods, such as advanced filtration, ultraviolet (UV) disinfection and biological processes. These alternative approaches not only reduce reliance on chemicals, but also reduce the risks to public health and the environment. Furthermore, implementing automated systems can optimize the use of these products by ensuring that dosages are applied accurately, avoiding waste and reducing operating costs. For example, sensors can be used to monitor water volume, effluent quality and other parameters, allowing for more precise control and optimization of the necessary dosages of chemical products in real time, reducing waste and costs.



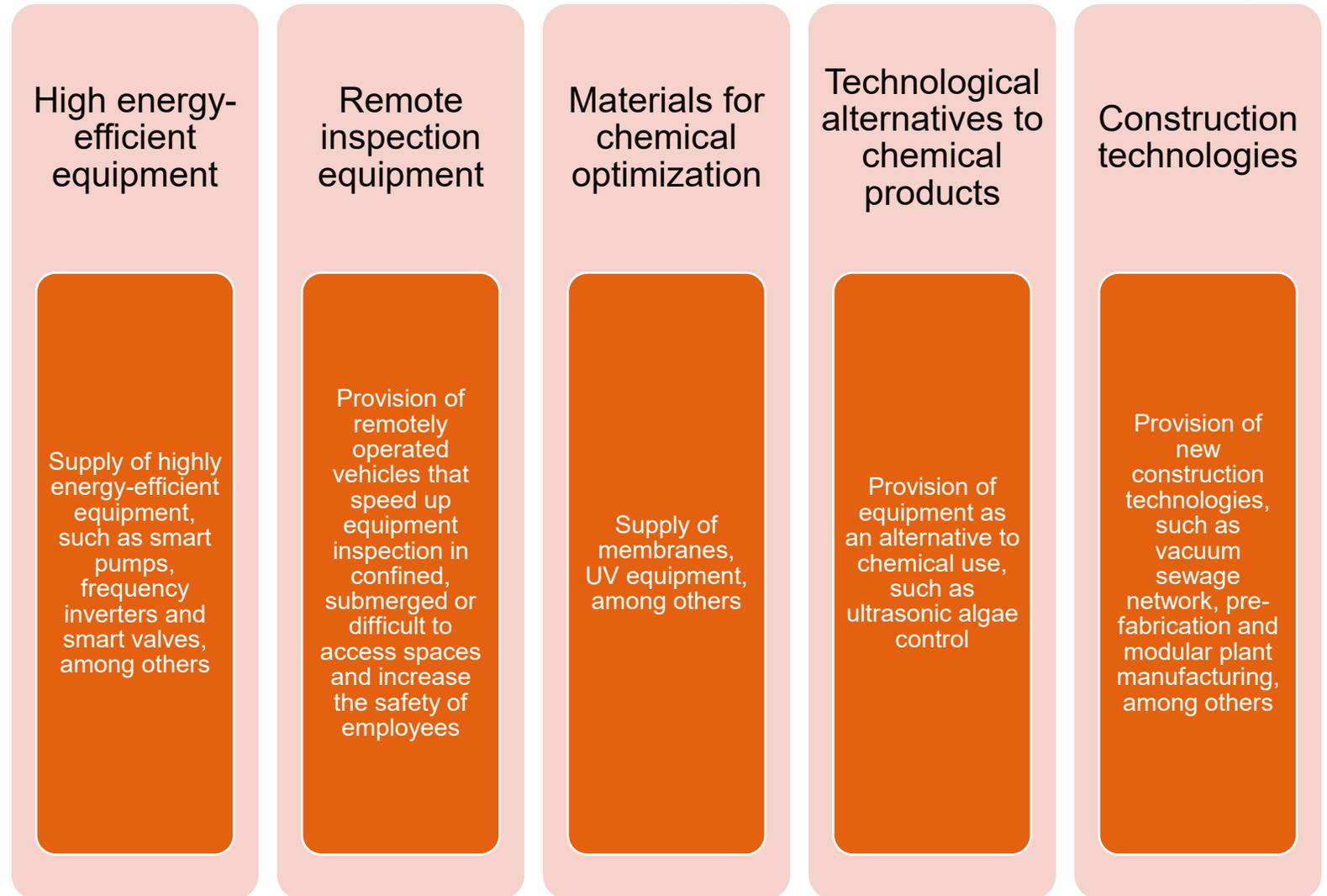


## Chapter 7 | Main Opportunities Mapped – Increase Operational Efficiency

### 7.6.4 Supply of equipment for operational efficiency

In addition to the previously mentioned opportunities, supply of suitable equipment plays a crucial role in the quest for operational efficiency in the sanitation industry. Dutch companies can offer a variety of equipment, such as energy-efficient pumps, chemical dosing and metering systems, advanced filtration equipment and others. Dutch companies can also offer equipment to enable the digitalization of processes. This equipment is designed to meet the sector's specific needs, aiming to optimize processes, reduce operating costs and improve the quality of the provided services.

New construction technologies can also be offered to the national market, such as vacuum sewage collector systems, pre-fabrication and modular plant construction.





# Chapter 7 | Main Opportunities Mapped – Increase Operational Efficiency

## 7.6.5 Asset management

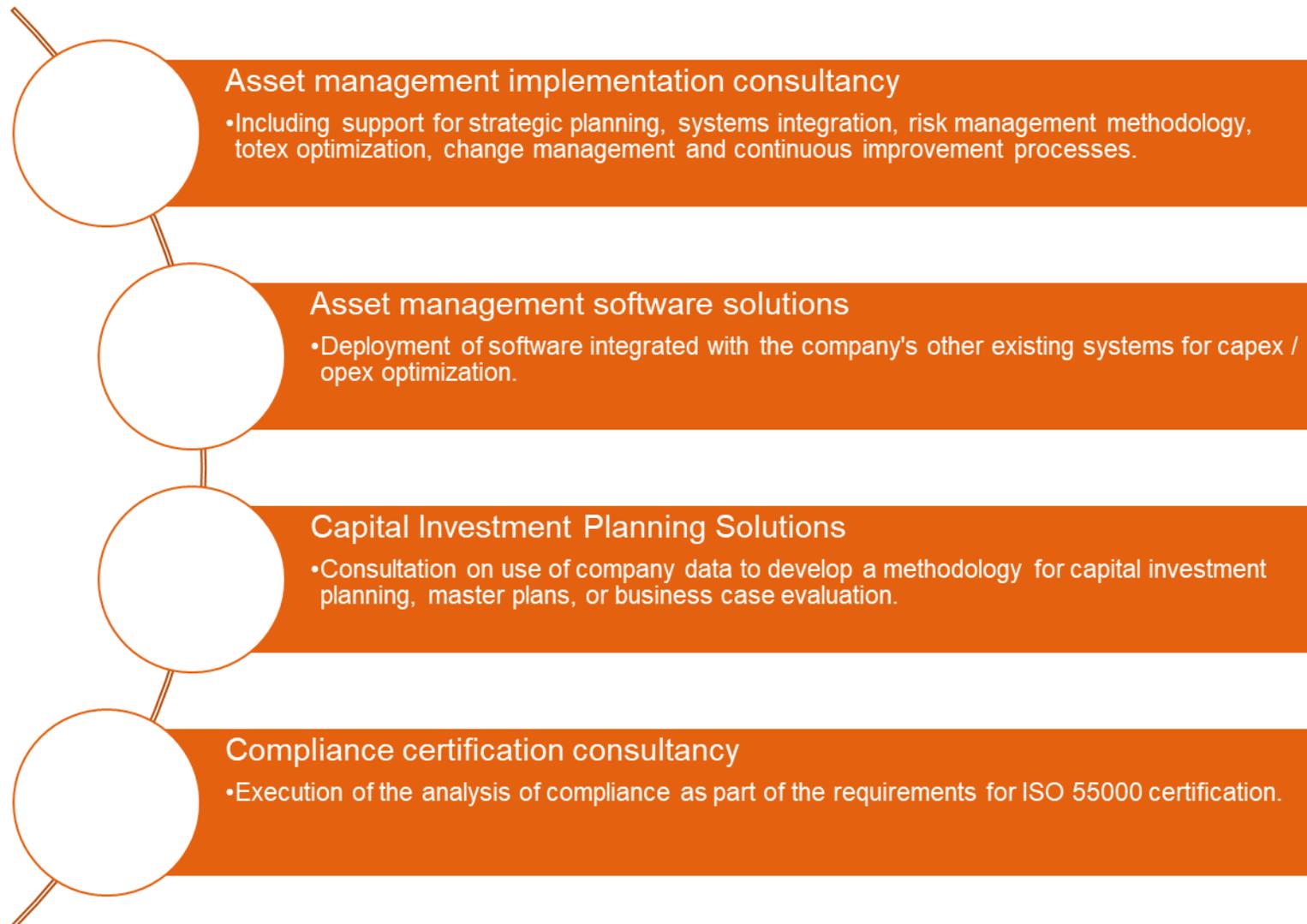
These emerging technology optimization solutions transform how the sanitation industry manages and operates its assets, enabling a more efficient and proactive management of resources and delivering benefits such as failure prediction and prevention, resource and process optimization, operational cost reduction and service quality improvements.

However, proper asset management is essential to harness these technologies' full potential. Asset management is a process that focuses on maximizing the value of an organization's assets throughout their life cycle. It is a comprehensive process that includes strategic planning, risk management, performance management and maintenance.

ISO 55000 is an international standard that provides guidelines for implementing effective asset management. It helps organizations understand the value of their assets, optimize resource utilization, minimize risk and improve operational efficiency.

Implementing asset management in the sanitation sector can generate a variety of benefits, including reduced operating costs, improved service quality, longer asset life, reduced risk of failure and increased safety for employees and the public.

In summary, adopting new technologies to improve the operational efficiency of the operators, together with implementing proper asset management based on ISO 55000, is an important trend transforming the sanitation industry. This approach enables a smarter and more efficient management of resources, providing significant benefits for the sanitation utilities and the population that depends on these services.





# Chapter 7 | Main Opportunities Mapped – Increase Operational Efficiency

## 7.6.6 Examples of case studies on the use of technology for operational optimization by Dutch companies (not exhaustive)

### Royal HaskoningDHV

- [Royal HaskoningDHV](#)<sup>72</sup>, an independent engineering consulting firm, is integrating 140 years of engineering expertise with digital technologies and software solutions, collaborating with many clients. In one such case, they entered into a cooperation agreement to bring HpH digestion technology, developed by Anglian Water, to market in the UK and abroad. This technology is in the market under the name Helea and support water companies to meet their Net Zero targets by offering a more affordable and sustainable route to advanced sludge digestion. The company also has a system called Nereda already applied in Brazil.

### Arcadis

- [Arcadis](#) offer a program for development and implementation of full-scale asset management, including methodology for business case assessments. In one of its projects, Arcadis developed a Water System Master Plan and Update, resulting in a 5% OPEX reduction.

### Samotics

- [SAM4 Health and SAM4 Energy](#)<sup>73</sup> are continuous monitoring systems that help to reduce risk and lower costs. SAM4 Health helps operators eliminate unplanned downtime, while SAM4 Energy aims to reduce energy consumption.

### HDM Pipelines

- HDM Pipelines developed the [I2pipe](#)<sup>75</sup>, a water pipe scanning and management solution that provides an integrated view of the network with information about its remaining useful life, estimated replacement cost and the risks of each pipe.

### Acquacolor

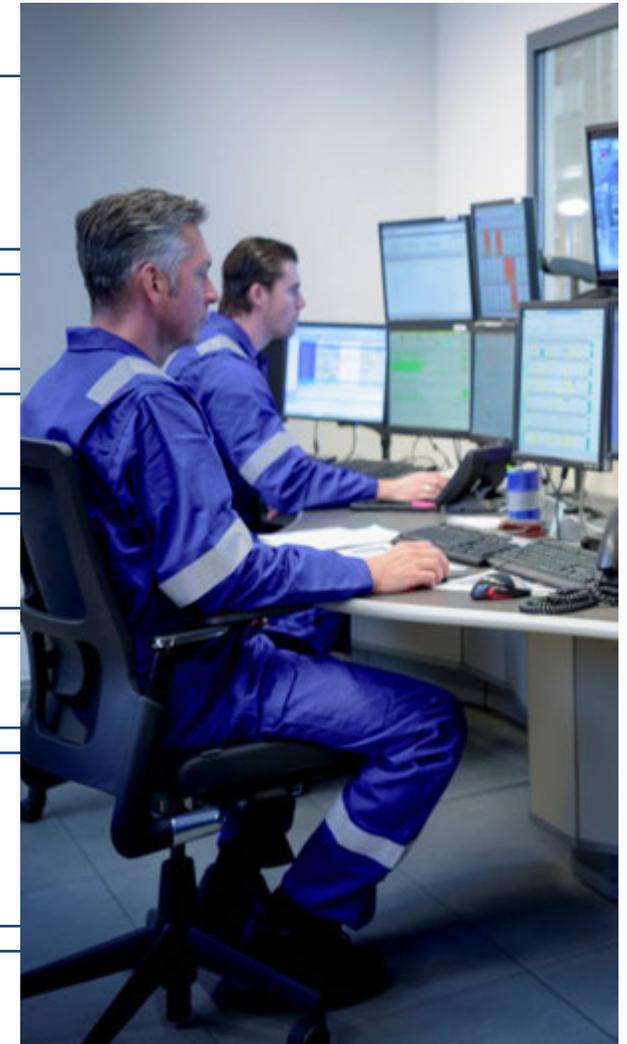
- [Acquacolor](#)<sup>74</sup> provides low-cost GSM sensors which can be applied in remote locations and can reduce costs by reducing sampling routes.

### LG Sonic

- LG Sonic provides smart solutions to combat water pollution and reduce the use of harmful chemicals in the water treatment industry, including devices that emit ultrasonic waves to reduce algae in ponds without the use of chemicals. The Rio de Janeiro state water distribution system, Companhia Estadual de Águas e Esgotos (CEDAE), [installed eight LG Sonic MPC floats](#)<sup>77</sup> in the Guandu River in March 2022 to eliminate problems with geosmin. Calculations by CEDAE's Sanitation Director, Daniel Okumura, show that the new technologies have helped save more than 29 million euros in chemical treatments.

### Spatial Insight

- [Spatial Insight](#)<sup>49</sup> is an independent Dutch data science consultancy that applies proprietary algorithms and software aiming to save Capex / Opex, reduce leakages and contribute to strategic asset management goals.





# Chapter 7 | Main Opportunities Mapped – Digitalization and Smart Data

## 7.7 Digitalization and Smart Data

Like all markets, the sanitation sector is undergoing a significant innovation process based on the new technologies arising from Industry 4.0. These technologies can be applied to the trends previously described, benefiting productivity and efficiency of companies. Examples of digitization trends and smart data technologies in the sanitation market are presented below. Practical use of these technologies is mentioned, along with the other drivers presented above.

### 7.7.1 Digitalization Tools

#### Digital Twins

Digital twins are real-time virtual representations of physical assets and processes in the wastewater industry. They enable continuous monitoring, predictive analysis and simulation of water treatment plants, distribution networks and wastewater treatment systems. With digital twins, you can optimize performance, identify problems early, reduce operating costs and improve energy efficiency, providing smarter and more efficient management of wastewater resources.

#### 3D Printing

3D printing can be used to produce spare parts and components for equipment quickly and cost-effectively, reducing downtime and increasing operational efficiency.

#### Artificial Intelligence

Artificial intelligence can be used to improve the efficiency of water and wastewater treatment processes by using machine learning algorithms to predict treatment demand, for example. This technology has also been employed to detect leaks, and recently, there has been a growing application of generative AI

for conceptual design and customer self-service.

#### Advanced Analytics

Applying Advanced Analytics in the sanitation sector offers an innovative approach to improving efficiency and service quality. By processing large volumes of data, techniques such as predictive modeling, data mining and machine learning can be used to gain valuable insights. Advanced Analytics can assist in identifying water consumption patterns, leak detection, demand forecasting, treatment process optimization and preventive maintenance. With this information, sanitation utilities can make better decisions, reduce operational costs, improve resource management and ensure quality services for the population.

#### Big Data

The use of big data analysis tools can help identify patterns and trends in water use and sanitation system performance, allowing preventive actions to be taken before system failures or outages occur. Commercial system data can also be analyzed for a better customer billing policy.

#### BIM

Building Information Modeling (BIM) is used in sanitation to design, build, and operate sanitation operating units, bringing efficiencies in construction and allowing easy and fast access to asset information for operations and maintenance teams.

#### IoT

Sensors and devices connected to the internet are being used to monitor and collect real-time data on water usage, water quality, reservoir levels and more. A large market for the use of IoT in sanitation is through deployment of Advanced Metering Infrastructure (AMI) systems, where digital water meters are

integrated with a central system that monitors consumption on a daily or hourly basis, replacing the manual readings that are taken monthly and require a meter reader to go to the site to take a reading.

#### Virtual & Augmented Reality

Virtual & augmented reality technologies can be used to train and empower employees, allowing them to learn how to operate equipment safely and efficiently before they start working with actual equipment. They can also help employees in the field find the location of water and sewage pipes and any interference that may exist.





# Chapter 7 | Main Opportunities Mapped

## 7.8 Brazilian Gaps vs Dutch Expertise

In this section the drivers and main market opportunities were mapped and scored, considering the existing gap in the Brazilian market (based on the estimated needs of these businesses and the presence of local competitors) and the Dutch expertise (analyzing the main Dutch companies in the industry). From these two scores, the opportunity level of each business was estimated.

As presented in the table below, the businesses with the highest level of opportunity for Dutch companies to operate in the Brazilian market are the supply of equipment for diversification of supply sources, consulting services for diversification of supply sources, supply of equipment for water reuse, complete reuse solutions for individual clients, supply of decentralized treatment equipment, solutions for energy efficiency and asset management. The next pages summarize the main opportunities mapped with their description, opportunities, challenges, main competitors, potential customers and estimated market value for the next 10 years.

Driver	Business Opportunity	BRAZILIAN GAPS	DUTCH EXPERTIZE	OPPORTUNITY LEVEL
Reducing Water Losses	Digitalization of the cadastre	◐	◐	◐
	Supply of equipment to reduce water losses	◐	◐	◐
	Digital solutions for the reducing real water losses	●	◐	◐
	Digital solutions for the reducing apparent water losses	●	◐	◐
Diversification of water sources	Supply of equipment for diversification of water sources	●	●	●
	Consulting services for diversification of water sources	◐	●	●
Water reuse	Supply of equipment for water reuse	◐	●	●
	Consulting services for water reuse	◐	●	◐
	Complete water reuse solutions for individual clients	◐	●	●
Decentralized treatment solutions	Supply of equipment for decentralized treatment	◐	●	●
	Consulting services for decentralized treatment solutions	◐	●	◐
	Complete decentralized treatment solutions for individual clients	◐	●	◐
Increase operational efficiency	Supply of equipment for operational efficiency	◐	◐	◐
	Energy efficiency solutions	●	◐	●
	Workforce optimization solutions	◐	◐	◐
	Chemical product optimization solutions	◐	●	◐
	Asset Management	●	●	●



# Chapter 8 | Business Opportunities

<b>Business</b> Supply of equipment for diversification of water sources – desalination		<b>Estimation of local market value (10 years)</b> US\$ 350 million			
<b>Description</b> <ul style="list-style-type: none"> <li>Supply of equipment for diversification of water supply sources with a focus on desalination. This includes the supply of membranes, compact desalination stations, new desalination equipment and more.</li> </ul>	<b>Opportunities</b> <ul style="list-style-type: none"> <li>Brazil's extensive maritime coast, which extends throughout the northeast (the driest region in the country), opening a range of opportunities for implementing desalination plants for human supply.</li> <li>The requirement of 99% water coverage in the new Regulatory Framework will require utilities to serve the population living in extremely dry regions of the country. Therefore, the use of diverse sources to supply this population is expected to grow.</li> <li>The large-scale desalinization process is new in Brazil. Therefore, few companies are established in this market.</li> </ul>		<b>Potential clients</b> Sanitation operators from coastal or dry areas, such as: <ul style="list-style-type: none"> <li>• AEGEA<sup>36</sup></li> <li>• BRK<sup>39</sup></li> <li>• SABESP<sup>31</sup></li> <li>• Embasa<sup>80</sup></li> <li>• Compesa</li> </ul> industries with high water consumption in the industrial process		
<b>Main competitors</b> <ul style="list-style-type: none"> <li>• Veolia Water Technologies</li> <li>• B&amp;F Dias</li> <li>• Toray Industries</li> <li>• Fluence Corporation</li> <li>• BBI Filtração</li> <li>• Koch Separation Solution</li> </ul>	<b>Challenges</b> <ul style="list-style-type: none"> <li>The higher cost of treating these solutions, when compared to the cost of treating surface water and groundwater, may reduce the investment interest of companies and utilities.</li> </ul>		<b>Brazilian Needs</b> 	<b>Dutch Expertise</b> 	<b>Time horizon</b> 



# Chapter 8 | Business Opportunities

<p><b>Business</b></p> <p>Consulting services for diversification of water sources</p>		<p><b>Estimation of local market value (10 years)</b></p> <p>US\$ 30 million</p>		
<p><b>Description</b></p> <ul style="list-style-type: none"> <li>Consulting services for diversification of supply sources. This includes technical and economic feasibility analyses of the solutions adopted, identification of diversification opportunities from an ESG and financial perspective, solutions for OPEX optimization in operating plants, among others.</li> </ul>	<p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>Brazil's extensive maritime coast, which extends throughout the northeast (the driest region in the country), opening a range of opportunities for implementing desalination plants for human supply.</li> <li>The requirement of 99% water coverage in the new Regulatory Framework will require utilities to serve the population living in extremely dry regions of the country. Therefore, the use of diverse sources to supply this population is expected to grow.</li> <li>The large-scale desalinization process is new in Brazil. Therefore, few companies are established in this market.</li> </ul>	<p><b>Potential clients</b></p> <p>Sanitation operators from coastal or dry areas, such as:</p> <ul style="list-style-type: none"> <li>AEGEA<sup>36</sup></li> <li>BRK<sup>39</sup></li> <li>SABESP<sup>31</sup></li> <li>Embasa<sup>80</sup></li> <li>Compesa</li> </ul> <p>industries with high water consumption in the industrial process</p>		
<p><b>Main competitors</b></p> <ul style="list-style-type: none"> <li>Veolia Water Technologies</li> <li>Fluence Corporation</li> <li>GS Inima</li> <li>Cetrel</li> <li>General Water</li> <li>Suez</li> <li>IDE Assets</li> <li>Acciona</li> </ul>	<p><b>Challenges</b></p> <ul style="list-style-type: none"> <li>The higher cost of treating these solutions, when compared to the cost of treating surface water and groundwater, may reduce the investment interest of companies and utilities.</li> </ul>	<p><b>Brazilian Needs</b></p> 	<p><b>Dutch Expertise</b></p> 	<p><b>Time horizon</b></p> 



# Chapter 8 | Business Opportunities

<p><b>Business</b></p> <p>Supply of equipment for water reuse</p>		<p><b>Estimation of local market value (10 years)</b></p> <p>US\$ 150 million</p>		
<p><b>Description</b></p> <ul style="list-style-type: none"> <li>Supply of wastewater reuse equipment to sanitation operators. This includes advanced treatment systems, filtration units, disinfection systems and other solutions that meet the quality standards required by Brazilian regulations</li> </ul>	<p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>The New Sanitation Regulatory Framework has given ANA a role as a regulatory inspection agent, facilitating the creation of more standardized regulations on water reuse in the country.</li> <li>The water scarcity in some regions of the country and the need to reduce water withdrawal for environmental reasons should heat up this market in the coming years.</li> <li>Alternative technologies to replace the water supply system via water tanker.</li> </ul>	<p><b>Potential clients</b></p> <p>Sanitation operators, such as:</p> <ul style="list-style-type: none"> <li>SANASA</li> <li>SABESP<sup>31</sup></li> <li>SANEPAR<sup>79</sup></li> <li>EMBASA<sup>80</sup></li> <li>BRK<sup>39</sup></li> <li>AEGEA<sup>36</sup></li> <li>Iguá<sup>28</sup></li> <li>GS Inima<sup>30</sup></li> </ul>		
<p><b>Main competitors</b></p> <ul style="list-style-type: none"> <li>GE Power &amp; Water</li> <li>Veolia Water Technologies</li> <li>B&amp;F Dias</li> <li>Toray Industries</li> <li>Fluence Corporation</li> <li>BBI Filtração</li> <li>Koch Separation Solution</li> <li>Fluxo Ambiental</li> </ul>	<p><b>Challenges</b></p> <ul style="list-style-type: none"> <li>Currently there is no centralized, well-defined regulation of wastewater use, creating uncertainty in the industry.</li> <li>High water availability in some regions of Brazil makes advanced wastewater treatment less financially viable than conventional water treatment.</li> </ul>	<p><b>Brazilian Needs</b></p> 	<p><b>Dutch Expertise</b></p> 	<p><b>Time horizon</b></p> 



# Chapter 8 | Business Opportunities

<p><b>Business</b></p> <p>Complete water reuse solutions for individual clients</p>		<p><b>Estimation of local market value (10 years)</b></p> <p>US\$ 600 million</p>		
<p><b>Description</b></p> <ul style="list-style-type: none"> <li>Supply of complete wastewater treatment solutions for reuse for industry and commerce, involving the provision of complete reuse solutions for individual customers, from the definition of the treatment to the operation of the implemented system.</li> </ul>	<p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>The New Sanitation Regulatory Framework has given ANA a role as a regulatory inspection agent, which may facilitate the creation of more standardized regulations on water reuse in the country.</li> <li>The water scarcity in some regions of the country and the need to reduce water withdrawal for environmental reasons should heat up this market in the coming years.</li> <li>Pressure for socio-environmental issues should grow in the coming years. Petrobras, for example, has the strategic goals of reducing its freshwater withdrawal by up to 40% by 2030.</li> </ul>	<p><b>Potential clients</b></p> <p>Big industries, such as:</p> <ul style="list-style-type: none"> <li>Mondelez Internacional</li> <li>BRF</li> <li>Unilever</li> <li>Coca-Cola</li> <li>PepsiCo</li> <li>Natura</li> <li>Suzano</li> <li>Petrobras</li> <li>BASF</li> <li>Klabin</li> <li>Vale</li> <li>CENIBRA</li> <li>Usiminas</li> <li>CMPC</li> <li>Gerdau</li> <li>Bracell</li> <li>Sylvamu</li> </ul>		
<p><b>Main competitors</b></p> <ul style="list-style-type: none"> <li>Veolia Water Technologies</li> <li>B&amp;F Dias</li> <li>W-Energy</li> <li>Fluence Corporation</li> <li>Cetrel</li> <li>General Water</li> <li>Opsan</li> <li>Allonda</li> <li>Acciona</li> </ul>	<p><b>Challenges</b></p> <ul style="list-style-type: none"> <li>Currently there is no centralized, well-defined regulation of wastewater use, creating uncertainty in the industry.</li> <li>The high availability of water in some Brazil regions makes advanced wastewater treatment less financially viable than conventional water treatment.</li> <li>There is still market resistance to the use of wastewater in manufacturing processes.</li> </ul>	<p><b>Brazilian Needs</b></p>	<p><b>Dutch Expertise</b></p>	<p><b>Time horizon</b></p>



# Chapter 8 | Business Opportunities

<p><b>Business</b></p> <p>Supply of equipment for decentralized treatment</p>		<p><b>Estimation of local market value (10 years)</b></p> <p>US\$ 300 million</p>			
<p><b>Description</b></p> <ul style="list-style-type: none"> <li>Supply of equipment for decentralized treatment for sanitation operators, enabling them to be more efficient and reach the contractual water and sewage coverage goals.</li> </ul>	<p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>Currently about 35 million Brazilians still do not have access to potable water and 100 million do not have sewage treatment. Implementing decentralized solutions can help expand access to remote and hard-to-reach regions, where traditional sanitation infrastructure is scarce.</li> <li>The decentralization of water and wastewater treatment enables the use of innovative technologies, such as more efficient and sustainable treatment systems, including the reuse of water and the generation of energy from organic waste. These solutions can bring economic, environmental and social benefits.</li> </ul>		<p><b>Potential clients</b></p> <p>Sanitation operators, such as:</p> <ul style="list-style-type: none"> <li>SABESP<sup>31</sup></li> <li>SANEPAR<sup>79</sup></li> <li>BRK<sup>39</sup></li> <li>AEGEA<sup>36</sup></li> <li>Iguá<sup>28</sup></li> <li>Águas do Brasil<sup>29</sup></li> <li>EMBASA<sup>80</sup></li> <li>New market entrants</li> </ul>		
<p><b>Main competitors</b></p> <ul style="list-style-type: none"> <li>GE Power &amp; Water</li> <li>Veolia Water Technologies</li> <li>B&amp;F Dias</li> <li>Fluence Corporation</li> <li>Fluxo Ambiental</li> </ul>	<p><b>Challenges</b></p> <ul style="list-style-type: none"> <li>Implementing decentralized solutions requires significant investments in infrastructure and technology. Initial costs can be high, requiring government financial support, public-private partnerships or other forms of financing to make the projects viable.</li> <li>The decentralization of water and wastewater treatment requires adequate regulation and monitoring by the competent authorities. It is important to establish norms and quality standards, in addition to ensuring adequate supervision to avoid public health problems and negative environmental impacts</li> </ul>		<p><b>Brazilian Needs</b></p> 	<p><b>Dutch Expertise</b></p> 	<p><b>Time horizon</b></p> 



# Chapter 8 | Business Opportunities

<p><b>Business</b></p> <p>Energy efficiency solutions</p>	<p><b>Estimation of local market value (10 years)</b></p> <p>US\$ 150 million</p>							
<p><b>Description</b></p> <ul style="list-style-type: none"> <li>Innovative technologies and solutions that reduce energy consumption in water and sewage treatment plants or pumping stations, contributing to the reduction of operational costs and environmental impacts. Use of clean energy that has lower costs than the captive market.</li> </ul>	<p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>Environmental legislation and regulations are becoming more stringent regarding the wastewater sector. Regulators are setting higher targets and requirements for energy efficiency in water and wastewater treatment operations. This is driving demand for solutions that reduce energy consumption and the carbon footprint of sanitation facilities.</li> <li>Energy efficiency significantly reduces operating costs in the sanitation sector, since these costs represent about 30% of OPEX. Private companies, which are gaining market share, are paying special attention to be more efficient.</li> </ul>	<p><b>Potential clients</b></p> <p>Sanitation operators, such as:</p> <ul style="list-style-type: none"> <li>SABESP<sup>31</sup></li> <li>SANEPAR<sup>79</sup></li> <li>BRK<sup>39</sup></li> <li>AEGEA<sup>36</sup></li> <li>Iguá<sup>28</sup></li> <li>Águas do Brasil<sup>29</sup></li> <li>EMBASA<sup>80</sup></li> <li>New market entrants</li> </ul>						
<p><b>Main competitors</b></p> <ul style="list-style-type: none"> <li>Concremat</li> <li>Worley</li> <li>Siemens</li> <li>Schneider Electric</li> <li>EDP Smart</li> <li>Allonda</li> </ul>	<p><b>Challenges</b></p> <ul style="list-style-type: none"> <li>Implementing energy efficiency solutions often requires significant investments. The return on investment can take some time to achieve, which can pose a challenge for sanitation companies, especially smaller ones that may have limited financial resources</li> <li>Implementing energy efficiency solutions requires a detailed analysis of existing operations and the integration of different systems and technologies. The complexity of water and wastewater treatment operations and lack of registration and historical data can make implementing efficient solutions technically challenging</li> </ul>	<table border="1"> <thead> <tr> <th data-bbox="1775 839 1982 875">Brazilian Needs</th> <th data-bbox="2000 839 2206 875">Dutch Expertise</th> <th data-bbox="2224 839 2430 875">Time horizon</th> </tr> </thead> <tbody> <tr> <td data-bbox="1803 936 1933 1258"> </td> <td data-bbox="2035 936 2165 1258"> </td> <td data-bbox="2270 936 2400 1258"> </td> </tr> </tbody> </table>	Brazilian Needs	Dutch Expertise	Time horizon			
Brazilian Needs	Dutch Expertise	Time horizon						



# Chapter 8 | Business Opportunities

<p><b>Business</b></p> <p>Asset management solutions</p>		<p><b>Estimation of local market value (10 years)</b></p> <p>US\$ 150 million</p>		
<p><b>Description</b></p> <ul style="list-style-type: none"> <li>Solutions in asset management, from consulting and technical support for implementation to the supply of software to assist in registering and tracking vertical and horizontal assets.</li> </ul>	<p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>Many sanitation companies in Brazil have old infrastructure that needs renovation and modernization. This creates an opportunity for asset management, which aims to optimize the performance of existing assets, extend their useful life and plan investments for replacement or upgrade.</li> <li>Effective asset management in the sanitation sector can lead to greater operational efficiency, which may be necessary for companies to become profitable.</li> <li>Asset management enables sanitation companies to make strategic, data-driven decisions to optimize asset investments. As investment in the coming years is expected to be high, operators must make more accurate decisions.</li> </ul>	<p><b>Potential clients</b></p> <p>Sanitation operators, such as:</p> <ul style="list-style-type: none"> <li>SABESP<sup>31</sup></li> <li>SANEPAR<sup>79</sup></li> <li>BRK<sup>39</sup></li> <li>AEGEA<sup>36</sup></li> <li>Iguá<sup>28</sup></li> <li>Águas do Brasil<sup>29</sup></li> <li>EMBASA<sup>80</sup></li> <li>New market entrants</li> </ul>		
<p><b>Main competitors</b></p> <ul style="list-style-type: none"> <li>Concremat</li> <li>Worley</li> <li>IBM</li> <li>SAP</li> <li>Bentley</li> </ul>	<p><b>Challenges</b></p> <ul style="list-style-type: none"> <li>The lack of regulation requiring implementation of an asset management system in the sanitation sector is a significant challenge. The lack of a specific regulation on this topic may slow down the development of this market and hinder the widespread adoption of efficient asset management practices.</li> <li>Asset management depends on accurate data and information about existing assets. However, many wastewater utilities may face challenges related to the quality and availability of this data. Lack of standardization, incomplete track record and lack of integration between systems can hinder the effective implementation of asset management.</li> <li>Implementing a structured asset management approach may require significant upfront investments in technology, training and processes.</li> </ul>	<p><b>Brazilian Needs</b></p> 	<p><b>Dutch Expertise</b></p> 	<p><b>Time horizon</b></p> 



## Glossary

**ABCON SINDCON:** National Association and Union of Private Concessionaires of Water and Sewage Public Services is an organization formed by private operators of water and sewage services. Its purpose is to promote the participation of the private sector in achieving universal access to basic sanitation in Brazil.

**Agência Nacional de Águas (ANA):** An agency linked to the federal government responsible for implementing water resource management, standardizing and regulating the sanitation sector, and mediating conflicts among other agents.

**AMI:** Advanced Metering Infrastructure refers to an integrated system of water meters, communication networks and data management systems that enables two-way communication between meter endpoints and utilities. Unlike AMR, AMI doesn't require utility personnel to collect the data. Instead, the system automatically transmits the data directly to the utility at predetermined intervals.

**AMR:** Automated Metering Reader refers to communication technology water utilities use to automatically collect water consumption and status data from water meters. AMR systems can be either walk-by or drive-by. An endpoint is connected to the meter's encoder register. The endpoint captures water flow and alarm data which is collected by utility personnel by walking or driving by with a data receiver in proximity to the device

**Apparent Losses:** Apparent (sometimes called commercial) losses occur when water that should be included as revenue generating water appears as a loss due to unauthorized actions or calculation errors. Apparent losses consist of erroneous meter readings, data handling errors or circumstances of unauthorized consumption, such as theft.

**CEDAE:** Companhia Estadual de Águas e Esgoto do Rio de Janeiro, a state-owned company in the southeast region of Brazil (Rio de Janeiro state).

**Cistern:** A water storage tank used to collect and store rainwater for domestic use.

**COMPESA:** Companhia Pernambucana de Saneamento, a state-owned company in the northeast region of Brazil (Pernambuco state).

**Concession Contract:** A contract in which public assets are transferred to a third party, who gains the right to exploit these assets for a certain period of time, provided that the concessionaire complies with the contractual requirements. The remuneration for this type of contract comes from the tariffs charged to users.

**CORSAN:** Companhia Riograndense de Saneamento, a formerly state-owned company in the south region of Brazil (Rio Grande do Sul state), which has recently been privatized.

**EMBASA:** Empresa Baiana de Águas e Saneamento, a state-owned company in the Northeast region of Brazil (Bahia state).

**Full Contracts:** Concession contracts that encompass the simultaneous provision of water supply and sewage collection services.

**GDP per Capita:** Gross Domestic Product per person, a measure of the economic output of a specific region or country divided by its population.

**HDI:** Human Development Index, a composite statistic of life expectancy, education and income indicators to measure human development.

**Infranational Agencies:** State, municipal and/or inter-municipal agencies responsible for the regulation, control and inspection of water and sewage services.

**Midwest Region:** Brazilian region comprised of Distrito

Federal (Federal District) and the states of Goiás, Mato Grosso and Mato Grosso do Sul.

**North Region:** Brazilian region comprised of the states of Acre, Amapá, Amazonas, Pará, Rondônia, Roraima and Tocantins.

**Northeast Region:** Brazilian region comprised of the states of Alagoas, Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, Rio Grande do Norte and Sergipe.

**OCC:** Operations Control Centre

**Overall Water Risk:** A Water Resource Institute (WRI) indicator that measures water-related risks by aggregating selected indicators from the Physical Quantity, Quality and Regulatory & Reputational Risk categories. Higher values indicate higher water risk. It supports informed decision-making and risk assessment related to water.

**Public Bidding:** The competitive process by which the government procures goods, works or services from suppliers. This involves publishing a public notice, inviting bids, evaluating them based on pre-determined criteria and awarding the contract to the winning bidder. The aim is to ensure fairness, transparency and equal opportunities for all bidders.

**Public-Private Partnership (PPP) Contract:** A type of contract in which the government outsources the provision of a service to a private partner through a bidding process, without transferring ownership of assets. In return, the private partner invests in management and infrastructure for the operation and maintenance of the service, while the government continues to oversee aspects such as the water system, end-user service, inspection and administration of tariff funds. Remuneration for the private partner is usually a combination of government contributions and a portion of the tariff. PPP contracts are commonly used in areas such as sewage management.



## Glossary

**Real Losses:** Real losses (also called physical losses) are actual physical water leaks from a storage system and consist of leakage from tanks, transmission and distribution mains, and service lines up to and including the meter.

**R&R:** Recovery and Replacement of Assets, refers to maintenance investment to replace and recover deteriorated infrastructure and ensure service continuity.

**SABESP:** Companhia de Saneamento Básico do Estado de São Paulo, a state-owned company in the southeast region of Brazil (São Paulo state).

**SANEAGO:** Companhia de Saneamento de Goiás, a state-owned company in the midwest region of Brazil (Goiás state).

**SANEPAR:** Companhia de Saneamento do Paraná, a state-owned company in the south region of Brazil (Paraná state).

**Sanitation Block:** Unit formed by a group of municipalities, not necessarily contiguous, established by state law. Its goal is to ensure economic and technical feasibility of sanitation services to less-favored municipalities.

**SCADA:** Supervisory Control And Data Acquisition refers to a system that uses software to monitor, supervise and control the variables and devices of a process.

**Septic Tank:** An underground tank where sewage is collected and decomposed by bacteria, before being drained into a leach field.

**Service Agreements:** An instrument by which a federative entity transfers the execution of services to another without the need for bidding. In sanitation, service agreements between state companies and municipalities were allowed before the approval of law 14.026/20.

**Sewage Coverage Index:** SNIS IN056 indicator that shows the percentage of the total population served by sewage services, relative to the municipalities served by water services. Data from the 2021 SNIS survey. In municipalities that did not respond to the sewage survey, it is assumed that there is no sewage collection.

**Sewage Treatment Index:** SNIS IN046 indicator that shows the percentage of collected sewage that is treated. Data from the 2021 SNIS survey.

**SNIS:** National Sanitation Information System gathers information and indicators on the provision of water, sewage, solid waste management and rainwater management services from providers operating in Brazil.

**Southeast Region:** Brazilian region comprised by the states of Espírito Santo, Minas Gerais, Rio de Janeiro and São Paulo.

**South Region:** Brazilian region comprised by the states of Paraná, Rio Grande do Sul and Santa Catarina.

**Total Loss Index:** SNIS IN049 indicator that shows the percentage of produced water that is not consumed. Data from the 2021 SNIS survey.

**Water Coverage Index:** SNIS IN055 indicator that presents the percentage of the total population served by water services. The data used comes from the 2021 SNIS survey, which covers 98.7% of the population.

**WICER:** Water in Circular and Economy Resilience.

**WTP:** Water Treatment Plant, a facility that uses physical, chemical, or biological processes to treat water for human consumption.

**WWTP:** Wastewater Treatment Plant, a facility that uses physical, chemical or biological processes to treat sewage or wastewater before it is discharged back into the environment.



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