

SISAR Model for Brazil Rural Water Supply



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Introduction

It was 1 May 2020. The Covid-19 pandemic had reached South America. Brazil had the most cases and deaths of all countries on the continent.¹ Its northeastern state Ceará was hit the hardest, with 16,529 confirmed cases and 1,102 deaths from the disease.² Washing hands frequently and thoroughly was the most important preventative measure against Covid-19. But in Ceará there was a shortage of water, and so even this simple measure posed a challenge for some people there, especially in rural areas. Lack of sufficient clean water had also brought extra pressure to hospitals, which could not operate properly without it. The Ceará state water company CAGECE was working day and night to combat the issue.

Marcondes Ribeiro Lima (**Appendix A**), SISAR Institute CEO, hoped to use the SISAR model – *Sistema Integrado de Saneamento Rural*, an integrated system for rural water and sanitation management in Brazil – to connect the rural poor more quickly. Lima had been an avid supporter of SISAR since from the very beginning. He witnessed how SISAR had helped thousands of rural households gain access to clean water, for which the organisation was awarded the federal SDG prize (**Appendix B**). He hoped to see SISAR projects replicated across Brazil sooner rather than later. But to achieve this, two critical challenges first had to be addressed:

One had to do with the local participation rate. Nearly three decades since the first SISAR project was set up, only 40 percent of Ceará's rural population was connected to a reliable clean water supply – of which 36% got their supply through SISAR; for the rest, finding and retrieving clean water was still a daily struggle. The other was about the funding. SISAR projects were fully funded by the Ceará State Government but scaling up would require much more investment. What alternatives were there?

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This case is part of the RSM Sustainable Development Goals (SDGs) case series. It is based on field research and is written to provide material for class discussion rather than to illustrate either effective or ineffective handling of a management situation.

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Water Management in Brazil

Country Overview

Brazil is one of the largest countries in the world and the biggest economy in South America. It is also a country of diversity, especially in geographic and climate zones. Natural resources vary greatly per region, and the disparity in opportunities has caused more people to settle in coastal cities than in the interior. As a result, the Human Development Index varies within Brazil from 0.63 in the Northeast to 0.76 in the Southeast (**Appendix C**).

The Brazilian territory contains about 12% of all fresh water on the planet. In all, there are 200 thousand micro basins spread over 12 hydrographic regions, such as the São Francisco, Paraná and Amazon basins (the most extensive in the world and 60% located in Brazil). It is an enormous water potential, capable of providing a volume of water per person 19 times higher than the minimum established by the United Nations - 1,700 m³ per inhabitant per year.

Water supply is also highly imbalanced in Brazil. The country has huge water resources, but they are concentrated in the sparsely populated Northwest (Amazon Basin), while the populous coastal cities are located in the less endowed Southeast (**Exhibit 1**). In the Northeast, water is actually scarce, and drought has become increasingly frequent. For over a century, the standard Brazilian response to drought was to build more reservoirs and manage the risk through emergency relief, rather than addressing the deeper causes of the people's vulnerability to drought. These approaches were termed 'the drought industry', meaning that established interests used these measures to gain support for their own political careers.⁴

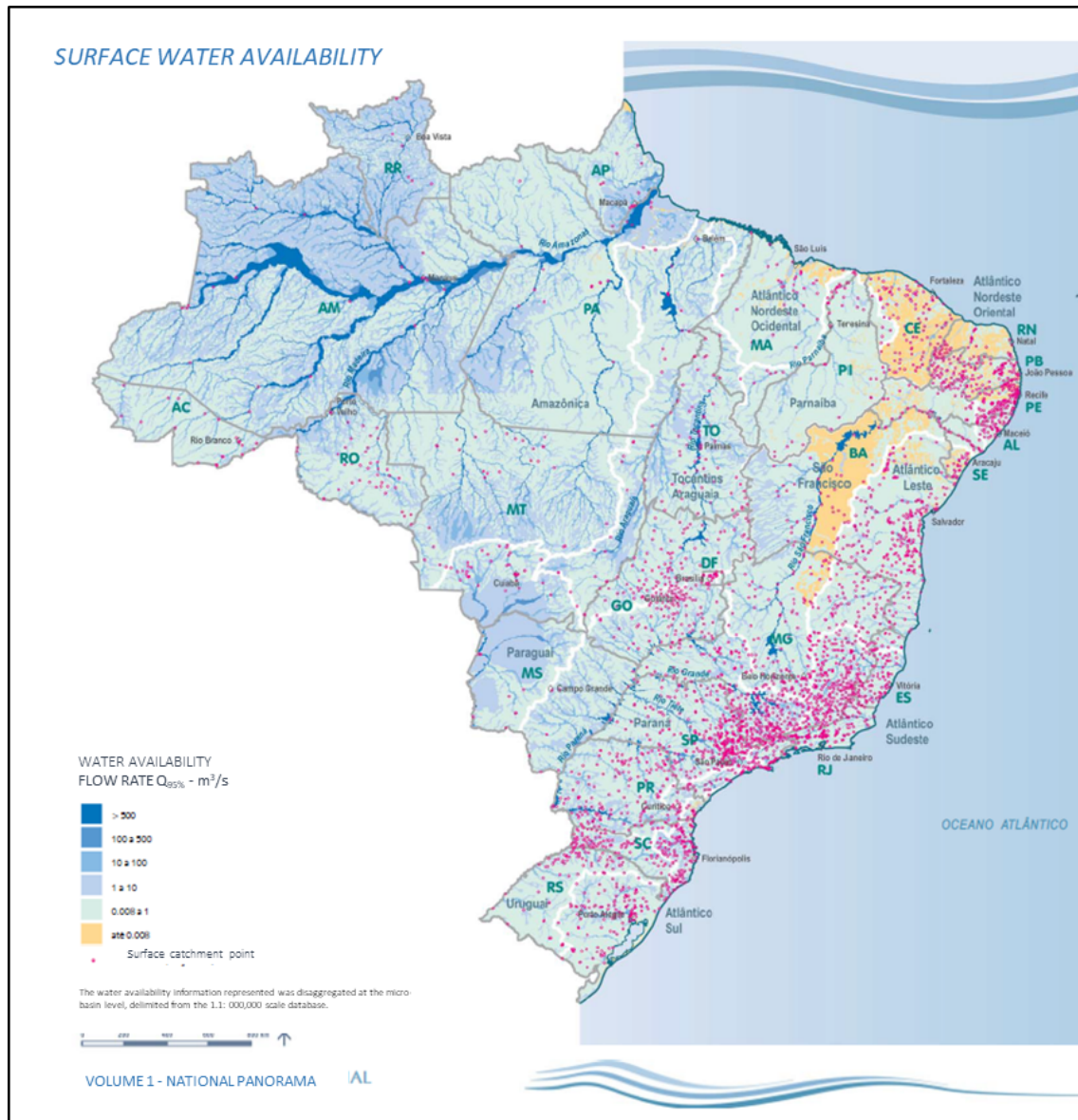
Water Supply Services

In general, the availability of treated water to homes and businesses varied greatly between regions. A huge disparity in the indicators could be observed between the north/northeast and south/southeast regions. Possible causes included geographic conditions (water availability in arid vs. water-rich regions), income and demographic distribution, and municipal management capacity. Apart from cultural differences, a lack of access to basic sanitation impacts people's sense of dignity, creates social exclusion and limits their ability to exercise citizenship.

The Brazilian water sector's management system was unable to adequately handle these differences and continued to apply a standard model for the whole country. The state of Brazil's water infrastructure was poor for an emerging economy. About 16 percent of the population (35 million) in 2018 did not have access to piped treated water.⁵ Even for the 84 percent of the population who were connected to the water network, there were constant interruptions and problems with quality (**Exhibit 2**).⁶ In the decade between 2010 and 2020, the water supply index had remained particularly stable at the same level.⁷

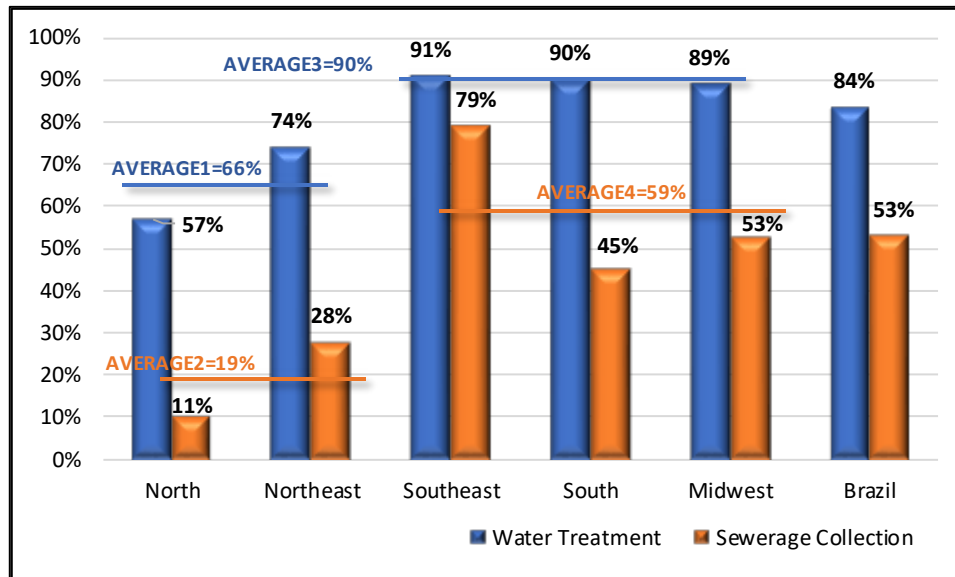
In rural areas, the numbers were even worse. According to the 2014 National Household Sample Survey (PNAD), only 34.5 percent of households in rural areas of Brazil were connected to water supply networks, with or without internal piping. The rest collected water from fountains and wells largely unsuitable for human consumption. Numerous settlements were dependent on supplies by water tank trucks from the nearest reservoir.

Exhibit 1: Brazil's freshwater resources



Source: Atlas Brazil Volume 1, ANA National Water Agency 2010, p.33

Exhibit 2: Water and sewerage coverage by region and Brazilian average in 2018



Source: Denise Moraes Carvalho with info from National Sanitation Information Website⁸

Sewerage management in Brazil was handled by the same authority as water management. Due to higher costs in wastewater collection and treatment, the deteriorating sewerage network and its low priority in public policy, sewerage coverage was worse than that of fresh water supply and displayed a greater regional disparity regarding the population covered. In 2018, 53 percent of the Brazilian population had access to sewerage services and 47 percent (**Exhibit 2**) – more than 100 million people – had unsanitary ways of dealing with wastewater, due to improperly constructed septic tanks or through dumping sewage into ditches, black pits or rivers. Only 45 percent of wastewater in the country was treated in 2018.

The problem was especially acute in the semi-arid regions, where coverage of water and services was much lower than the rural average. The water sector had been stagnant for years, and there was no intention on the government’s side of taking decisive SDG action to solve the problem by 2030.

Obviously, the poor water services were not just a problem of absolute scarcity, but of money. By federal law of 1997 (law nº 9.433/97) all stakeholders within a river basin jointly set a water charge for the area. This was formally not a tax, but an economic scarcity signal. In practice, however, it was much too low to be an incentive for rational water use, and total revenue was far from sufficient to cover the necessary investment in water infrastructure. Because their payments led to so little in return, people did perceive it as a tax.

Apart from this charge, there was a service price for water consumed. There was a standard minimum tariff; low-income households were sometimes charged a lower ‘social tariff’. The minimum tariff was higher than many people’s actual consumption, and as such did not encourage rational consumption. The basic water allowance was

so big that it made no sense to economise. On the contrary, this model penalised those who use less water. As a consequence, inducing responsible use, combating wasteful consumption and promoting efficiency, which were important premises for SDG6 (Clean Water and Sanitation), were not included in the collection model.⁹

Brazil's subsidy policies were defined at the operator level (municipal or state), which resulted in different standards and criteria throughout the country. On the supply side, there was a strong regional dependence on national budgetary resources for investments. Reformulating the subsidy policy was one of the greatest challenges for low-income regions. On the demand side, the subsidy policy was opaque about the definition of subsidised tariffs and had limited reach to the needy population.¹⁰

The World Bank called the tariff structure of Brazil's water service outdated, because it was unable to address the problems of inefficiency, low service quality, lack of access for the poor, and lack of investment funds for repair and upgrades. Furthermore, the water infrastructure was insufficient to respond to extreme climate conditions. Inter-basin water transfers and increasing conflicts over trans-border basins between users demonstrated a clear need for more integrated sector governance.¹¹

The Regulatory System

The Federal Water and Sanitation Law (2007) stated that municipalities must establish fundamental principles and guidelines, make a local plan for basic sanitation,¹² and supervise its implementation. This resulted in various regulatory agencies, whose technical capacity to meet the demands of the sector were questionable. The system was spread between municipal (53 percent) and state (47 percent) agencies.¹³ Municipalities often outsourced water supply in their area to state or private water companies. This was done through contract agreements *without* a formal bidding process or goals for coverage and quality. As a result, state-owned water companies supplied 73 percent of the population, municipal companies 21 percent and private companies 6 percent. Many utilities suffer from serious water losses (almost 40 percent), overstaffing and high operational costs.¹⁴ Mediocre performance did not lead to sanctions or a change of supplier. The state-centred mode and the low appreciation of civil society in Brazil left many gaps and led to low efficiency in the operation of the water sector.

In 2013 the Federal Government, obliged by the Water and Sanitation Law (2007), adopted a national plan for basic sanitation (PLANSAB by its Portuguese abbreviation), aiming for universal access by 2033 – a delay of three years compared to the UN SDG target. The plan required investments in the order of €100 billion over 13 years (2021-2033).¹⁵ That meant an average of €7.7 billion a year. Yet the average investment per year in the 2010s was €2 billion, well below the average value required to reach the PLANSAB targets.

A process to create a new regulatory framework for the sector started in 2017 and was still unfinished by May 2020. The proposed bill assigned ANA, the National Water

Agency, to be the federal entity responsible for issuing general guidelines for sector regulation. Municipal and state regulatory agencies were required to be aligned with ANA.¹⁶

Ceará – The Thirsty State



State Overview

Ceará is one of the 27 states in Brazil. It is located in the northeastern part of the country, with a mountainous interior and an Atlantic coastline (**Exhibit 3**). About nine million people lived in Ceará in 2019,¹⁷ of which over three million in the capital city Fortaleza and two million in rural areas.

Exhibit 3: Ceará state in Brazil



Source: Brazil / Britannica

Ceará is one of the most populated semi-arid regions in the world.¹⁸ The climate is hot, with seasonal monsoon rains (January to June) and dry periods lasting at least six months (total annual rainfall is under 500 mm). The rivers are small, and most run dry during the rainless season. The state is susceptible to prolonged periods of drought; climate change is expected to increase their frequency and length. This would have a

major impact on rainfed agriculture, which accounts for 96 percent of total surface area, 6.6 percent of state GDP, and 40 percent of employment.¹⁹

The state of Ceará has gone through a period of water scarcity, which can be considered among the most serious in the last 50 years. According to the Drought Monitor (ANA/FUNCEME)²⁰ the intensity of the current drought in most of the state's territory was classified among the levels of exceptional extreme drought, which represent a greater degree of severity. Some regions such as the Sertões de Crateús and Canindé already accounted for six years of drought.

Northeastern Brazil is the most populated semi-arid region in the world. In all, about 11 million people live in these rural areas and do not have access to drinking water. They must travel several kilometers to find a source of water, which is generally unfit for human consumption. The region has high rates of infant mortality as a result of diarrhea caused by the consumption of contaminated water.

In 2017 about 17 percent of Ceará's population lived below the poverty line and 10 percent in extreme poverty.²¹ Water scarcity had deeply marked the life of the people living in the interior, the 'sertão' as Brazilians call it. Only 300,000 of the two million rural population had access to clean water. Poor communities got water from unprotected sources or had it trucked in from a reservoir. It was common to see women with water cans on their heads walking quietly three or four kilometers to get water. The simplest activities, like doing laundry, became complicated. Without a good sense of hygiene, many people fell ill from drinking contaminated water. Diarrhea caused high rates of infant mortality (**Exhibit 4**). In the 2012-2017 drought, Ceará suffered drastically reduced reservoir levels and deteriorated water quality. This forced the adoption of stricter water allocation rules.²² As a consequence, the poor became much more vulnerable, since they were dependent on local politicians (often rich and powerful) to provide water for drinking and crop irrigation (farming was their main source of income).²³ This had further reduced their trust in public institutions.

Exhibit 4: Key indicators of health, education and economy in Ceará

Indicators	1987	1997	2005
Infant Mortality	137.0 ⁽¹⁾	40.0	33.2 ^(Folke and T. Hahn)
Population with monthly income below minimum wage (%)	33.5 ⁽²⁾	19.9	
Illiteracy (% of the population over 7 years-old)	43.3	31.7	22.6 ^(Folke and T. Hahn)
Level of education (% of population between 7-14 years old ⁽⁶⁾)	56.7	95.0	96.8
Households with piped water (%)	31.5	53.3	74.0
Houses with electricity (%)	53.1 ^(Folke and T. Hahn)	75.6	95.6
Households with garbage collection (%)	28.0	49.0	72.2

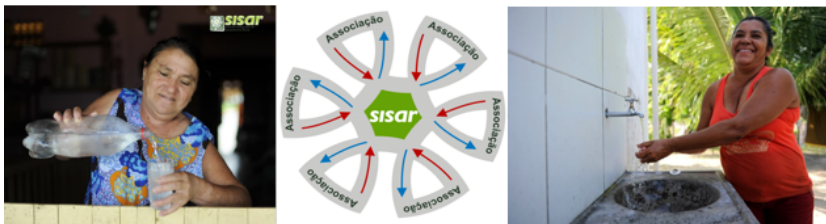
Source: IBGE/PNAD, SEDUC, SESA, Government of the State of Ceará, 2000
Notes: (1) 1986
(2) the rate for 1997 is 42/1,000
(Folke and T. Hahn) 1985
(Folke and T. Hahn) 2004
(Folke and T. Hahn) % population over 15 years old
(6) Number of people enrolled in schools

Source: Maria Carmen Lemos, Drought Governance and Adaptive Capacity in NE Brazil. A Case Study of Ceará, Occasional Paper for Human Development Report 2007/2008, p.4.

In view of all these problems, the concept of rural sanitation emerged, with application of techniques for water supply and self-management of adduction, treatment and distribution systems. The rural population finds it very difficult to obtain water within the quality standard required by the Ministry of Health, due to the lack of a conventional water supply system (standard). Alternative individual and collective solutions are adopted for supply without a technical framework that guarantees the necessary quality. Raw water, due to pollution and the lack of protection of water sources, poses several risks to human health, since water has the capacity to transport contaminating agents, which can cause diseases in man, as well as or significantly alter its normal performance of community tasks.

It was in this void of solutions for the rural sanitation sector that the SISAR solution emerged, based on the pressing need of the local population to obtain basic conditions for survival, such as health, food and productive activity that would guarantee a sustainable condition of life.

Integrated System for Rural Sanitation (SISAR)



In the 1980s, after decades of centralised government delivery, international development programmes switched to community management of water supply as a way to improve coverage among the poor. In Brazil, the German development bank KfW was involved with these early trials and noticed that not all went well. The water supply systems, which had a planned lifetime of 20 years, were operated by the beneficiary communities without much commitment, training or support. The state and its donors had assumed that the villagers would keep the water supply going. However, when the systems broke down due to lack of maintenance the people simply reverted to their old ways. A brand-new management model was needed. Finally, in the mid-1990s, an integrated system for rural water management was born, which was called SISAR by its Portuguese abbreviation.

The SISAR Model



In the SISAR system, the state water company CAGECE (department GESAR)²⁴ provided the technical standards and training, so that it could involve the beneficiary communities in the decision-making and operation of their own water facilities. Social workers from GESAR carried out eligibility checks that included the availability of water and electricity (for pumping), population size (a minimum of 500 for drinking water and 1000 for wastewater), and the commitment of the community and its municipal

authorities to participate in its institutions. Next, GESAR social workers gave communities practical trainings in management, hygiene and environment. Each village then established an association, which joined the regional SISAR. Each family was entitled to a minimum consumption of 10 cubic metres per month, or 50-100 litres per person per day. This was enough for daily household needs but not for crop irrigation or small businesses. The amount paid monthly to SISAR corresponded to this minimum volume or, when higher, was proportional to the volume consumed. The amount paid, up to the minimum volume, was the same for all communities, regardless of their location and size (number of families). This is an implicit subsidy from those whose systems are simpler and cheaper to those whose systems are complex and more expensive.

The funding to cover the costs of construction, modernisation and expansion of the facilities came from (inter-)government sources through the Ceará state budget. To redress the scarcity of public financial resources, the state government partnered with the German bank KfW and the International Bank for Reconstruction and Development (IBRD) to co-finance SISAR projects. In the financing agreements between the State and the KfW and IBRD Banks, there is a counterpart amount contributed by the State (between 10 and 20 percent of the total amount). IBRD, through the São José Programs, financed amounts several times higher than KfW but without the same level of involvement in the SISAR project itself. KfW, through the Ceará I, II, III and IV programmes, provided financing in the order of €90 million. Although KfW's share of funding was lower, its impact on the formation and modeling of SISAR was enormous. The government's own investment was less than KfW's and came via federal government programmes through FUNASA (National Health Foundation). Finally, there were small donations from the European Community (LAIF - Latin America Investment Facility) and CSR funds from private beverage companies with an interest in clean water (Coca-Cola and Ambev).

The water users, on the other hand, paid a service fee that comprised a unit charge plus margins for energy use (water pumps) and operator costs.²⁵ The wealthier towns in SISAR's region brought in more income through a higher fee, so that poorer towns and villages could have access to clean water at lower rates. This cross-subsidy was a social policy feature in the 2007 Water Law that facilitated universal access. Municipalities could also form a consortium for the purposes of achieving the necessary economies of scale and spreading the cost of subsidising access for the poorest. SISAR used this feature to organise cross-subsidies between its affiliates.

Overall, there were five sustainability pillars of SISAR:

- I. Political (governments: federal, state, municipal and civil society)
- II. Technical (technological innovations, new demands)
- III. Social (rescuing citizenship, empowering community, strengthening associations)
- IV. Economic and Administrative (fair tariff, cross subsidy, performance indicators, transparency, ethics)
- V. Environmental (preservation and maintenance of water resources)

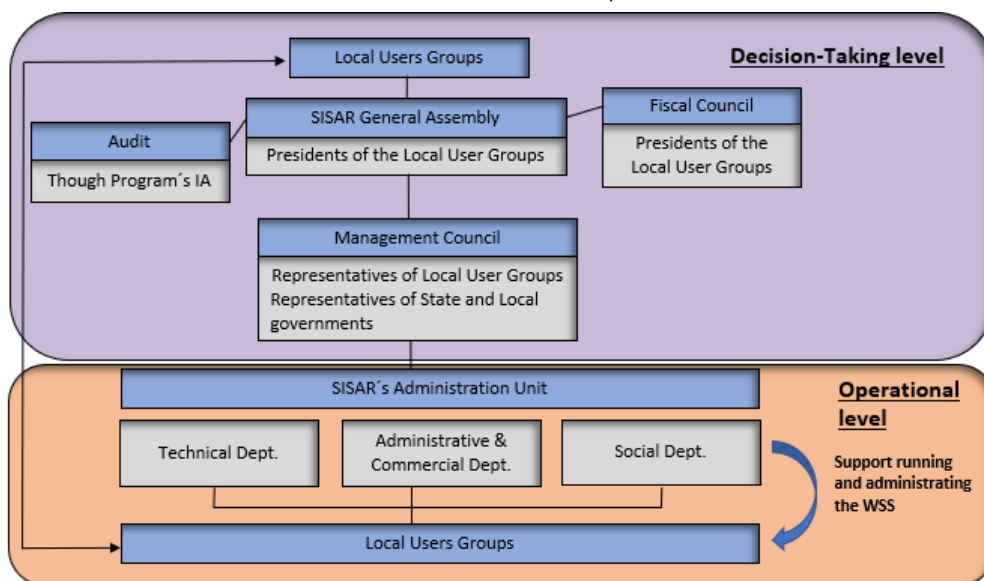
Organisational Structure

SISAR’s operation depended on two levels of tripartite agreements: (i) one through the programme between the Ceará State Government (management), the KfW bank (financing) and CAGECE (technical aspects), and (ii) the other with the municipality, the local affiliated community association and the SISAR operation structure itself.

All stakeholders had to be brought together in SISAR’s organisational structure, so that by checks and balances standards would be maintained and transparency and trust upheld.

Legally, SISAR was a civil association under private law, non-governmental and without economic ends (non-profit). Its structure was based on its General Assembly in which all members participated with equal voting power. Its daily activities, however, were directed by the Board of Directors (with a seat of associations and representatives of the state government and city halls) and supervised by the Fiscal Council (composed only of affiliated associations). Here is how it worked. The chairpersons of the local associations came together once a year as the General Assembly (GA), deciding on major administrative, financial, social and technical issues. Next, the GA elected an 11-member Board of Directors (four meetings per year) with representatives from the local associations (unpaid), Ceará state and municipal governments. The Fiscal Council, supporting the GA in financial, legal and budgetary matters, had 50-50 participation from associations and other stakeholders. Thus, in the money area where trust is particularly important, all stakeholders took part in advice and oversight. SISAR’s Administration Unit (paid staff) took care of technical issues and carried out maintenance, billing and fee collection. The staff were selected and trained to adequately support local user groups in administrative, social and technical areas (**Exhibit 5**).

Exhibit 5: Institutional set-up of SISAR



Source: Alejandro Meleg, SISAR, a sustainable management model for small rural decentralised water and wastewater systems in developing countries, Journal of Water Sanitation and Hygiene for Development, 2012.

Stakeholders

SISAR brought together many stakeholders, the most important of which included local user groups and affiliated community associations, municipalities, the state water company, the state government and the German bank KfW (**Exhibit 6**).



Stakeholder 1: Local user groups and affiliated community associations

Communities scattered over the Ceará countryside were too small (some of them with only 50 households) and too poor for cost-effective water supply. People were uneducated, as the local schools only offered primary education. Through practical community development, they started trusting SISAR. As the people debated and decided on joint projects they learned the basics of self-organisation, which they subsequently applied to other projects, for instance public health. In the beginning, communities would elect their representative to SISAR's General Assembly and Fiscal Council. He/she would be their voice on such issues as operating fee and tariffs, and would approve SISAR's accountability. He/she would also defend SISAR decisions before the community. By faithfully paying their bills the people demonstrated their commitment to SISAR. The community associations selected the local system operator and monitored his/her activities. The associations ensured the proper use of water and systems, and notified SISAR whenever there were other system demands.



Stakeholder 2: Municipalities

Municipalities, responsible by law for drinking water, authorised SISAR to run the water supply system and participated in its Board of Directors to foster accountability and transparency. Since SISAR often came hand in hand with external financing, municipalities generally saw the programme as an opportunity. Unfortunately, their actual participation in meetings was low, since they had few qualified staff. Municipalities should provide technical and administrative support to their community associations, but often did not do this due to a lack of financial resources.



Stakeholder 3: Ceará State Government

As part of the wider democratisation process in Brazil, the Ceará State Government set up new programmes in rural development, small business development, education, basic rural health & sanitation and rational water management. Notably, it encouraged the use of knowledge, innovation and community involvement in decision-making. Thus, local committees were set up to select the beneficiaries of relief and development programmes, thereby breaking the routine of exchanging relief funds and jobs for political favours. Ceará was one of the first states to introduce a water resources law (1992). It created several levels of water management, including watershed user commissions and a state water resources council.



Stakeholder 4: GESAR, a department of the state water company (CAGECE)

GESAR, a unit within the state water company (CAGECE), was created to focus exclusively on the expansion and management of water supply in Ceará's rural communities. As part of the replication effort, it helped set up SISAR units and provided support in planning according to technical standards, construction of facilities, and management training and advice. It built and owned the actual facilities for water supply (**Appendix D**) and delegated the management of these facilities to SISAR. It also monitored the overall functioning of SISAR projects, continually striving for their sustainability. Without the technology, reputation and legitimacy of GESAR and the state water company behind it, SISAR projects would not have been as successful or mature.



Stakeholder 5: KfW Development Bank (Germany)

KfW Development Bank had been involved with clean water supply management in Ceará since the early 1990s. With an interest in efficient institutions and positive economic outcomes, KfW provided both the management innovations that were at the heart of SISAR and money to build the necessary infrastructure. The Ceará state government wanted KfW to be involved in replicating the SISAR model all over the state. Over the years, as more money was involved, a more rigorous accountability process was applied. Within a year of completion of each project, a final evaluation committee would visit the implementation areas to carry out an analysis of the impacts and assign scores to all the projects. This report was the basis for approval of funding for future projects and was also a lesson in accountability.²⁶

Exhibit 6: Summary of stakeholders & responsibilities

Stakeholders	Responsibilities
Local communities user groups	<ul style="list-style-type: none"> • Establish / reform local association + join SISAR • Guide its representative in SISAR decision making in Board of Directors and Fiscal Council • Select and monitor the local system operator • Manage and operate the system (proper use & timely repair of water system; water treatment) • Pay water bills on time • Local administration; strengthening of attitudes & skills
Municipalities	<ul style="list-style-type: none"> • Delegate / authorise the provision of the service to SISAR • Participate in Board of Directors meetings • Seek to increase safe water coverage
SISAR	<ul style="list-style-type: none"> • Shared management with the local association • Maintenance and control of water quality • Socio-environmental training
Ceará State Government	<ul style="list-style-type: none"> • Promote sustainable rural development, including provision of safe water and improved sanitation • Coordinate public policies for the sector

	<ul style="list-style-type: none"> • Budget State Funds & capture external donor funds for investment in increased rural coverage to achieve SDG 6 • Strengthening of SISAR
State water company, department GESAR	<ul style="list-style-type: none"> • Expansion & management of rural water supply • Assistance in organisation and installation • Construction of new / improved water supply systems • Technical support + management training for local groups • Social area support
KfW Development Bank	<ul style="list-style-type: none"> • Investment support • Management innovations • Exercise of accountability

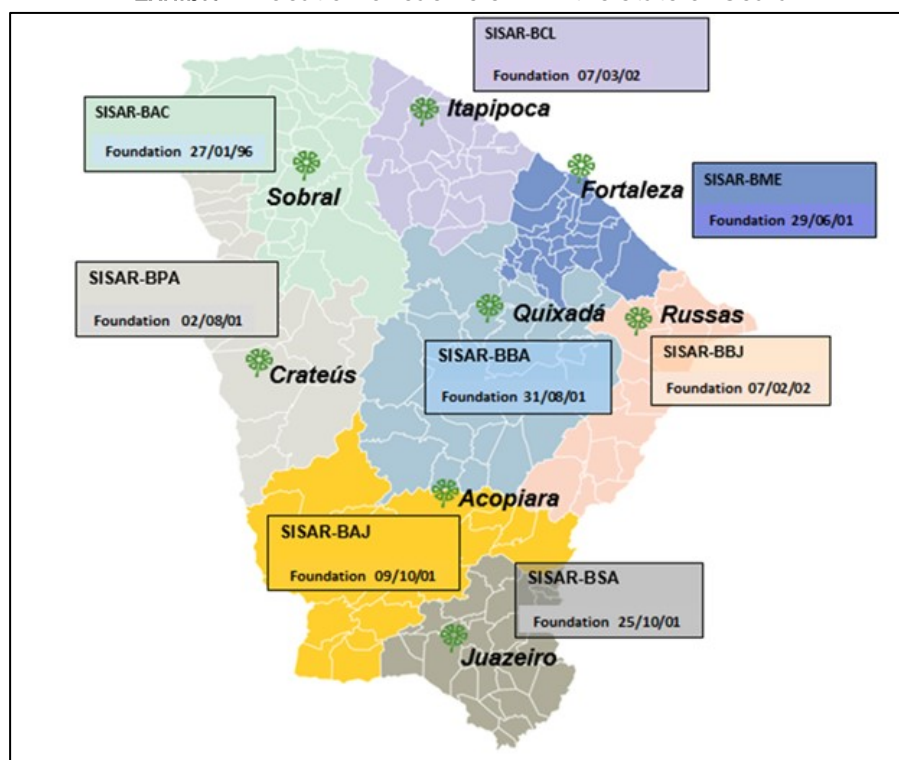
Evolution

In 1992 the Ceará state water company CAGECE initiated a new approach to rural water supply in the Sobral region with assistance and a loan from KfW (Ceará I).²⁷ The innovations were that KfW started providing community empowerment and management training to the villages, and that CAGECE provided technical training and support. The Sobral project cost about €13.5 million; it provided drinking water to 63 communities and sanitation to 22 villages, benefitting 120,000 people.

This success was remarkable and led the state government to create GESAR as a dedicated unit within CAGECE for expanding and managing rural sanitation. In preparation, KfW bank first conducted a thorough evaluation of Project Ceará I, which identified the following problems: (1) non-payment of energy bills by municipalities, leading to service interruptions, (2) some municipalities stopped their active participation at the end of the implementation stage due to lack of staff and resources, (3) inadequate maintenance of the water systems due to use of earmarked resources for other purposes. Adjustment to the principles and procedures were made to increase accountability and monitoring.

In 2001 the replication of the SISAR model to seven other regions began. The second (Ceará II) and third (Ceará III) phases continued the upgrade and expansion effort of SISAR from 2006 to 2016 at the cost of around €24 million. A new feature at this stage was that KfW hired consultants to periodically monitor the processes and formed evaluation commissions for new projects. Also, funds were set aside to strengthen SISAR's equipment and materials, and to integrate a collective sanitary sewage system. The improvements took a lot of resources, and so only 30,000 additional people benefitted. Eight SISARS were deployed, strategically located in eight different hydrographic basins (**Exhibit 7**).

Exhibit 7: Location of each SISAR in the State of Ceará



Source: SISAR Institute

Ceará's Rural Sanitation Programme (Águas do Sertão or Ceará IV), begun in 2019, was able to aim for a much larger number of people to be served: 200,000 people by 2023 at the cost of €62.5 million. Additional features of water resource protection and rational use, and improved access, reflect emphases of the SDG age.

By the end of 2019, SISAR involved 161 municipalities with 200,000 communities in Ceará, serving over 700,000 rural people (**Exhibit 8**).²⁸ It had managed to cover its operational expenditure (staff, replacement parts, filters, etc.) from its income of water fees since 2012, but it was still 100% dependent on the state for the other larger expenditures such as constructing and maintaining facilities.

In 2020, SISAR created its own institute in order to support its affiliates in technical, administrative, social and environmental matters (**Exhibit 9**). This included training and professionalising staff and community leaders in basic sanitation. Moreover, the SISAR Institute provided consulting services to SISAR-like projects in other Brazilian states. Finally, it also created opportunities for the exchange of knowledge and experience both within Brazil and abroad. In short, SISAR Institute was a platform made to facilitate replication of the SISAR model. Apart from membership fees, SISAR Institute received income from production and marketing contracts, development aid money, donations and private project contributions (such as Coca-Cola Brazil Institute, Avina Foundation and Ambev).

Exhibit 8: SISAR's growth 2001-2019

YEAR =>	2019		2013		2001	
SISAR UNIT	AFFILIATED LOCATIONS (1)	TOTAL CONNECTIONS (2)	AFFILIATED LOCATIONS (1)	TOTAL CONNECTIONS (2)	AFFILIATED LOCATIONS (1)	TOTAL CONNECTIONS (2)
Sobral	163	37,764	95	19,020	36	7,895
Acopiara	146	21,592	89	11,398	4	342
Quixadá	179	26,569	100	14,011	8	358
Russas	79	17,416	34	5,789	2	168
Itapipoca	116	20,017	69	8,660	1	127
Fortaleza	86	12,749	46	5,936	7	475
Crateús	233	35,294	133	17,296	6	466
Juazeiro	186	28,941	120	15,529	2	150
TOTAL	1,188	200,342	686	97,639	66	9,981
Growth	73%	105%	939%	878%	-	-

Notes:

(1) *Affiliated Locations: Represents the number of associations affiliated to SISAR systems.*

(2) *Total Connections: Represents the total number of connections (active and inactive) to the SISAR water system.*

Exhibit 9: Timeline of major events

1991: Start of the Ceará I (KfW I) Programme
 1996: Foundation of SISAR in Sobral (Acuru basin)
 1999: Creation of GESAR, unit of CAGECE
 2001: Replication of SISAR model across Ceará
 2005: Start of the Ceará II (KfW II) Programme
 2011: Start of the Ceará III (KfW III) Programme
 2014: Implementation of Water for All Programme
 2015: Foundation of SISAR Network
 2018: Creation of Basic Sanitation Programme / SISAR SDG Award SISAR
 2019: Start of the Ceará IV (KfW IV) Programme
 2020: Foundation of SISAR Institute

Achievements and Challenges

In almost 25 years, SISAR had managed to provide access to safe water to 700,000 disenfranchised rural poor in over a thousand communities. Not only that, but in order to get underway with these communities they first won their trust and empowered them. As a result, the people gained higher self-esteem and an incentive to be active citizens of their villages and country. Many subsequently undertook all kinds of community development projects, while others had difficulty maintaining active interest beyond the implementation phase of the water system. SISAR was still not without its problems, but it had proven to be a winning formula because it took care of social, institutional, technical and financial aspects of community-based rural water

supply. Both in Brazil and internationally, the SISAR model came to be seen as the democratisation of water resource management, with the network being an important ally of the state in the implementation and improvement of clean water supply (**Appendix E**).

In 2018, SISAR was granted the 'Brazil SDG Award', an initiative of Brazil's federal government to promote the UN Sustainable Development Goals (SDGs), for its innovation and contribution and for serving as a reference for other societal stakeholders (**Appendix F**). Despite SISAR's success and the size of the SDG task ahead, interest from Brazilian politicians remained low. Their priority was inaugurating new infrastructure, not supporting well-operating public services.

Why was expansion of rural water and sanitation so slow, even in Ceará with its positive SISAR experience and relatively favourable government situation? The answer was financial feasibility of new facilities in the face of extreme poverty and ever more frequent drought. The conditions were particularly tough in the driest parts of Ceará, where new technical solutions were needed. In the short term, funds from the government and international donors might foot the bill, but what about the long term?

Other challenges included the task of consistently reaching the water quality level required by the Ministry of Health, and the low participation by municipalities in SISAR meetings beyond start-up. This was probably due to the low level of staff qualification in rural town halls and was expressed in the low share of rural towns (under 50,000 inhabitants) throughout Brazil that prepared sanitation plans on time.

Internally, SISAR also faced its own challenges: there was no homogenous and continuous workforce on the SISAR team, necessary for successes to last. According to community development experts, ongoing strengthening of social ties and connections was needed in order to maintain long-term interest and participation in community issues.

The Future: Scaling up SISAR

Given that coverage by SISAR services in Ceará state was just 36 percent, there was ample room for scaling up. As the CEO of SISAR Institute who closely worked with SISAR for all these years, Marcondes Ribeiro Lima was of the opinion that SISAR as an organisation needed to demonstrate that its water supply and management system were able to guarantee adequate water quality at a viable cost. Only in this way could SISAR persuade more communities to participate, both in Ceará and beyond.

By the middle of 2020 Ceará's rural water supply coverage was as follows:

- 36% by SISAR (quality piped service);

- 35% by CAGECE, SAAEs or Associations of Rural Communities, of which 4% CAGECE (qualified service), 15% SAAEs (service varied from good to precarious) and 16% Associations of Rural Communities (precarious); and
- 29% had no safe water supply.

The 4 percent under CAGECE was already in the process of handover to SISAR, so that makes 40 percent SISAR coverage in total. The 29 percent of the population without safe water supply was the most likely target for SISAR, but the villages with poor quality services might eventually decide that SISAR could do a better job for them.

Many of the communities not affiliated to SISAR had installed water distribution systems, but they were very old and extremely deteriorated. These systems needed financial resources for general reform that local communities did not have. Contributions made by SISAR, by the Municipalities, by CAGECE and by the Communities themselves, made possible to restore the systems of some locations, making them qualified enough to apply to the SISAR system. However, resources are scarce for everyone and, on average, a maximum of five to eight systems were recovered per year through these Initiatives.

At the same time, the SISAR system was in need of improvement, especially concerning water quality and facility maintenance. Since tariffs could hardly be increased, SISAR would need more external investment. So far it had been dependent on state funding, but in recent years the private sector had also shown interest in supporting SISAR. Companies like Coca-Cola and AMBEV already had projects linked to SISAR, such as the AMA project, brokered by civil society organisation AVINA. Moreover, SISAR had aroused the interest of other countries (such as India, Ethiopia and Mexico) and UN organisations. There were plenty of opportunities. The questions were which type(s) of investors SISAR should partner with and what funding model would be most suitable.

This led to another question: wouldn't it be better if SISAR became independent from the state and were run as a private entity? This could give SISAR more freedom to operate and more financial returns, but it could also take away the legitimacy SISAR now enjoyed. What SISAR had achieved could not have been possible without the state government and the state water company; many local communities trusted SISAR simply because it was backed by the state.

For Ceará State, water and sewage services were bundled into one. The state government had always looked at both services at the same time, but because collecting and treating sewage was more demanding and expensive than supplying clean water, sewerage services always had second priority. For the same reason, SISAR had never paid enough attention to sewerage services. If SISAR could find a new viable funding model, should it start providing sewerage services, or should it focus on scaling up what it already did well?

All these questions would determine whether SISAR could successfully expand to the rest of the country and benefit many more people. No matter what decisions SISAR

would take, one thing was clear: SISAR would continue with the partnership structure it was using now, which was the essence of its success. Maybe it could even improve the structure so that more interested parties could be brought together and jointly contribute to building a clean, sanitised and healthy world at a faster rate.

Appendix A: Biography of Marcondes Ribeiro Lima

Marcondes Ribeiro Lima, CEO - SISAR Institute

Bachelor of Accounting and specialist in Accounting Auditing from Faculdade Integrada do Ceará. CAGECE employee for 21 years, where he has held various positions as Administrative-Financial Manager at SISAR Fortaleza (BME), Administrative Supervisor of private projects with AMBEV and Avina and for the last two years CEO of Instituto SISAR. Participation in the consolidation of SISAR's administrative-financial management model through the establishment of financial, technical and social routines, as well as internal controls.

Performance in the replication of the SISAR model, revision of the bylaws, execution of strategic planning and project management. Performance in the dissemination of the SISAR model to communities, support to associations in accountability, mobilization and training and representation with city halls.

Participation in national and international missions for institutional presentations of the SISAR Management Model. Responsible for expanding the SISAR Management Model for Basic Sanitation in other States in Brazil and countries, as well as strengthening the existing SISARs in the State of Ceará. He has given numerous lectures at national congresses and conferences to present and disseminate the SISAR model in different environments, including academic ones.

Provision of consultancy through the SISAR Institute for the creation, structuring and training of a community management model for rural sanitation in other regions of the national territory such as *Central de Caetité / Bahia*. Participation in international cooperation programs such as TRILATERAL SOUTH-SOUTH Cooperation between Brazil - Unicef - Ethiopia.

He is a member of the Confederación Latinoamericana de Organizaciones Comunitarias de Servicios de Agua y Saneamiento - CLOCSAS.

Appendix B: The Brazil SDG Award



The National Award for Sustainable Development Goals – the *Brazil SDG Award* – is an initiative of Brazil’s Federal Government that will be granted every two years until 2030 and was implemented for the first time in 2018. In practice, it works through the Government Secretariat of the President in partnership with the Institute of Applied Economic Research (IPEA), the National School of Public Administration (ENAP), the Ministry of Planning, Development & Management, and the National Secretariat for Social Articulation (SNAS).

The award’s objectives are to:

- Encourage and give visibility to the practices developed by state, municipal and Federal District governments and civil society that contribute to the achievement of the Sustainable Development Goals in the country;
- Contribute to the formation of a ‘database of practices’ that will serve as a reference for the implementation and dissemination of Agenda 2030; and
- Encourage the involvement of the various segments of society, government and educational, research and extension institutions to promote practices that contribute to the dimensions of Agenda 2030 (social, environmental, economic and institutional). The registered practices must contribute to the achievement of at least one of the SDGs.

Projects must report on:

1. General description of the practice: Characterisation of the problem situation; Goals; Description of the practice steps; Financial resources; Practice team; Current situation; Practice summary.
2. Criteria for evaluating the practice: Results generated; Beneficiary participation; Practice replicability; Convergence of the practice with current public policies; Adherence to SDGs.
3. Lessons learned: Main barriers found in the development of the practice; Success factors of the practice and barriers overcome; Practice deserves to be rewarded.

Appendix C: Brazil Country Facts



Brazil is the world's the fifth largest country by territory (8.5 million square kilometres) and sixth largest by population (211 million)²⁹. Most of these people, 85%, live in urban areas, the remaining 15% in rural areas. Brazilian Portuguese is the country's national language. The HDI is 0.761, which is lower than that of Argentina and Chile and similar to that of Colombia and Mexico. Yet Brazil has the biggest economy in South America. For immigrants from many European and East-Asian nations it has long been a land of opportunity. Brazil (from brazilwood found in the Northeast) was ruled by the Portuguese for two centuries (and very briefly the Dutch), who were interested in its tropical fruit, sugar cane and mining resources. They brought in Africans to work as slaves on the plantations. Apart from the Europeans and Africans, Brazil has many indigenous tribes and peoples. It is host to the world's biggest tropical rainforest, the Amazon, which is threatened by large-scale, uncontrolled deforestation.

Brazil is a country with massive inequality of income and opportunity, both within and between the states of the federation. The Northeast region (9 states, 57 million people) is the poorest and the least urbanised (73% urban population).³⁰ Its climate is the driest in the country; its history is littered with droughts, especially in the last decade. Its Human Development Index (HDI) of 0.663 is far below the Brazilian average.³¹ Its coast was the first to be settled by Europeans; it has a troubled history of colonial wars, plantations with slave labour and civil unrest, but it was also the first part of Brazil to abolish slavery. Ethnic and socio-economic diversity (58% of European origin; 27% of African origin; 15% of indigenous South American origin) are very high here.³² In recent decades the Northeast has benefitted from an influx of foreign direct investment. Yet the rural exodus has continued to the mega-cities and the South.

According to the World Bank, the most water-dependent sectors of Brazil's economy are also the key drivers of growth – irrigated agriculture, cattle breeding, mining, and tourism.³³ Almost 68% of Brazil's energy supply came from hydropower in 2015, and with planned diversification it would still make up 57% by 2030. Although a low-cost, low-emission source in times of abundant rainfall, hydropower is vulnerable to supply shortages in times of erratic rains or drought.

Historically, Brazil's water sector has had a great dependence on federal resources channeled to state service providers. The Federal Constitution of 1988 moved accountability for water and sewerage services to the municipalities. While areas such as electricity and telecom were placed under regulatory laws in the 1990s, the water sector lacked clear rules until 2007.

In the late 1980s, after a two-decade dictatorial period, Brazil began a process of democratisation. During military dictatorship power was centralised and public participation in decision-making and policy implementation minimised. The 1988 Constitution defined Brazil as a democratic state under the rule of law, which promotes political pluralism and citizen participation. As a group the non-profit and civil society organisations are referred to in Brazil as the 'third sector', besides government and business. It had to be built nearly from scratch. Most information on this third sector comes from the International Center for Non-profit Law's Civic Freedom Monitor. Otherwise, there is a lack of information on this sector for academic and policy debate. In the late 2010s, Brazil was in a deep economic crisis, and following the impeachment of President Dilma Rousseff (2016) also in a crisis of distrust between politicians and the population. Persecution, restrictions, and physical violence against leaders and activists of social and environmental movements and CSOs became more prevalent.

In 2016, there were 820,000 civil society organisations active in the country, of which 86 percent were private, 12 percent religious, and 2 percent private foundations. They employed almost 3 million people (3 percent of the total labor force), of whom 13 percent had only completed basic education, 49 percent full secondary education, and 38 percent a higher education degree. These data demonstrate the third sector's economic importance, in addition to its relevance in matters of public interest.³⁴

A controversial point has long been the remuneration of CSO leaders. Throughout the history of non-profits, it has been assumed that professionals working in this area should do so voluntarily, without receiving any kind of remuneration. However, with the evolution of civil society, CSOs require a more organised, quality approach to their work. Consequently, its staff has to be better educated, budgets need to grow, and managers have to be more present and professional. Thus, CSOs now pay (higher) salaries to their staff in order to attract the right people.

In 2014, a new law was approved regulating the partnership between Civil Society Organisations (CSOs) and public authorities. It introduced clearer rules for contracting government services and distributing funds to CSOs. This was based on objective criteria and procedures and enhanced practice standards for partnerships that had to be followed by all levels of government. This increased legal consistency for all actors involved.³⁵

The Civil Code recognises two forms of CSOs, associations and foundations. An association is a not-for-profit membership organisation created by two or more individuals or legal entities in order to achieve a particular goal. A foundation is an organisation (public or private) established through an endowment or fund dedicated to a public interest cause, such as social assistance, culture, health & environment or education. CSOs may obtain government designations of public recognition that grant tax and other benefits. However, tax benefits in Brazil depend on the nature of activities rather than on the nature of the organisation itself. As a result, CSOs are subject to burdensome reporting requirements to prove their tax status regarding tax exemptions. Moreover, some states levy a 4% tax on donations, and non-profits are

experiencing difficulties in opening bank accounts, obtaining credit and developing financial relations.³⁶

Historically, social organisations engagement in sanitation services had been low, because it was regarded as a 'hard' technical area in which effective participation required an engineering degree. Some NGOs, however, took up the cause of sanitation as a social and health issue rather than an environmental one, for instance Trata Brasil³⁷. They tend to be financed by the private sector and have few links with the social movements and advocacy-oriented CSOs that dominate state and local councils. Despite good results, civil society players still receive little public appreciation in Brazil.

The 'Sanitation Law' created new incentives for civil society and citizen engagement by obliging the creation of social oversight mechanisms both for defining policy and for monitoring. Yet the system's mode of operation is that of a centralised system in state hands with strong links to state-owned enterprises and municipalities. Its culture is one of the creation and protection of privileges for state-owned operators and reduced opportunities for private actors.

For more information:

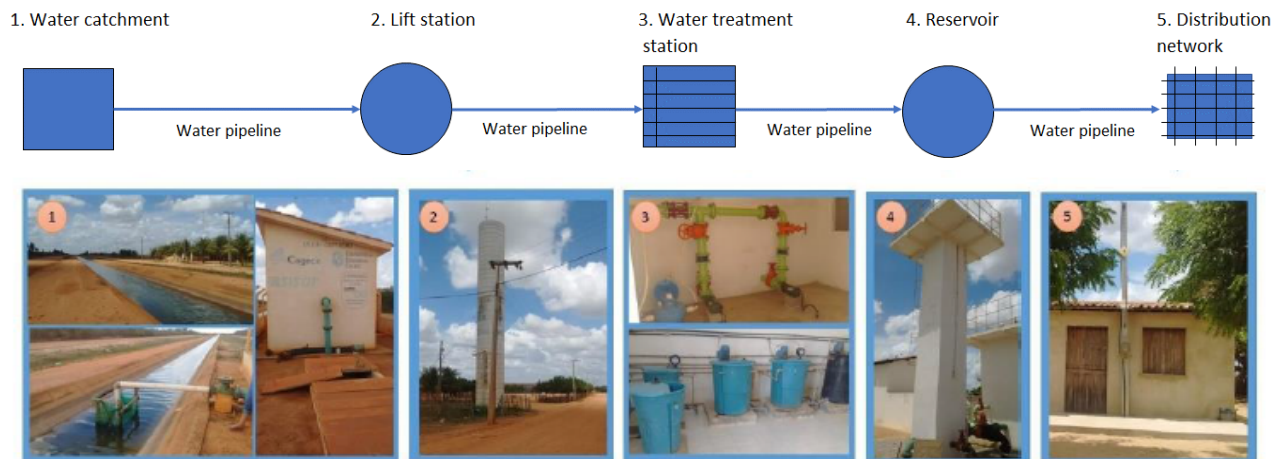
Video 'History of the third sector and civil society action in Brazil'

<https://www.youtube.com/watch?v=EFogXrd_9AM>

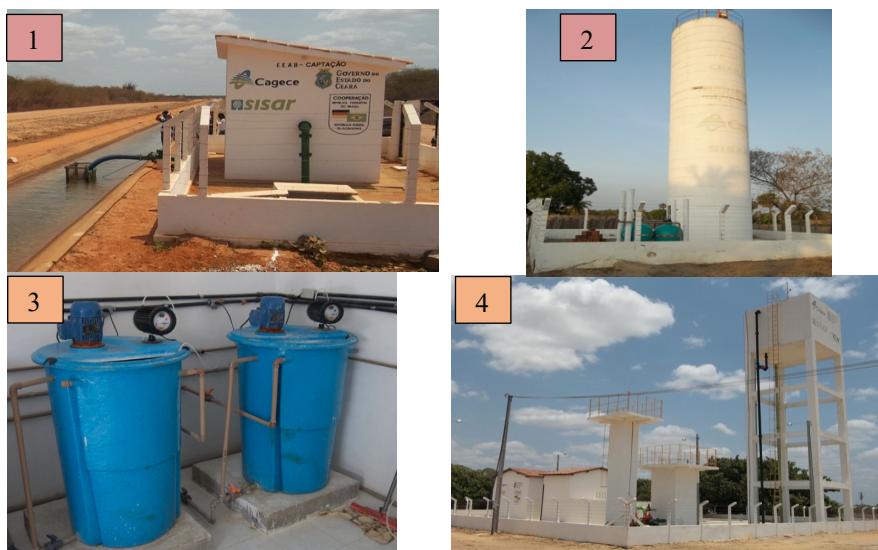
Appendix D: Standard Model of SISAR Water Treatment Plant and Water Supply System

SISAR represented a relevant socio-technical innovation for water supply in rural areas. The SISAR model comprised the community-based implementation of water supply systems, with the proper treatment and charging on the basis of water meters, as well as proper operation and maintenance. The SISAR proposition changed the social relationship between those who would receive the water and the service provider, with a charge for the water consumed.

The technical solution adopted by SISAR was simple, based on the model already used by CAGECE itself and comprising: (1) the capture of water from an available source; (2) pumping systems to carry water to the Treatment Station (ETA); (3) the water treatment plant (ETA), where the water was treated; (4) a reservoir of treated water, ready for distribution; (5) piping system for the distribution of treated water to the consumer's residence where, at the entrance to each location, a water meter was installed to measure the water consumed.



SISAR technical solution design - Water supply system



Appendix E: Summary Table of Rural Ceará Before and After SISAR

ASPECT	BEFORE SISAR	AFTER SISAR
Access to information	Unstructured information	Structured local data
Education	Elementary school only; travel to secondary school in town	Public health & environment self-help skills by associative learning; improved water operation skills
Environment quality	Uncontrolled pollution of water sources; sewage discharge into nature	Protection of water sources; conscious water consumption
Housing	Outdoor unsanitary toilet; water carried in buckets from unsafe sources or water trucks	Indoor bathroom, toilet and washbasins; improved living conditions
Income generation	Low; attitude of dependency	Improved harvest; new economic activity; reduction of rural exodus
Political voice	Disenfranchised; powerless	People participate in SISAR democratic systems; improved equity
Public health	Poor personal hygiene; high incidence of disease and infant mortality	Improved hygiene; reduced sickness and mortality
Self-respect	Low; people felt neglected; undervalued	High; awareness of personal value and rights
Social Capital	Lack of trust; lack of initiative and commitment; low appreciation of and participation in community life; lack of citizenship	Newfound sense of belonging; voice and representation in decisions that affect their well-being; empowerment
Technical matters	Technical unpreparedness; highly deficient operation	Know-how & initiative to maintain water facilities
Transparency	No tradition	Learning to demand and provide openness and accountability
Water system	Dysfunctional or discontinued; without quality assurance	Well maintained; problems get fixed quickly; water quality assurance

Ceará Rural Communities Before and After the Arrival of SISAR (source: prepared by the authors)

Abbreviations

ABAR	Associação Brasileira de Agências de Regulação (Brazilian Association of Regulatory Agencies)
ANA	Agência Nacional de Água (National Water Agency)
CAGECE	Companhia de Água e Esgoto do Estado do Ceará (Water and Sewerage Company of the State of Ceará)
CSR	Corporate Social Responsibility
ETA	Estação de tratamento de água (Water treatment station)
FUNASA	Fundação Nacional de Saúde (National Health Foundation)
GESAR	Gerência de Saneamento Rural/CAGECE (Rural Sanitation Management / CAGECE)
IBRD	International Bank for Reconstruction and Development
KfW	Kreditanstalt für Wiederaufbau (Reconstruction Credit Institute / German Bank)
LAIF	Latin America Investment Facility
SAAE	Serviço Autônomo de Água e Esgoto (Autonomous Water and Sewer Service)
SISAR	Sistema Integrado de Saneamento Rural (Integrated Rural Sanitation System)

Endnotes

- ¹ [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)31095-3/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)31095-3/fulltext)
- ² <https://g1.globo.com/ce/ceara/noticia/2020/05/01/ceara-ultrapassa-500-obitos-por-covid-19-e-registra-78-mil-casos-em-150-municipios.ghtml>
- ³ GEF – Global Environmental Facility. 2008. Measuring Impacts from SLM – Development of a Global Indicator System - under the KM:Land initiative. Available on: <http://www.ciesin.org/documents/km-land-indicator-profiles-final.pdf>. Accessed 20th July 2020.
- ⁴ Maria Carmen Lemos, Drought Governance and Adaptive Capacity in NE Brazil. A Case Study of Ceará, Occasional Paper for Human Development Report 2007/2008, p.5-6.
- ⁵ Instituto Trata Brasil (2018), Key Statistics in Brazil, available from: <http://www.tratabrasil.org.br/saneamento/principais-estatisticas>, Accessed 17 March 2020.
- ⁶ Brazil National Sanitation Information System (SNIS – Sistema Nacional de Informações sobre Saneamento), 2016; Annual Water and Sewer Diagnosis (Diagnóstico AE), 2018; National Secretariat for Environmental Sanitation under the Ministry of Cities; available on: <http://www.snis.gov.br/diagnostico-anual-agua-e-esgotos/diagnostico-dos-servicos-de-agua-e-esgotos-2018>. Accessed 18 March 2020.
- ⁷ National Sanitation Information System (SNIS), Annual Water & Sewerage Diagnosis 2018. Available at <http://www.snis.gov.br/diagnostico-anual-agua-e-esgotos/diagnostico-dos-servicos-de-agua-e-esgotos-2018>, consulted on 15 April 2020.
- ⁸ Ibid
- ⁹ Democracy and Sustainability Institute (IDS), Recommendations for improving SABESP (Basic Sanitation Company of São Paulo State) tariffs, 2019, available on https://ids-ecostage.s3.amazonaws.com/media/Recomenda%C3%A7%C3%B5es_para_a_tarifa_da_Sabesp_Relat%C3%B3rio_Final_Setembro_2019.pdf, accessed on 6 July 2020.
- ¹⁰ Regulation Project for the Water and Sanitation Sector - Sectorial Diagnosis and Proposed Actions. Brazilian Association of Sanitary and Environmental Engineering, Instituto Trata Brasil, 2017. available on: <http://www.tratabrasil.org.br/estudos/estudos-itb/outros-estudos>. Consulted on 5 June 2020.
- ¹¹ Systemic Country Diagnostic, World Bank 2016, p.238; available on <http://documents1.worldbank.org/curated/en/180351467995438283/pdf/101431-REVISED-SCD-Brazil-SCD-Final-version-May-6-2016.pdf>, accessed 6 July 2020.
- ¹² In Brazil, basic sanitation includes water supply, sewage, wastewater treatment and municipal solid waste management.
- ¹³ ABAR - Associação Brasileira de Agências de Regulação (2019). Saneamento Básico – Regulação 2017. Available at: <http://abar.org.br/biblioteca>, Consulted on 13 September 2019.
- ¹⁴ Systemic Country Diagnostic, World Bank 2016, p.236; URL see note 10.
- ¹⁵ Official notice by the Brazilian Development Bank BNDES, available at: <https://agenciadenoticias.bndes.gov.br/detalhe/noticia/Aprovacao-do-marco-regulatorio-atraira-mais-investidores-privados-para-o-saneamento-diz-Montezano/>. Consulted on 26 June 2020.
- ¹⁶ Brazil Talk. 2020. Available in: <https://braziltalk.org/2020/03/27/will-bill-3235-2019-ensure-a-sustainable-water-and-sanitation-universalization-in-brazil-a-historical-perspective-of-the-water-and-sanitation-governance-in-brazil/>, consulted on 19 May 2020.
- ¹⁷ Brazilian Institute of Geography and Statistics (IBGE), 2015 National Household Sample Survey - available from: <https://www.ibge.gov.br/estatisticas/sociais/rendimento-despesa-e-consumo/9127-pesquisa-nacional-por-amostra-de-domicilios.html?=&t=resultados>, Accessed on 19 March 2020.
- ¹⁸ FUNCEME, 2017. FUNCEME – Fundação Cearense de Meteorologia e Recursos Hídricos (Ceará Meteorological and Water Resources Foundation). Índices de aridez do Estado do

Ceará (Aridity indices of the State of Ceará). Available at: <http://www.funceme.br/?p=1607>, Consulted on 21 May 2020.

¹⁹ Drought Governance and Adaptive Capacity in NE Brazil. A Case Study of Ceará, 2008.

²⁰ ANA / FUNCEME - Agência Nacional, Monitor de Secas - National Water Agency, Drought Monitor / Fundação Cearense de Meteorologia e Recursos Hídricos - Ceará Foundation of Meteorology and Water Resources); Available at: <http://monitordesecas.ana.gov.br/mapa> and <http://www.funceme.br/app-zend-monitordesecas/auth/>; Consulted on 20 July 2020.

²¹ World Bank, Ceara Water Security and Governance Project, Combined Project Information Documents & Integrated Safeguards Datasheet, March 2019, p.4.

²² Ibid, p.7.

²³ Drought threatens water-truck lifeline in parched northeast Brazil; Consulted on 16 May 2020: <http://www.ipsnews.net/2015/11/drought-threatens-water-truck-lifeline-in-parched-northeast-brazil/>.

²⁴ Fulfils the role of Project Implementing Unit.

²⁵ Operators are hired (without contract) by the Association on the basis of Terms of Volunteer Work and receive a monetary compensation for their part-time collaboration. This kind of informal work relationship is a fragile aspect of the SISAR Model, because it could lead to legal problems; Brazil - An innovative management model for rural water supply and sanitation in Ceará State, by Sueli Correa de Faria for Global Water Partnership South America (#411).

²⁶ Due to KfW's involvement not only as a financier, but mainly, for its participation in the design of the SISAR operation model from the beginning, we did not detail for the purposes of this case study the participation of IBRD, although this entity has been a relevant agent financier of infrastructure for the operation of the systems.

²⁷ The KfW money was channelled through Ceará State Government.

²⁸ Wilson Dos Santos Rocha and Maria Salvetti for Water Global Practice, Case Study SISAR Ceará, World Bank, August 2017.

²⁹ World Bank Data, <https://data.worldbank.org/indicator/SP.POP.TOTL>, accessed 6 July 2020

³⁰ National Household Sample Survey 2015, Brazilian Institute of Geography and Statistics, available on: <https://www.ibge.gov.br/estatisticas/sociais/rendimento-despesa-e-consumo/9127-pesquisa-nacional-por-amostra-de-domicilios.html?=&t=resultados>. Consulted on 19 March 2020.

³¹ Subnational HDI map, <https://globaldatalab.org/shdi/maps/shdi/>, accessed 6 July 2020.

³² Source: <https://enacademic.com/dic.nsf/enwiki/626387>, accessed 6 July 2020.

³³ Brazil Retaking the Path to Inclusion, Growth and Sustainability, World Bank Systemic Country Diagnostic 2016, p.235.

³⁴ According to IPEA (2018). Available at:

https://www.ipea.gov.br/portal/index.php?option=com_content&view=article&id=33432&catid=410&Itemid=433.

³⁵ Source: <https://www.icnl.org/resources/civic-freedom-monitor/brazil>

³⁶ Ibid.

³⁷ More on Trata Brasil: <http://www.tratabrasil.org.br/institucional/quem-somos>, accessed 6 July 2020.