# SDG 6 IN BRASIL

## ANA'S VISION OF THE INDICATORS

2ND EDITION

ANA

NATIONAL WATER AND SANITATION AGENCY - BRAZIL

National Water and Sanitation Agency

Ministry of Regional Development

# SDG 6 in Brazil

## ANA's vision of the indicators

2nd Edition

Brasília – DF

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# Presentation

The United Nations (UN) 2030 Agenda proposes 17 Sustainable Development Goals (SDGs) and 169 corresponding targets, as a result of the consensus reached by delegates from its Member-States in 2015. The SDGs are the essence of the 2030 Agenda and are to be implemented within the 2016- 2030 period. The goals are monitored by indicators and each country's results and historical evolution can be compared, offering a global overview for the worldwide monitoring of the Agenda by the United Nations.

SDG 6, or Sustainable Development Goal 6, consists of 8 targets that aim to "Ensure the availability and sustainable management of water and sanitation for all". The goal deals with sanitation and water resources in an integrated perspective. It allows for the evaluation of each country's scenario as to the availability of water resources, water demands and uses for human activities, aquatic ecosystems conservation actions, water loss reduction, access to water supply, sanitation and sewage treatment.

Today the whole world is following the recommendation to wash their hands with soap and water to avoid Covid-19 contamination, in addition to other hygiene measures that reinforce the importance of access to sanitation.

The National Water and Sanitation Agency (ANA) is the central institution in Brazil responsible for managing water resources and defining the reference standards for providing sanitation services. ANA systematically monitors the conditions and the management of water resources in Brazil through statistics and indicators that feed the National Water Resources Information System (SNIRH).

In 2019, ANA launched the first edition of the *SDG 6 report in Brazil: ANA's vision of the Indicators*. Now, ANA presents the second edition of this publication, containing updates of the time series of indicators and contributions to its calculation due to methodological improvements and new data available. Each indicator has a specific calculation and updating process, both with regard to guidance and data collection by UN custodian agencies, as well as the availability of more current data.

SDG 6 indicators are monitored constantly by ANA in partnership with other bodies such as the Brazilian Institute of Geography and Statistics (IBGE), responsible for monitoring all 17 SDGs, in addition to the Ministry of Health (MS), the Ministry of Regional Development (MDR) and the Geological Survey of Brazil (CPRM). Governance of the 2030 Agenda is coordinated in Brazil by the Secretariat of the Presidency of the Republic (SEGOV-PR).

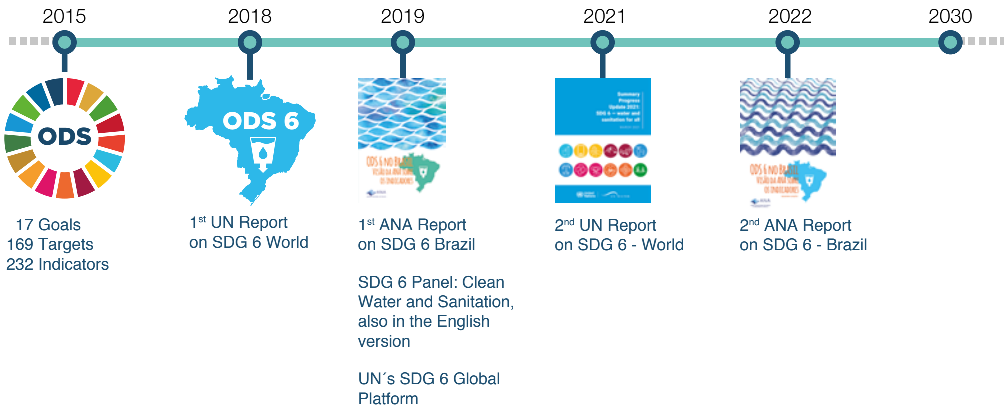
**The Board of the National Water Agency**

# SDG 6: Clean Water and Sanitation

The 2030 Agenda is a result of a consensus led by the United Nations (UN), after a consultation process with its Member-States, civil society and other partners, to boost actions to combat poverty and to promote sustainable development, prosperity and well-being for humans. The document was approved in 2015, during the United Nations Annual General Meeting and consists of 17 Sustainable Development Goals (SDGs) and 169 targets distributed among the SDGs, providing a more concrete and integrated dimension to the Agenda.

The goals for each SDG are monitored by indicators and each country's results and its evolution can be compared, offering a global overview for the worldwide monitoring of the 2030 Agenda by the United Nations.

After the UN Annual General Meeting of 2015, the process of implementing the SDGs in Brazil was instituted through Decree no. 8,892, of October 27, 2016, which created the National Commission for Sustainable Development Goals (CNODS). Under the leadership of new management, the Brazilian government has significantly changed the guidelines for fulfilling the 2030 Agenda since 2019. In April of the same year, Decree no. 9,759 was published, legally in effect as of June 2019, which extinguished the National Commission for SDGs. After the dissolution of CNODS, governance of the 2030 Agenda within the Federal Government is now directly coordinated by the Secretariat of the Presidency of the Republic (SEGOV-PR)




In Brazil, governance of the 2030 Agenda is coordinated and articulated by the Secretariat of the Presidency of the Republic (SEGOV-PR). Decree no. 10,591, of December 24, 2020, established the Special Secretariat for Social Articulation (SEAS/SEGOV) as responsible for assisting the Chief Minister of State in matters related to the implementation of international commitments and agreements to which the country is a signatory.

The UN maintains a platform to disseminate SDG 6 data worldwide. Through their Safeguarding Bodies, the indicators are updated with the countries periodically, through workshops, e-mail exchanges with the focal points and sending and receiving forms for data collection.


In Brazil, most SDG 6 indicators have ANA as a focal point for updating, monitoring and communicating with Custodian Agencies. For some of them, ANA works in an integrated manner with the Brazilian Institute of Geography and Statistics (IBGE), Ministry of Health (MS), Ministry of Regional Development (MDR) and the Geological Survey of Brazil (CPRM).

ANA implements the National Water Resources Policy, coordinates the National Water Resources Management System and establishes reference standards to regulate sanitation services (according to new attributes defined by Law no. 14,026 of 2020).

Water resource management is a relatively recent in Brazil. The National Water Resources Management System (SINGREH), created and established in the 1988 Brazilian Constitution, involves several organs, entities and civil society. It is regulated by Law no. 9,433 of 1997, which established the National Water Resources Policy, along with its foundations, goals and instruments. ANA is the central institution that executes water management in the country and regularly presents statistics and indicators for the identification of the National Water Resources Policy's implementation results and the monitoring of the National Water Resources Plan (PNRH).

For more information, visit https://www.gov.br/ana/pt-br/assuntos/saneamento-basico

In 2021, the Brazilian Water Resources Report was the consolidated diagnosis and prognosis of the new National Water Resources Plan for the period between 2022 and 2040. This set of data and technical information underpins the discussions of the new plan by the water resource user sectors, academia, civil society and governments, through workshops, meetings, seminars and public consultation, in order to obtain contributions to its joint construction.

Available at http:// conjuntura.ana.gov.br.

**NEW LEGAL FRAMEWORK FOR SANITATION IN BRAZIL**

From an institutional perspective, the sanitation sector has experienced great challenges in recent years, resulting from the approval and implementation of a new regulatory framework after a long political and legal clash. Law no. 14,026 was sanctioned on July 15, 2020 and constitutes the new Regulatory Framework for Sanitation in Brazil, which amended, among others, Law no. 11,445/2007 and Law no. 9,984/2000 to give ANA the competence to issue reference standards to regulate the sanitation sector. ANA changed its name to National Water and Sanitation Agency. The reference standards are general rules, which contain guidelines and should be taken into consideration by sub-national regulatory agencies within the scope of public sanitation services under its authority.

Basic sanitation is, according to Law no. 11,445 of 2007, the set of public services, infrastructure and operational facilities for: drinking water supply, sanitation, cleaning and management of municipal solid waste and drainage and management of urban rainwater.

This information is stored in the database that feeds the National Water Resources Information System (SNIRH) and supports the preparation of the annual Brazilian Water Resources Report. This Report is the reference for monitoring and managing the water situation in the country. It is prepared in partnership with agencies and entities that integrate SINGREH, as well as other federal and state public agencies that are part of a broad network that supports the calculation of SDG 6 indicators.

ANA has updated indicators comprising time series and disaggregation in different spatial groups. The updates were made along with the UN´s Custodian Agencies, as well as participation in international workshops to reconcile methodologies and exchange experiences between countries. It is worth noting that ANA, as a focal point in Brazil, has worked with agencies to improve the methodology for calculating indicators through the participation as a specialist in the Target Group for SDG 6.4 and as a pilot country for spatial disaggregation of indicator 6.4.2 (Level of Water Stress).

For the second edition of the SDG 6 report in Brazil: ANA's Vision of the Indicators, the indicators were updated in different ways. There are indicators that were updated using the same methodologies and databases that were already being used and are available in the 1st edition (ex: 6.4.2 and 6.a.1), and others that have undergone changes in the form of calculation or in the databases used. Considering the methods, some indicators have been modified by the Custodian Agencies itself (ex: 6.4.1, 6.6.1 and 6.b.1), others by the focal point in order to improve the calculation for the country (ex: 6.1.1, 6.2.1a, 6.2.1b, 6.3.1, 6.3.2, 6.5.1, 6.5.2).

| INDICATOR | UN Custodian Agency | TIER methodology classification | Update frequency | Last data collected by the Custodian Agency | Focal Point in Brazil | Updated in the 2nd Edition of the SDG 6 Brazil Report |
|---|---|---|---|---|---|---|
| 6.1.1 | World Health Organization (WHO), United Nations Children´s Fund (UNICEF) | **Tier II** | Continuously | 2021 | IBGE | Yes |
| 6.2.1 | WHO, UNICEF | **Tier II** | Continuously | 2021 | IBGE | Yes |
| 6.3.1 | WHO, UN-HABITAT, United Nations Statistics Division (UNSD) | **Tier II** | Continuously | 2021 | ANA | Yes |
| 6.3.2 | United Nations Environment Programme (UNEP) | **Tier II** | Every three years | 2020 | ANA | Yes |
| 6.4.1 | Food and Agriculture Organization of the United Nations (FAO) | **Tier I** | Annually | 2020 | ANA | Yes |
| 6.4.2 | FAO | **Tier I** | Annually | 2020 | ANA | Yes |
| 6.5.1 | UNEP | **Tier I** | Every three year | 2020 | ANA | Yes |
| 6.5.2 | International Hydrological Programme (UNESCO-IHP), United Nations Economic Commission for Europe (UNECE) | **Tier I** | Every three years | 2020 | ANA | Yes |
| 6.6.1 | UNEP, The Convention on Wetlands (Ramsar) | **Tier I** | Annually | 2020 | ANA | Partially |
| 6.a.1 | WHO, Organisation for Economic Co-operation and Development (OECD) | **Tier I** | Every 2 years | 2021 | MDR | Partially |
| 6.b.1 | WHO, OECD | **Tier I** | Every 2 years | 2021 | MDR | Yes |

The TIER classification is assigned by the Inter-agency and Expert Group on SDG Indicators (IAEG-SDGs) at three levels based on the level of development and the availability of data at the global level, as follows:

**Level I:** The indicator is conceptually clear, it has an internationally established methodology and standards are available. Data are regularly produced by countries for at least 50 percent of countries and the population in all regions where the indicator is relevant.

**Level II:** The indicator is conceptually clear, it has an internationally established methodology and standards are available, but the data are not produced regularly by countries.

**Level III:** No internationally established methodology or standards are available for the indicator, but the methodology/standards are being (or will be) developed or tested.

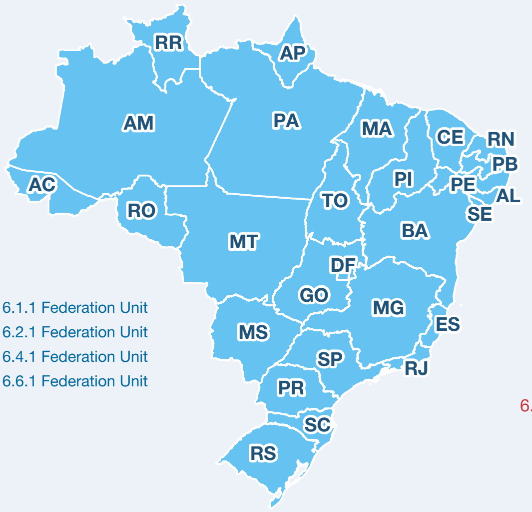
The TIER classification was last updated on March 29, 2021: https:// unstats. un.org/sdgs/iaeg- sdgs/tier-classification/

To facilitate the monitoring analysis of its eight targets - the main purpose of this report -, three main thematic axes were created to present the results by target and indicator, as well as presenting additional data that contribute to its monitoring, under the governance of ANA and partners, to assist in the interpretation of the situation in Brazil. The presentation of territorial groups of the results of the SDG 6 indicators remain those that have already been adopted in the 1st edition of this report: Geographic Regions, Federation Units and Hydrographic Regions, when applicable:

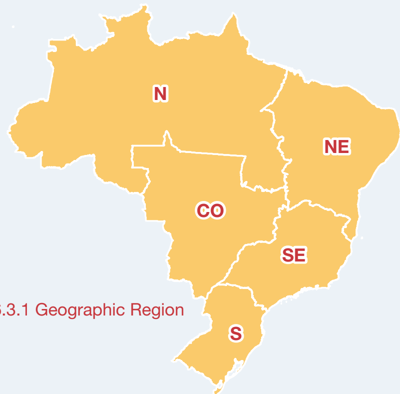
- WATER SUPPLY AND SANITATION;
- WATER QUALITY AND QUANTITY; AND
- MANAGEMENT: SANITATION AND WATER RESOURCES.

SDG indicators 6.5.1, 6.5.2, 6.a.1 and 6.b.1 are only presented at the national level.

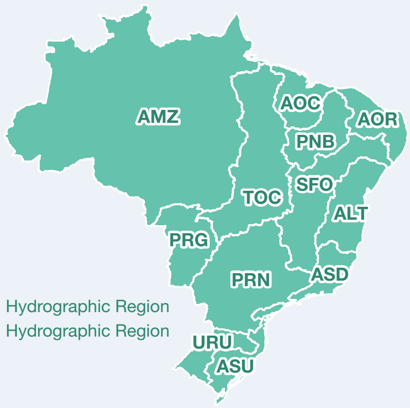
**Territorial groups adopted** in the disaggregation of the national indicator results




6.1.1 Federation Unit
6.2.1 Federation Unit
6.4.1 Federation Unit
6.6.1 Federation Unit




6.3.1 Geographic Region




6.3.2 Hydrographic Region
6.4.2 Hydrographic Region

### Federation Units

Acre (AC)
Alagoas (AL)
Amapá (AP)
Amazonas (AM)
Bahia (BA)
Ceará (CE)
Distrito Federal (DF)
Espírito Santo (ES)
Goiás (GO)
Maranhão (MA)
Mato Grosso (MT)
Mato Grosso do Sul (MS)
Minas Gerais (MG)
Paraná (PR)
Paraíba (PB)
Pará (PA)
Pernambuco (PE)
Piauí (PI)
Rio Grande do Norte (RN)
Rio Grande do Sul (RS)
Rio de Janeiro (RJ)
Rondônia (RO)
Roraima (RR)
Santa Catarina (SC)
Sergipe (SE)
São Paulo (SP)
Tocantins (TO)

### Geographical Region

North (N)
Northeast (NE)
Southeast (SE)
South (S)
Midwest (CO)

### Hydrographical Region

Amazon (AMZ)
Tocantins-Araguaia (TOC)
Western Northeast Atlantic (AOC)
Parnaíba (PNB)
Eastern Northeast Atlantic (AOR)
São Francisco (SFO)
East Atlantic (ATL)
Southeast Atlantic (ASD)
South Atlantic (ASU)
Uruguay (URU)
Paraná (PRN)
Paraguay (PRG)

A summary of the most current results of the SDG 6 indicators presented in this report follows below:

To make it easier to read, detailed results for each indicator are presented throughout this report with the title of the figure surrounded by an orange rectangle.

| | INDICATOR | | |
|---|---|---|---|
| SAFE DRINKING WATER FOR ALL | 6.1.1 | Proportion of the Population using Safely Managed Drinking Water Services | 97.4 % |
| SANITATION FOR ALL | 6.2.1 | Proportion of the Population using Safely Managed Sanitation Services, Including using a Handwashing Facility with Soap and Water Available | 72.2 % |
| BETTER WATER QUALITY | 6.3.1 | Proportion of Wastewater Safely Treated | 58.3 % |
| | 6.3.2 | Proportion of Water Bodies with Good Ambient Water Quality | 77.4 % |
| MORE EFFICIENT WATER USE | 6.4.1 | Change in Water Use Efficiency Over Time | 78.02 RBL/m³ 23.42 USD/m³ |
| | 6.4.2 | Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources | 1.7 % |
| INTEGRATED WATER RESOURCES MANAGEMENT | 6.5.1 | Degree of Integrated Water Resources Management and Implementation (IWRM) | 63.1 % |
| | 6.5.2 | Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation | 62.0 % |
| HEALTHIER ECOSYSTEMS | 6.6.1 | Change in the Extent of Water-Related Ecosystems Over Time | 21 % |
| INTERNATIONAL COOPERATION | 6.a.1 | Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan | 42.1 USD millions |
| MORE LOCAL PARTICIPATION | 6.b.1 | Participation of local communities in water and sanitation management | 5 of 6 sub-sectors |

# Water Supply and Sanitation

There are two SDG 6 targets that fall under the thematic axis of Water Supply and Sanitation, both aimed at the universalization of the supply of drinking water and sewage collection and treatment:

**Target 6.1 - By 2030, achieve universal and equitable access to safe and affordable drinking water for all.**

**Target 6.2 - By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.**

Target 6.1 has as a goal the universalization of water supply by providing safe drinking water to all households, i.e., water free from contamination, available where necessary in sufficient quantity and quality and in accordance with the population's consumption needs, in an equal and fair manner. In turn, target 6.2 deals with the removal of human contact (collection) and the treatment of domestic sewers, as well as the availability of adequate facilities that provide access to hygiene habits (such as hand washing) to the population, and ending open air defecation.

The term "sanitation" used in Target 6.2 is widely used in reference to what Brazilian legislation defines as sewage collection and treatment.

## Target 6.1 is monitored by **Indicator 6.1.1 - Proportion of the Population Using Safely Managed Drinking Water Services.**

For calculating indicator 6.1.1 according to UN guidelines, one should include the proportion of the population that has access to an improved source of water located within or near the household (that is accessible within a 30-minute radius), available where necessary and free from fecal contamination and hazardous chemicals. Improved sources include piped water accessible within the household or premises, supplied by the general network or otherwise supplied (for example: protected wells and springs, public taps, rainwater and bottled water). An improved water source that is not readily accessible and with access not exceeding 30 minutes is categorized as "basic service". When the access time exceeds 30 minutes, the service is categorized as "limited".

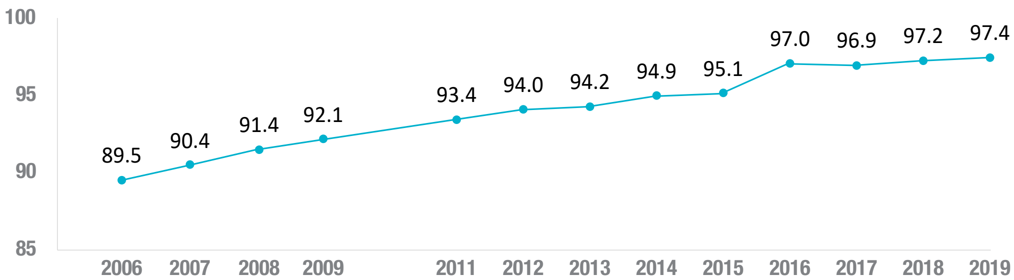
Water free from chemical and fecal contamination is water that meets the standards defined in national or local regulations. In case of the absence of a standard, the reference is the World Health Organization (WHO) guidelines on the quality of drinking water. For global reports, thermotolerant coliforms (or *E. coli*) are the preferred indicators for microbiological quality, and arsenic and fluorine are the priority indicators for chemicals.

In Brazil, indicator 6.1.1 was calculated considering the urban and rural population living in households supplied by the general network and also by other forms of access to water such as wells and cisterns, all of those with internal piping. Considering the available databases, it was not possible to include the availability (existence of intermittencies, for example) in the calculation of the indicator yet. The quality of distributed water has been incorporated into the indicator using the data from the analysis by the Quality of Water for Human Consumption Information Monitoring System (SISAGUA), of the Ministry of Health (MS). However, as the sampling is different between the sources used to analyze access to safe water services and the quality of distributed water, a sub-indicator was created to include the water quality component.

The data referring to the intermittency in the supply is still being assessed. The databases of PNAD (IBGE) and SNIS (MDR) are analyzed, in order to include this component in the calculation of the indicator, in future editions of its monitoring.

The percentage of the Brazilian population that used safely managed drinking water services in 2019 was of around 97.4%. A 5.3% growth was observed between 2009 and 2019. In absolute numbers, this growth represents a quantity of 26 million people in the last 11 years. Despite the high percentages of access to safely managed drinking water services in Brazil, in 2019 there were still 5.5 million people without access to these services.

**Evolution of the population with safely managed drinking water services in Brazil** - 2006-2019 (%)

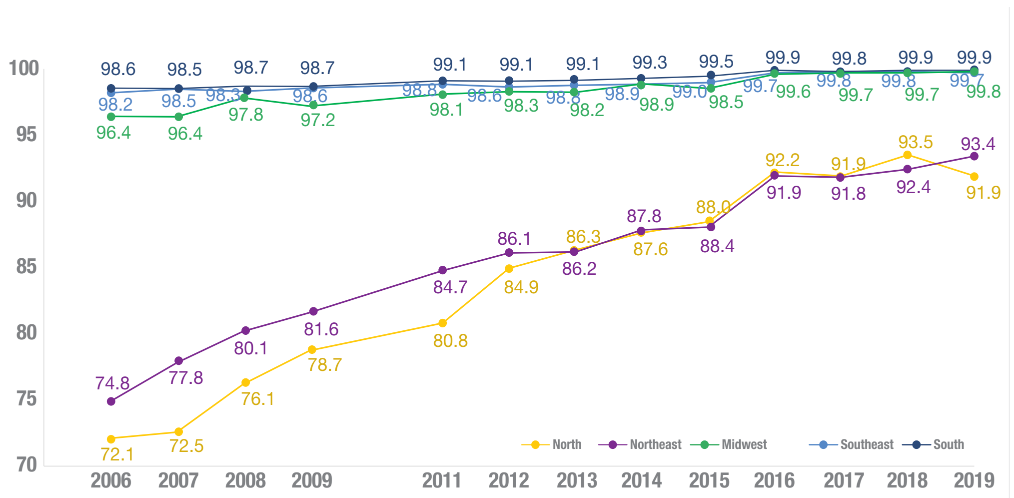



Data from the National Household Sample Survey (PNAD) up until 2015 and the Continuous National Household Sample Survey (PNADC) as of 2016.

Source: IBGE.

The South, Midwest and Southeast regions reached levels near 100%, while the North and Northeast regions reached around 92% of the population. It is possible to observe expressive growth in the North and Northeast regions, that had much lower values of the indicator at the beginning of the period, which has been reducing the difference between the Brazilian Geographical Regions. There was a small reduction in the population with access in the Northern Region in 2019. The reduction may have occurred due to statistical fluctuations, since the data was obtained through a sample survey.

**Evolution of the population with safely managed drinking water services in the Geographical Regions** - 2006-2019 (%)




PNAD data up until 2015 and PNADC data as of 2016.

Source: IBGE.

In Brazil, Ordinances no. 888/2021 and no. 2,472/2021 of the Office of the Minister of the Ministry of Health (GM/MS) recently revised the control and the surveillance monitoring procedures of the quality of water for human consumption and its potability standard, either from a collective system or from an alternative supply solution. Thus, all water intended for human consumption (except for bottled water and water used as raw material to prepare products) distributed collectively through a system or alternative collective solution of water supply, must be the object of water quality control and surveillance.

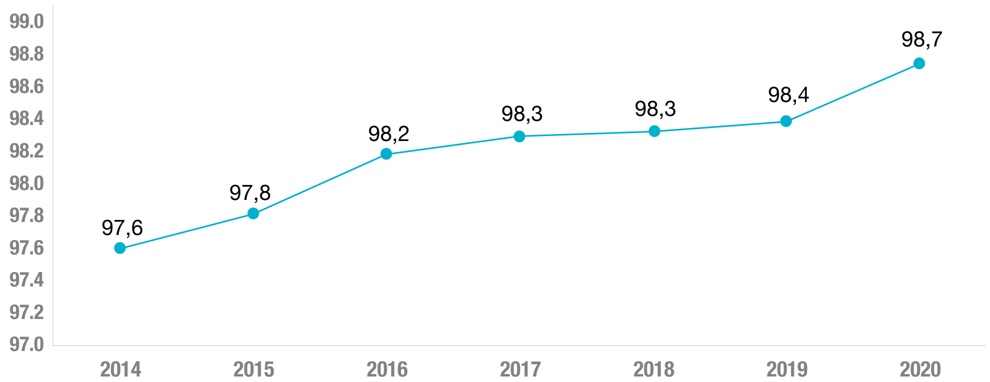
GM/MS Ordinance no. 888, of May 04, 2021, and GM/MS no. 2,472, of September 28, 2021, amended Annex XX of GM/MS Consolidation Ordinance no. 5, of September 28, 2017.

SISAGUA´s data are from the Quality of Water for Human Consumption Information Monitoring System (Vigiagua) National Program and are available to the public at http://dados.gov.br/dataset?q=sisagua. The data is divided into "Control" (monitored by those in charge of the water supply services according to the sampling defined in the potability standard and established according to the population supplied) and "Surveillance " (monitored by professionals in the health care sector, considering Vigiagua´s National Guideline of the Sampling Plan and the population of the municipality). The MS Epidemiological Bulletin (in press) shows the analysis of water quality distributed by Control and surveillance sampling and will be made available on the Ministry of Health´s website.

It is up to the responsible for the system or the collective alternative solution to exercise water quality control and to forward monthly, quarterly and half-yearly parameter analysis reports with information on water quality control to the public health authority of the states, the Federal District and the Municipalities.

Data from the monitoring of the quality of the consumed water by the population are added to SISAGUA, provided by the MS. This data was used to prepare the percentage series of fecal contamination-free sampling, i.e., with the absence of thermotolerant coliforms (*E.coli*). The total percentage of samples without *E.coli* reached 98.7% in 2020.

**Percentage of samples without *E.coli* in Brazil** (2014-2020)

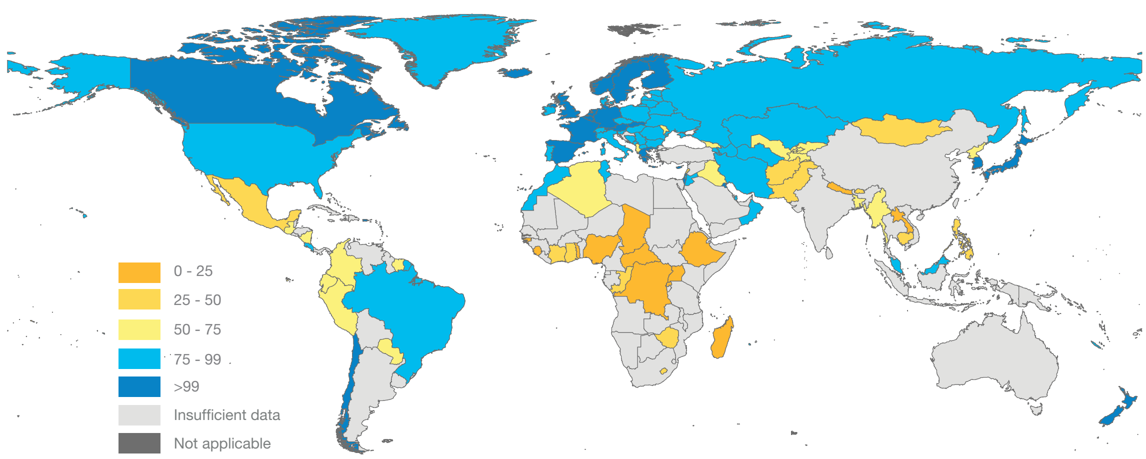



Data source: SISAGUA/MS.

Worldwide, 1.6 billion people have had access to safely managed drinking water services since the year 2000. Globally, seven out of ten people used safe drinking water services in 2017, corresponding to a global access percentage of 71%.

The proportion of the global population with access to safely managed drinking water services increased from 70% to 74% between 2015 and 2020, representing an increase of 193 million people. In the urban environment, coverage increased from 85% to 86%, while in the rural environment it went from 53% to 60%.

**Evolution of the population with safely managed drinking water services in the World** in 2020 (%)*




*Data available for 138 countries around the world.

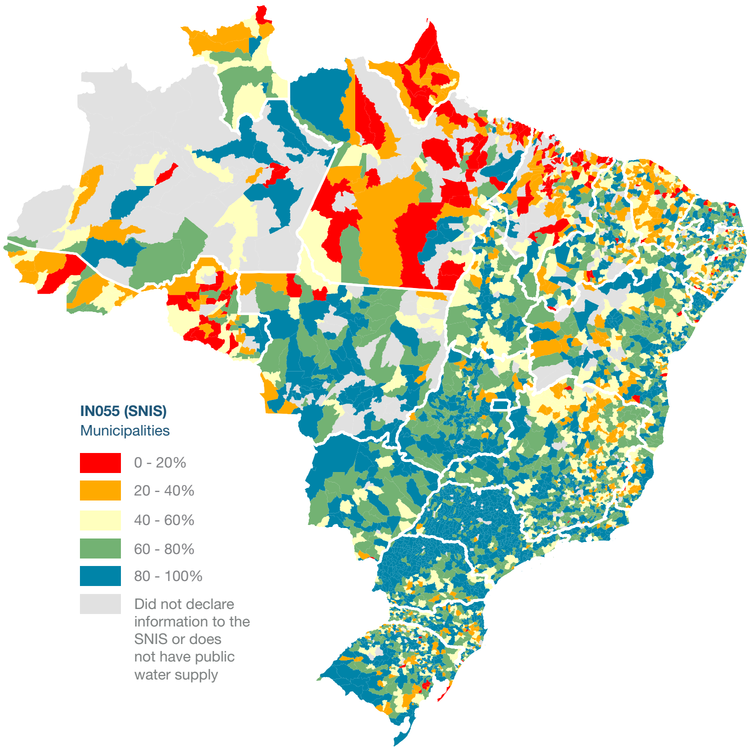
Source: UN-Water´s SDG6 Summary Progress Update 2021 Report.

In addition to the data for the entire country or divided by geographical region and federation unit, the public water network's supply rates can be obtained by Brazilian municipality in 2019, based on the data provided by the National Sanitation Information System (SNIS) of the MDR. This year this number was an average (IN055) of 83.7% for the country. It should be noted that the index does not include alternative supply solutions, which are very common in Brazil's North and Northeast regions and in less densely populated areas, such as rural areas (unlike the data used to calculate indicator 6.1.1, which include wells, cisterns and other sources, provided there is internal piping).

The coverage of water supply by the general network can be analyzed by the municipalities that declared data to SNIS. Indicator IN055: Index of total water service to the population. Available at http://www.snis.gov.br/

Source: SNIS/MDR.

**Total water supply network service index in Brazil, by municipality** – 2019 (%)




Water Security, according to the UN´s concept, exists when water is available in a sufficient quantity and quality to meet human needs, the practice of economic activities and the conservation of aquatic ecosystems, accompanied by an acceptable level of risk related to droughts and floods.

The high coverage index indicates access to the network of a water supply system, but does not necessarily mean full access to the water supply. Ensuring water security for human supply requires, in addition to investments in infrastructure (for example, expanding the physical coverage of the water and sewage network), efficient management. These actions allow concrete results to be achieved to conserve and recover water and ensure the necessary water supply for the multiple ways water resources are used. In Brazil, 43% of urban areas are supplied exclusively by surface springs and 14% by surface and underground springs (mixed supply) with a predominance of surface use, totaling 3,169 urban regions and a population of 156 million inhabitants (84% of Brazil's total). This coverage indicator shows the great relevance of rivers, lakes and reservoirs in the supply mainly of large population centers, as is the case of the cities of São Paulo, Rio de Janeiro, Brasília, Fortaleza and Porto Alegre. According to the 2nd Edition of the Water Atlas 77.3 million inhabitants, 36% of the Brazilian urban population, lives in cities (1,975) with a water supply classified with medium water security and 50.8 million in urban regions (785) that have low or minimum water security.

The Water Atlas is based on the assessment of all water sources and urban water supply systems and suggests solutions to meet current and future demands for the 5,570 Brazilian municipalities by 2035. The 2nd edition was released in October 2021 and is available at: http:// atlas.ana.gov.br. Also, the National Water Security Plan proposes structural (interventions) and non-structural (management) measures to prevent and solve problems regarding water supply in situations of scarcity: https://pnsh.ana.gov.br/.

# METHODOLOGICAL SHEET

## INDICATOR 6.1.1

### Concept

The indicator aims to quantify the proportion of a country's population that uses safely managed drinking water services, which are available where necessary and free from fecal contamination and hazardous chemicals. The standards used as reference are associated with piped water for use in households or properties; public taps; shallow or tubular wells; protected springs and rainwater. In this way, the indicator incorporates three aspects: water availability when necessary[1], accessibility by the population and quality of the water used.

[1]Intermittence Data have not yet been incorporated into the calculation of the indicator.

### Methodology and data sources

For the calculation of indicator 6.1.1, one used data from the National Household Sample Survey – PNAD (2009 to 2015), that considers the rural and urban population residing in households served by the general network or by collective alternatives, and data from Continuous PNAD (2016 to 2019), that considers the households with indoor plumbing (given that it meets the prerogative of accessibility because there is no data on time of access to sources), supplied by the general network or alternative sources, such as deep or artesian wells, shallow wells, water table or cistern, fountain or spring.

Data sources:

**IBGE/SIDRA** – Table 1955 | **IBGE** – Continuous PNAD

**Ministry of Health** - SISAGUA

### Time series available for 2021:

2006 to 2019 (PNAD and PNADC), except 2010 (year in which the Census was carried out, there was no concomitant PNAD)

2014 to 2020 (SISAGUA)

### Spatial unit for calculation

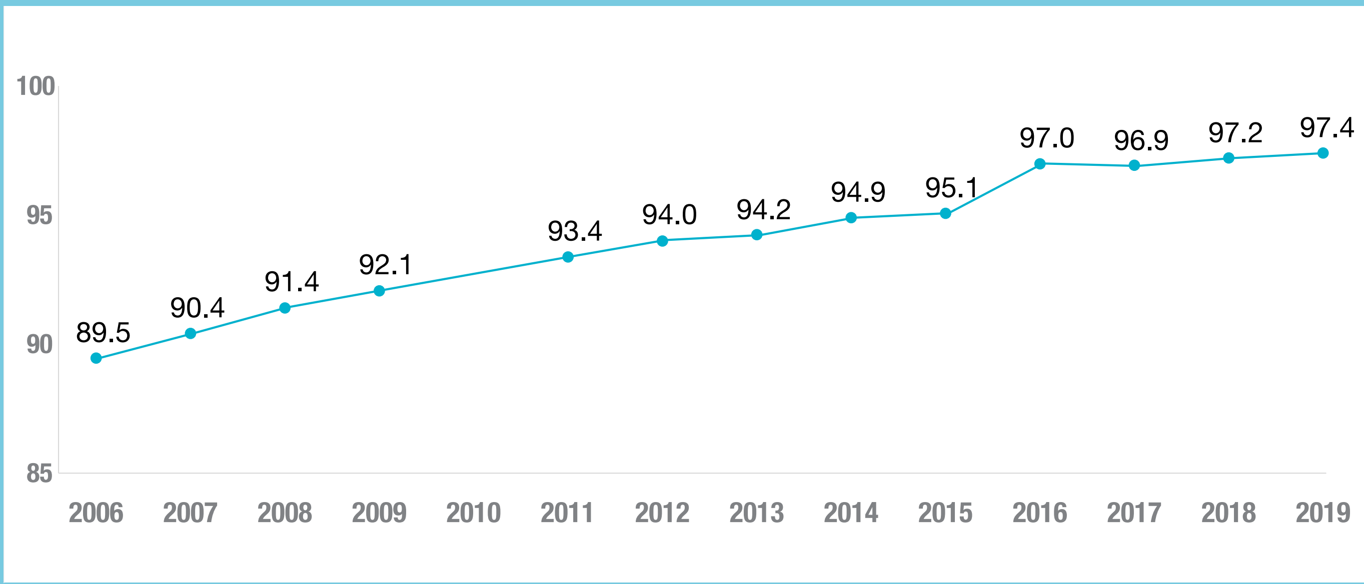
Federation Unit (UF), Geographical Region, Brazil

### Step by step

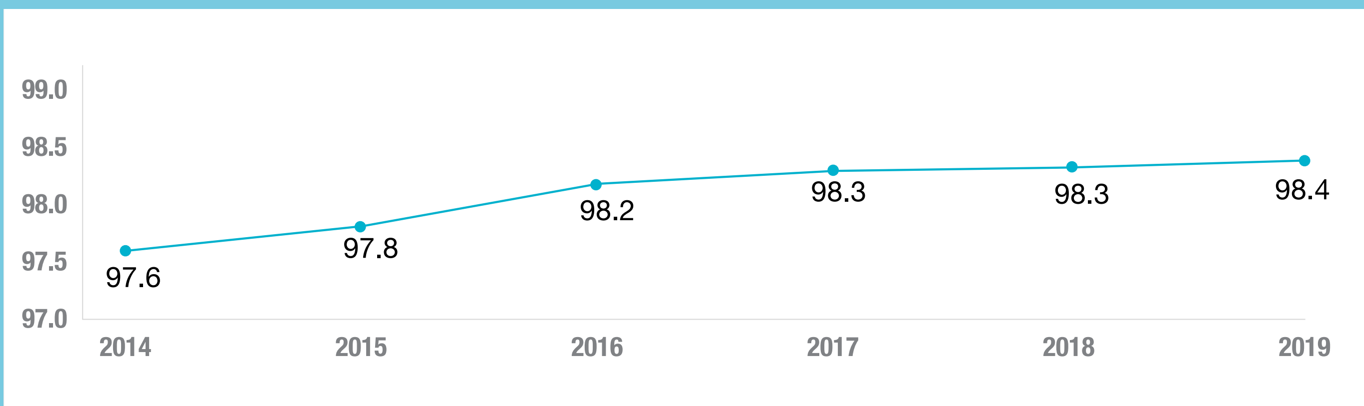
1. Consultation to the PNAD Time series by Federation Unit through the IBGE Automatic Recovery System (SIDRA) database, to obtain the total population and the proportion of the population residing in households with indoor plumbing serviced by the general network or by alternative sources (Table 1955).
2. Consultation to the Continuous PNAD by Federation Unit for the calculation of households with indoor plumbing supplied by the general network, independent of frequency, and by other sources (wells, ponds, fountains and springs). The "Housing" table, "Basic Services" tab, indicator was accessed: "Percentage of residents in households (percentage)", opening variable "Plumbing" and category: "Indoor plumbing".
3. The aggregation is made by Federation Unit, Geographical Region and for Brazil, and for the total population per reference year.
4. For the analysis of the quality of the distributed water, the Control and Surveillance samples from SISAGUA´s database were consulted, with extraction on 04/14/2021.
5. Sampling accounting was performed within the potability standards for *E. coli* (without thermotolerant coliforms) in relation to the total sampling and grouped data of Control and Information Monitoring, for Brazil.

# Proportion of the Population Using Safely Managed Drinking Water Services

**Evolution of Indicator 6.1.1 in Brazil** – 2009-2019 (%)




**Evolution of water quality distributed for human consumption –** 2014-2019 (Percentage of samples without *E.coli* in Brazil)



# METHODOLOGICAL SHEET

## INDICATOR 6.1.1

**Times Series of Indicator 6.1.1** (%)

| Territorial Unit | 2006 | 2007 | 2008 | 2009 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rondônia | 89.5 | 83.8 | 87.9 | 91.3 | 91.1 | 97.3 | 94.8 | 97.5 | 99.0 | 99.0 | 98.5 | 99.0 | 98.5 |
| Acre | 54.8 | 63.9 | 63.0 | 65.7 | 72.8 | 72.0 | 71.0 | 72.9 | 78.6 | 85.7 | 83.7 | 88.2 | 90.2 |
| Amazonas | 82.7 | 76.1 | 82.5 | 84.7 | 82.1 | 87.8 | 87.0 | 88.5 | 87.7 | 91.0 | 92.2 | 92.1 | 89.6 |
| Roraima | 82.7 | 82.0 | 88.5 | 90.6 | 93.5 | 94.7 | 92.4 | 93.6 | 92.8 | 98.7 | 97.8 | 98.3 | 96.9 |
| Pará | 61.9 | 65.6 | 68.2 | 70.8 | 76.1 | 80.0 | 83.5 | 84.8 | 86.1 | 90.5 | 89.2 | 92.1 | 89.7 |
| Amapá | 80.1 | 88.1 | 94.3 | 94.6 | 85.6 | 90.1 | 92.1 | 90.9 | 87.6 | 95.4 | 97.5 | 95.9 | 98.0 |
| Tocantins | 81.3 | 81.7 | 83.4 | 86.2 | 88.2 | 90.4 | 92.6 | 92.6 | 94.5 | 96.9 | 97.8 | 97.8 | 98.0 |
| North | 72.1 | 72.5 | 76.1 | 78.7 | 80.8 | 84.9 | 86.3 | 87.6 | 88.4 | 92.2 | 91.9 | 93.5 | 91.9 |
| Maranhão | 60.8 | 61.9 | 70.3 | 66.8 | 70.9 | 73.8 | 70.4 | 76.4 | 76.7 | 89.2 | 89.5 | 90.7 | 91.1 |
| Piauí | 63.4 | 65.1 | 70.3 | 70.9 | 81.2 | 84.1 | 83.7 | 87.5 | 88.2 | 91.0 | 91.9 | 93.6 | 94.8 |
| Ceará | 76.7 | 80.7 | 81.2 | 84.9 | 83.9 | 85.0 | 86.1 | 89.2 | 88.2 | 91.1 | 92.4 | 92.6 | 93.7 |
| Rio Grande do Norte | 83.3 | 86.7 | 88.5 | 89.8 | 91.1 | 93.2 | 93.2 | 91.7 | 92.9 | 93.9 | 94.4 | 94.5 | 94.7 |
| Paraíba | 80.6 | 81.5 | 83.9 | 83.3 | 87.6 | 87.7 | 89.3 | 89.7 | 91.1 | 88.7 | 87.3 | 88.7 | 91.0 |
| Pernambuco | 78.8 | 78.9 | 79.6 | 83.1 | 87.6 | 88.2 | 87.5 | 88.2 | 87.9 | 90.9 | 89.9 | 90.4 | 91.8 |
| Alagoas | 69.5 | 76.3 | 76.6 | 78.5 | 84.2 | 84.0 | 87.5 | 87.1 | 87.0 | 91.1 | 89.9 | 90.2 | 91.9 |
| Sergipe | 89.1 | 91.0 | 89.3 | 89.9 | 88.2 | 89.3 | 90.3 | 91.2 | 90.5 | 94.1 | 93.6 | 94.1 | 93.9 |
| Bahia | 75.8 | 80.6 | 83.0 | 84.8 | 87.9 | 89.3 | 89.7 | 90.4 | 91.1 | 94.6 | 94.4 | 94.9 | 95.5 |
| Northeast | 74.8 | 77.8 | 80.1 | 81.6 | 84.7 | 86.1 | 86.2 | 87.8 | 88.0 | 91.9 | 91.8 | 92.4 | 93.4 |
| Minas Gerais | 95.5 | 96.5 | 96.9 | 96.8 | 98.0 | 98.1 | 98.5 | 98.9 | 98.8 | 99.6 | 99.7 | 99.7 | 99.7 |
| Espírito Santo | 97.3 | 99.1 | 98.7 | 99.7 | 99.5 | 99.6 | 99.4 | 99.8 | 99.1 | 99.9 | 99.9 | 99.9 | 99.9 |
| Rio de Janeiro | 98.7 | 98.7 | 98.1 | 99.3 | 98.7 | 97.6 | 97.9 | 97.4 | 98.3 | 99.3 | 99.6 | 99.8 | 99.6 |
| São Paulo | 99.3 | 99.3 | 99.0 | 99.0 | 99.3 | 99.2 | 99.2 | 99.3 | 99.3 | 99.9 | 99.9 | 99.8 | 99.8 |
| Southeast | 98.2 | 98.5 | 98.3 | 98.6 | 98.8 | 98.6 | 98.8 | 98.9 | 99.0 | 99.7 | 99.8 | 99.8 | 99.7 |
| Paraná | 98.9 | 98.7 | 98.7 | 98.6 | 99.0 | 98.9 | 99.2 | 99.5 | 99.5 | 99.9 | 99.9 | 99.9 | 99.8 |
| Santa Catarina | 98.5 | 98.5 | 98.5 | 99.0 | 99.1 | 98.5 | 99.0 | 99.2 | 99.3 | 99.9 | 99.9 | 99.9 | 99.9 |
| Rio Grande do Sul | 98.2 | 98.3 | 98.8 | 98.6 | 99.2 | 99.5 | 99.1 | 99.2 | 99.5 | 99.9 | 99.8 | 99.8 | 99.8 |
| South | 98.6 | 98.5 | 98.7 | 98.7 | 99.1 | 99.1 | 99.1 | 99.3 | 99.5 | 99.9 | 99.8 | 99.9 | 99.9 |
| Mato Grosso do Sul | 98.2 | 97.5 | 97.8 | 97.6 | 97.9 | 98.1 | 98.5 | 98.8 | 99.1 | 99.6 | 99.8 | 99.8 | 99.9 |
| Mato Grosso | 89.8 | 92.1 | 95.3 | 93.2 | 96.4 | 97.0 | 96.5 | 98.1 | 97.5 | 99.4 | 99.5 | 99.3 | 99.6 |
| Goiás | 97.9 | 97.3 | 98.3 | 98.2 | 98.6 | 98.8 | 98.7 | 99.3 | 98.5 | 99.8 | 99.7 | 99.7 | 99.7 |
| Distrito Federal | 99.2 | 98.3 | 99.6 | 99.2 | 99.1 | 98.8 | 99.0 | 98.8 | 99.3 | 99.3 | 99.9 | 100.0 | 99.9 |
| Midwest | 96.4 | 96.4 | 97.8 | 97.2 | 98.1 | 98.3 | 98.2 | 98.9 | 98.5 | 99.6 | 99.7 | 99.7 | 99.8 |
| **Brazil** | **89.5** | **90.4** | **91.4** | **92.1** | **93.4** | **94.0** | **94.2** | **94.9** | **95.1** | **97.0** | **96.9** | **97.2** | **97.4** |

Target 6.2 of SDG 6 aims to universalize the collection and treatment of the countries sewage by 2030. The target is monitored by **Sub-indicator 6.2.1a: Proportion of the Population Using Safely Managed Sanitation Services,** and by **Sub-indicator 6.2.1b: Proportion of Population with Handwashing Facilities with Soap and Water Available.**

The population that uses safely managed sanitation is defined by the UN as one that has an improved sanitation facility in their households that is not shared with other households, and whose sewage is treated and disposed of *in situ* (on-site), or transported and treated outside of the land or property. Improved sanitary facilities include private toilets with a flushing system or another form of adding liquids by the user to direct it to the sewage collection system, septic tanks or pit latrines, improved pit latrines (with slabs or ventilation) and composting toilets. Improved sanitary facilities which do not meet the mentioned treatment criteria are characterized as "basic services", such as untreated pit latrines. As for the septic tanks, they are considered to be appropriate on-site treatment solutions.

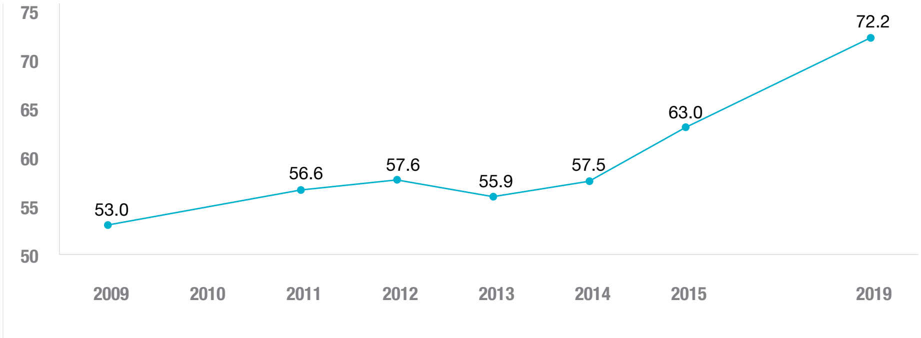
Sub-indicator 6.2.1a included the portion of the population that has access to the sewage collection network and its treatment, or septic tanks. For sub-indicator 6.2.1b, the population that has bathrooms in their own household was recorded. Brazil does not have surveys that identified the presence or absence of handwashing facilities with soap and water. However, bathrooms are basic facilities for maintaining hygiene habits, and it is a cultural habit of the Brazilian population to wash their hands with soap and water.

The portion of the Brazilian population that used safely managed sanitation services in 2019 was 72.22%. The population with access to the collection and treatment of sewage through the public network, including septic tanks connected to the network, reached 52.08% of the population. On the other hand, the portion of the population that had its sewage sent to septic tanks not connected to the network represented 20.2% of the population.

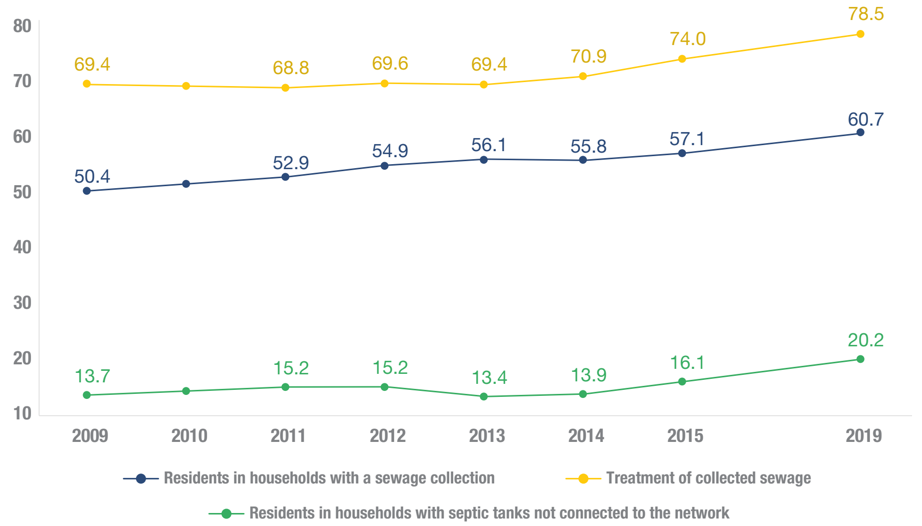
The indicator was only calculated for the years when the PNAD provided septic tank data separately from pit latrines data, which did not occur in the years 2016, 2017 and 2018. In the first edition of this report, we used projections of the use of septic tanks (connected and not connected to the network) for the years mentioned. Regarding the year 2010, in which the Census was carried out, there was no concomitant PNAD.

Data source: IBGE and SNIS/MDR.

**Evolution of the population using safely managed sanitation services in Brazil –** 2009-2019 (%)




**Evolution of safe sewage treatment components in Brazil** (%)

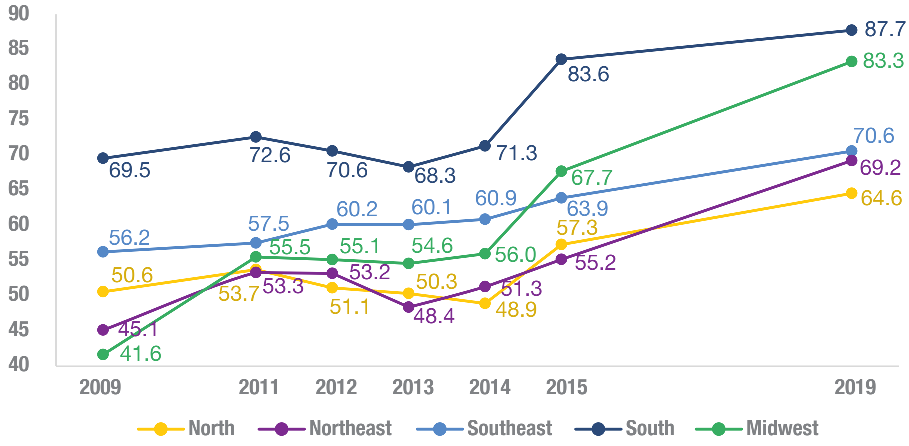



There is an increase of 19.2% in the proportion of the Brazilian population that used safely managed sanitation services between 2009 and 2019. This evolution corresponds to 47.8 million people who have begun using these services in the last 11 years. Even so, 58.4 million Brazilians still do not have proper access.

The growth of sub-indicator 6.2.1a over the years analyzed was due to the increase in collected sewage treatment (SNIS IN016), as well as the population served by the sewage collection network and by septic tanks not connected to the network. These components show that the positive evolution of the indicator is not only related to conventional sewage treatment, with septic tanks playing a fundamental role in the safe management of wastewater, especially in the rural area.

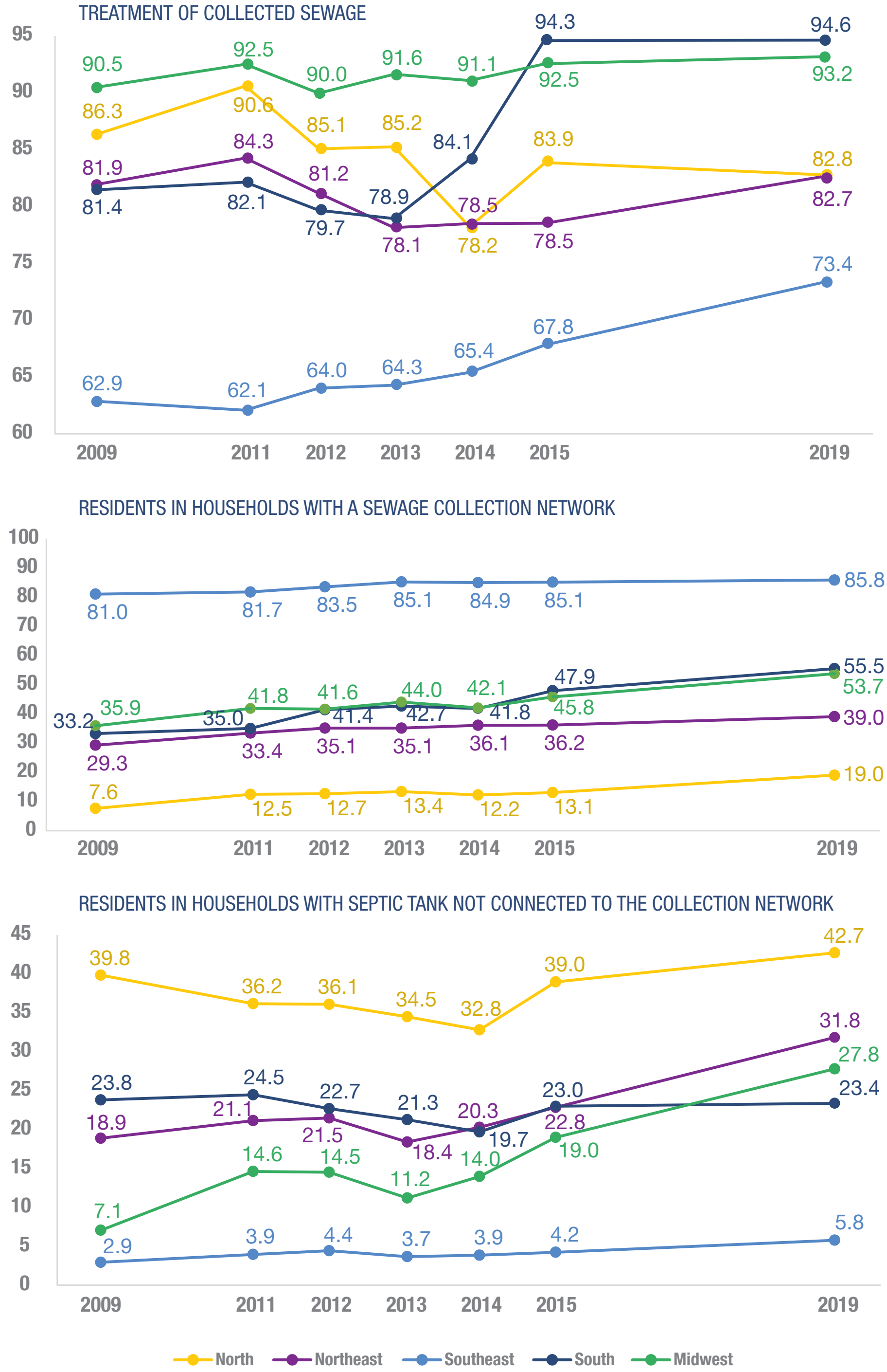
Among the Geographical Regions, we highlight the role of septic tanks not connected to the network in the Northeast, Midwest and North Regions. Regarding sewage treated in treatment plants (WWTPs), it is worth mentioning an increase in the treated sewage collected in the South and Southeast Regions. The South and Midwest regions reach percentages for indicator 6.2.1a higher than 80% of the population.

## Evolution of the population using safely managed sanitation services in the Geographical Regions – 2009-2019 (%)



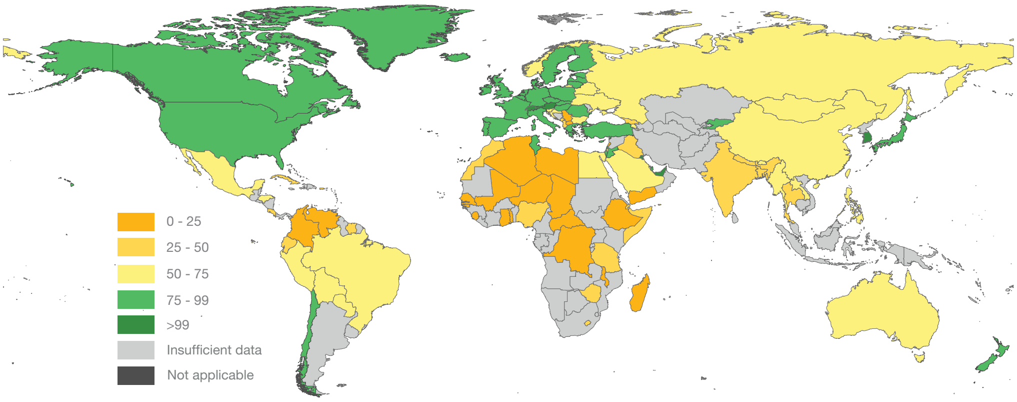

Data source: IBGE and SNIS/MDR.

## Evolution of the components of safe sewage treatment in Geographical Regions



Worldwide, the global population with access to safely managed sanitation services increased from 47% to 54% between 2015 and 2020, representing still 3.6 billion people who lacked this access. In the rural environment, coverage increased from 36% to 44%, and in the urban environment, from 57% to 62%. Two-thirds of the population without access to basic services is located in rural areas. In the same period, the global population that practiced open defecation reduced by one third, from 739 million people to 494 million, with 85% of this decrease occurring in rural areas.

**Population with access to safely managed sanitation services in the World in 2020** (%)

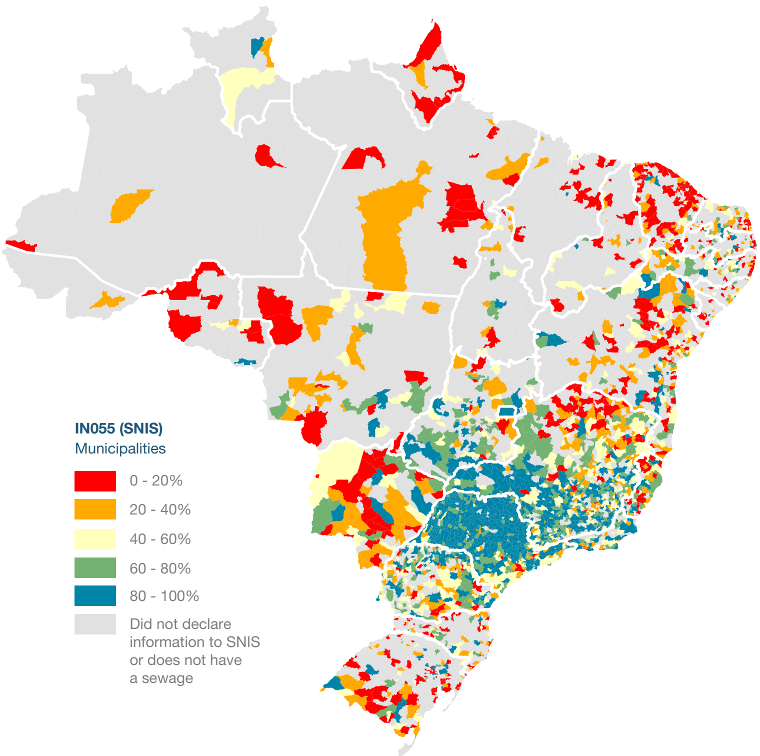



Source: UN-Water´s SDG6 Summary Progress Update 2021 Report.

Due to the lack of municipal data to calculate sub-indicator 6.2.1a the same way as suggested by the UN, data can be obtained by municipality from the total service rate of the public sewage collection network, Indicator IN056 of SNIS, and the country´s average was at 54.1 in 2019. However, it should be noted that the index does not include individual sanitation solutions, such as septic tanks (unlike sub-indicator 6.2.1a), nor information on sewage treatment, which will be addressed in more detail in target 6.3.

Differences between information of the population served by the SNIS and PNAD sewage collection network - used to calculate this indicator - can be explained by the methodology of the databases: SNIS/MDR is a system that collects self-declared information from sanitation service providers while PNAD/IBGE is a sample survey of households.

**Sewage Collection Services Rate in the Municipalities, in 2019 (%)**



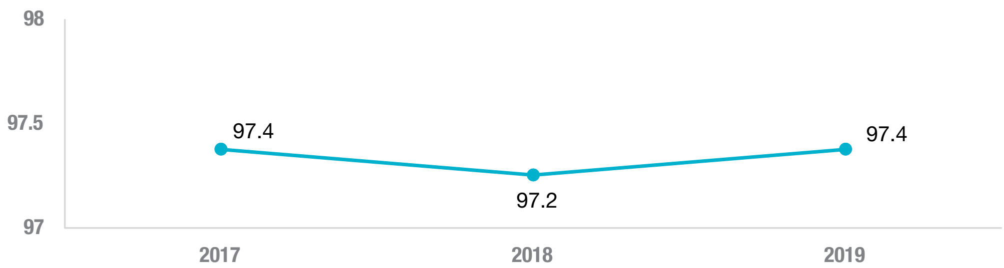

Coverage of the sewage collection network can be analyzed by municipality with data from SNIS – Indicator IN056: Total Sewage Service Index Referred to the Water Supplied Municipalities. Available at http:// www.snis.gov.br/

Source: SNIS/MDR.

The COVID-19 pandemic highlighted the importance of handwashing to prevent and control the spread of infectious diseases. To 'Build back better' and improve resilience, governments must accelerate their efforts to ensure hand hygiene for all. In Brazil, the population with an exclusive bathroom per household reached 97.4% in 2019, which means that 5.5 million people still did not have access to these facilities in their homes. Around the world, from 2015 to 2020, the global population with basic handwashing facilities with soap and water at home increased from 67% to 71%, but 2.3 billion people still do not have these facilities in their homes.

This expression "Build back better" means a strategy aimed at reducing the risks for people of nations and communities in the wake of future disasters and emergencies. It was adopted by the UN Member-States as one of the four priorities of the Sendai Framework to recover from disasters, reduce risks and sustainable development: https://www.un.org/en/coronavirus/building-back-better-requires-transforming-development-model-latin-america-and-caribbean.

**Evolution of the population with access to a bathroom for exclusive use by the household in Brazil** – 2017-2019 (%)



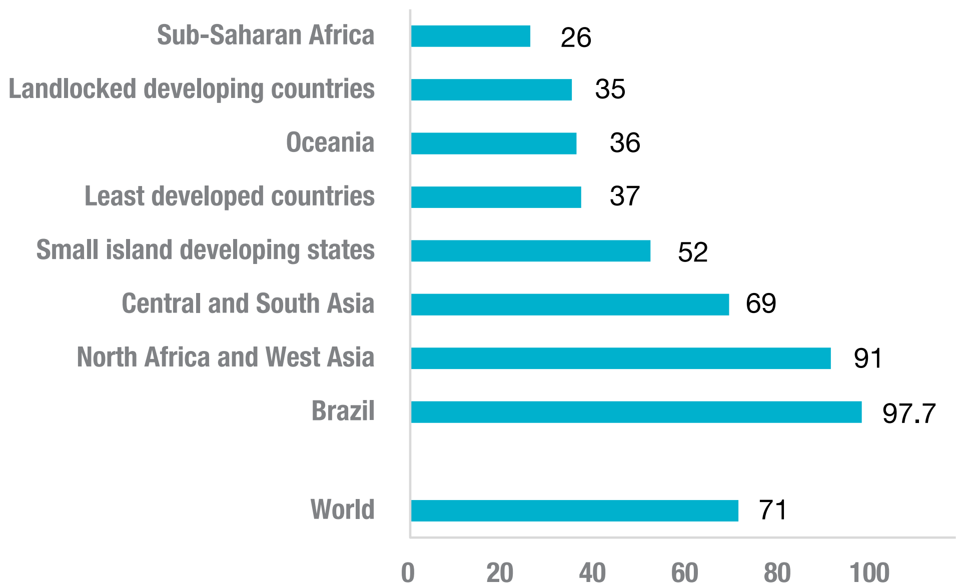

The estimate is based on the "population with access to a bathroom for exclusive use by the household" indicator of the PNAD. However, the survey does not show whether or not there is, in the bathroom installation, equipment (sink, faucet, water outlet, etc.) to wash hands with soap and water.

Data source: IBGE.

**Evolution of the population with access to a bathroom for exclusive use by the household in the Geographical Regions** – 2017-2019 (%)

| | 2017 | 2018 | 2019 |
|---|---|---|---|
| North | 90.2 | 89.5 | 89.0 |
| Northeast | 94.2 | 93.8 | 94.5 |
| Southeast | 99.7 | 99.7 | 99.8 |
| South | 99.7 | 99.8 | 99.8 |
| Midwest | 99.7 | 99.9 | 99.7 |

**Proportion of population with handwashing facilities with soap and water around the world in 2020 (%)**




Source: UN-Water´s SDG6 Summary Progress Update 2021 Report.

ANA has maintained constant exchanges of information and revisions of data from Brazil along with the Pan American Health Organization (PAHO/UN) on the data compiled by the JMP (the WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene), since the data related to indicators 6.2.1 and 6.3.1 presented in the reports from Brazil differ from the data published by the UN in the SDG6 global monitoring reports. The appropriate methodology for calculating the indicators has also been assessed along with IBGE, considering the available databases and the reality in Brazil.

For sewage treatment data, no information is available on the disposal of waste from septic tanks not connected to the collection network, which in Brazil represent 20% of the population in 2019, a significant percentage. In the absence of information, according to the methodology, a reduction factor is applied to the percentage of the population using this alternative solution. To calculate the indicators in the Brazilian reports, this reduction is not applied because they are considered safe solutions. Thus, the population using septic tanks not connected to the network is considered here to have access to safe wastewater treatment.

In addition, it is considered that all sewage treated in WWTPs receives safe treatment, although there is no information on treatment levels (SDG indicators request at least secondary treatment). In Brazil an analysis is being made of the level of treatment required in each WWTP. This analysis is made according to the characteristics of the receiving body in the process of obtaining the right to use water resources and with the legislation in force in the environmental licensing stage. The regulations require very broad quality standards, so that wastewater can be discharged without causing health risks to the population, respecting downstream uses in water bodies, or avoiding significant damage to the environment. However, the treatment process selected for a WWTP is not restricted solely to environmental, public health, and/or legal requirements. In addition, economic, social, operational aspects, the availability of the area and even the desires of the community are considered.

According to the Sewage Atlas, in Brazil, the average efficiency of BOD removal in WWTPs is 74%, and individual solutions is 60%. For the study, a survey of the treatment of domestic sewage in all Brazilian municipalities was conducted, with efficiency data in the removal of BOD, survey of WWTPs and necessary solutions according to the assimilation capacity of organic loads by the receiving bodies. The publication was recently updated in 2019 and is available at: https://metadados. snirh.gov.br/geonetwork/ srv/por/catalog.search#/ metadata/1d8cea87-3d7b- 49ff-86b8-966d96c9eb01

Within the implementation scope of the public sanitation policy, federal legislation entrusted the Federal Government with the responsibility of preparing the National Water Supply and Sanitation Plan (PLANSAB). This plan has the purpose of establishing a set of guidelines, goals and strategic actions to universalize sanitation services in the national territory. The Plan has goals for residential water supply by network or other piped sources, collection of household sewage by network or septic tank and treatment of collected wastewater. Thus, it relates directly to targets 6.1 and 6.2.

# METHODOLOGICAL SHEET

## INDICATOR 6.2.1

### Concept

The indicator measures the parcel of the population using sanitation services and sanitary facilities with adequate safety criteria regarding hygiene habits.

As defined by the UN, the indicator is tracked through two sub-indicators: the proportion of the population that uses safely managed sanitary services (internal piping for the conduction of the wastewater from toilets to public sewage drains and septic tanks or pit latrines with treatment); and the proportion of the population that has hand washing facilities in their households.

The population that uses safely managed sanitation services is defined by the UN as one that has an improved sanitation facility in their household that is not shared with other households, and whose sanitary waste is treated and disposed of *in situ* (onsite), or transported and treated outside the land or property. Improved sanitary facilities include private toilets with a flushing system or another form of adding liquids by the user to direct it to the sewage collection system, septic tanks or pit latrines, improved pit latrines (with slabs or ventilation) and composting toilets.

Improved sanitary facilities which do not meet the aforementioned treatment criteria are characterized as “basic services”, such as pit latrines without sanitary waste collection for treatment. As for septic tanks, they are considered to be appropriate on site treatment solutions.

### Methodology and data sources

To calculate the indicator, SNIS, PNAD and Continuous PNAD information was used, adopting the following formulation:

$$\text{Sub-indicator 6.2.1a} = (\text{IN016} \times \text{PNAD}_A) + \text{PNAD}_B$$

Where:

IN016 = Sewage treatment index (in %), given by the following formulation:

$$\frac{ES006 + ES014 + ES015}{ES005 + ES013}$$

Where:

ES005: Collected sewage volume

ES006: Treated sewage volume

ES013: Volume of imported raw sewage

ES014: Volume of imported sewage treated at the importer’s premises

ES015: Volume of raw sewage treated at the importer’s premises

$PNAD_A$ = Proportion of the resident population in households supplied by a general network or septic tank connected to the network

$PNAD_B$ = Proportion of the resident population in households with a septic tank not connected to the collection network

Data sources:

**SNIS:** Indicator IN016 – Sewage treatment index (percentage);

**IBGE/SIDRA:** PNAD 2009, 2011-2015 – Table 1956

**IBGE:** 2019 Continuous PNAD – Table 7192

### Time series available for 2021

Sub-indicator 6.2.1a: 2009 a 2019 (except 2010[1], 2016[2], 2017[2] e 2018[2])

[1] Year in which the Census was conducted, there was no concomitant PNAD

[2] The indicator was only calculated for the years when the PNAD provided septic tank data separately from pit latrines data, which data separation did not occur in 2016, 2017 and 2018. In the first edition of this report, we used projections of septic tanks (connected and not connected to the network) for the years mentioned. However, as the 2019 PNAD re-submitted the septic tank data, it was decided against using the projections again and to just keep the indicator for the years that have official data.

Sub-indicator 6.2.1b: 2017[3] to 2019

[3] There was a change in the PNAD methodology starting in 2017, and the PNAD 2016 data that was presented in the first edition of this report now show a discontinuity with the data from subsequent years. Up until 2016,

# METHODOLOGICAL SHEET

## INDICATOR 6.2.1

the question was "is there a bathroom, toilet or hole for waste of exclusive use". As of 2017, the question became "is there a bathroom for exclusive use". Thus, the second question is more specific, which led to a slight drop in the percentages, and therefore the data began to be presented just from 2017 onward.

### Spatial unit for calculation

Federation Unit

### Spatial level

Federation Unit, Geographical Region, Brazil

### Step by step

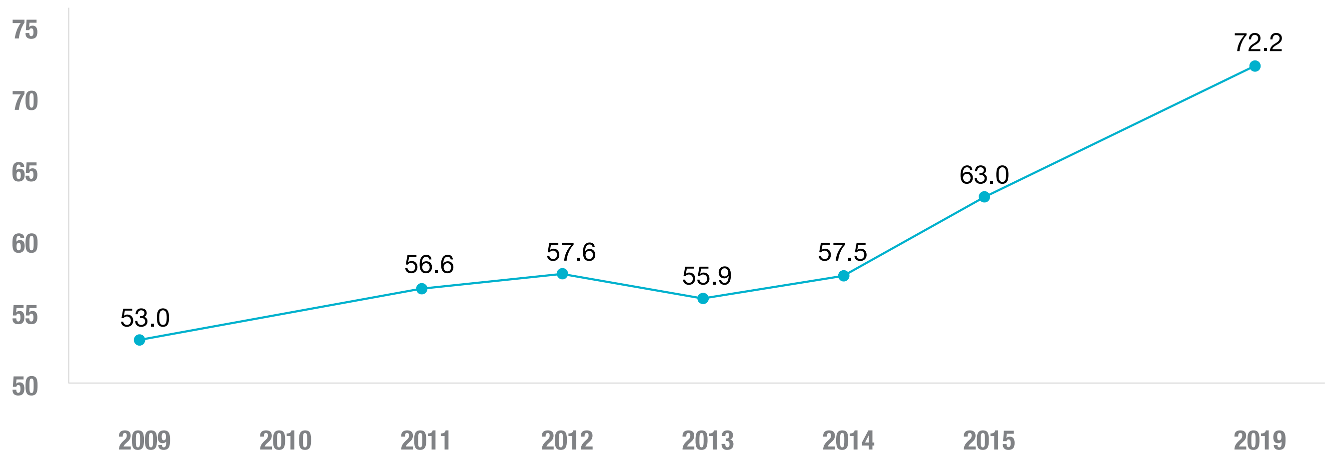
**Sub-indicator 6.2.1a**

1. The IN016 data from SNIS is obtained in the "Summary Table of Information and Indicators per State", with the respective group totals and by year.
2. The percentage of the total resident population in households with general network or septic tanks connected to the collection network (PNADA), from SIDRA, referring to Table 1956 of the PNAD and Table 7192 of the Continuous PNAD, for the years in which the septic tank data were made available.
3. The percentage obtained in step 2 is multiplied by the volume of treated sewage provided by SNIS IN016.
4. The percentage of the resident population in households with a septic tank not connected to the collection network (PNADB) is obtained from SIDRA, consulting the same tables in step 2
5. Indicator 6.2.1a is calculated for the years 2009-2019 according to the equation above
7. The indicator is added for each Federation Unit, Geographical Region and Brazil

**Sub-indicator 6.2.1b**

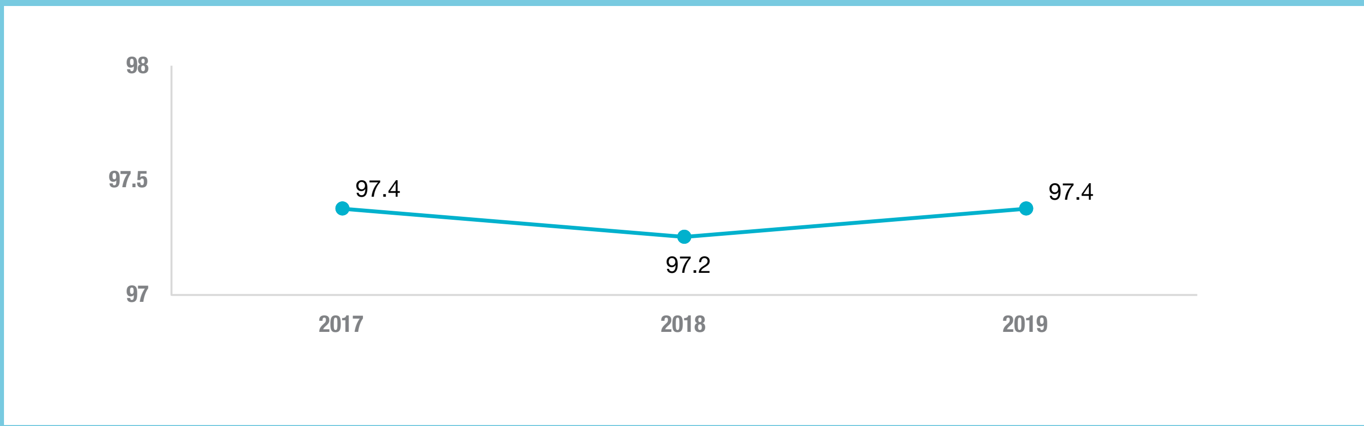
1. The data in Table 6734 are obtained from SIDRA - Households and Residents with a bathroom for exclusive use/ Variable - Percentage of residents in households with a bathroom for exclusive use (%)
2. The indicator is added for each Federation Unit, Geographical Region and Brazil

### Sub-indicator 6.2.1a in Brazil - 2011 to 2019 (%)



# Proportion of the Population Using Safely Managed Sanitation Services, Including Handwashing Facilities with Soap and Water

## Sub-indicator 6.2.1b in Brazil - 2011 to 2019 (%)




## Time Series for Indicator 6.2. in Federation Units and Geographical Regions (%)

| Territorial Unit | Sub-indicator 6.2.1a | | | | | | | Sub-indicator 6.2.1b | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2009 | 2011 | 2012 | 2013 | 2014 | 2015 | 2019 | 2017 | 2018 | 2019 |
| Rondônia | 24.8 | 70.8 | 58.2 | 32.2 | 32.8 | 41.8 | 69.6 | 98.9 | 99.1 | 99.3 |
| Acre | 45.9 | 43.4 | 44.4 | 49.6 | 55.6 | 60.1 | 60.8 | 81.7 | 78.9 | 78.1 |
| Amazonas | 57.7 | 60.3 | 51.5 | 57.2 | 68.2 | 66.9 | 70.4 | 91.4 | 88 | 87.5 |
| Roraima | 88.4 | 88.5 | 89.0 | 87.9 | 88.2 | 92.4 | 72.3 | 96.7 | 95.4 | 95 |
| Pará | 49.5 | 41.4 | 41.7 | 48.3 | 38.3 | 49.1 | 58.2 | 87.1 | 86.8 | 85.8 |
| Amapá | n.a | 56.1 | 45.3 | 34.1 | 36.4 | 14.2 | 67.7 | 90.8 | 98.3 | 98.8 |
| Tocantins | 27.7 | 37.0 | 58.1 | 34.6 | 44.5 | 64.4 | 69.4 | 96.5 | 96.9 | 96.7 |
| North | 50.6 | 53.7 | 51.1 | 50.3 | 48.9 | 57.3 | 64.6 | 90.2 | 89.5 | 89 |
| Maranhão | 47.8 | 36.4 | 37.6 | 40.8 | 38.4 | 44.8 | 62.1 | 83.3 | 81.3 | 84.5 |
| Piauí | 60.3 | 71.0 | 73.0 | 80.7 | 81.4 | 83.5 | 85.8 | 87 | 86.8 | 88.3 |
| Ceará | 42.8 | 50.5 | 47.9 | 44.6 | 39.1 | 47.6 | 77.4 | 96 | 95.5 | 94.6 |
| Rio Grande do Norte | 40.4 | 71.3 | 79.1 | 54.8 | 61.6 | 53.6 | 44.3 | 98.9 | 98.2 | 97.8 |
| Paraíba | 50.8 | 57.1 | 63.0 | 52.3 | 57.5 | 53.8 | 76.4 | 97.1 | 95.6 | 97.2 |
| Pernambuco | 42.5 | 61.9 | 54.3 | 49.8 | 50.9 | 57.9 | 68.9 | 97.3 | 96.2 | 97.6 |
| Alagoas | 31.5 | 42.6 | 39.5 | 20.1 | 43.6 | 39.7 | 64.8 | 96 | 96.2 | 96.4 |
| Sergipe | 78.5 | 64.5 | 65.1 | 56.2 | 50.9 | 59.8 | 69.6 | 97.3 | 97.5 | 96.3 |
| Bahia | 49.1 | 52.2 | 53.9 | 54.0 | 57.8 | 60.9 | 69.2 | 95.3 | 95.9 | 96.4 |
| Northeast | 45.1 | 53.3 | 53.2 | 48.4 | 51.3 | 55.2 | 69.2 | 94.2 | 93.8 | 94.5 |
| Minas Gerais | 27.1 | 36.0 | 38.7 | 40.0 | 41.7 | 42.0 | 50.9 | 99.1 | 99 | 99.4 |
| Espírito Santo | 63.6 | 60.4 | 68.2 | 70.8 | 64.3 | 68.4 | 56.2 | 99.8 | 99.9 | 99.8 |
| Rio de Janeiro | 76.3 | 60.0 | 60.1 | 57.5 | 55.8 | 59.1 | 63.2 | 99.9 | 99.9 | 99.9 |
| São Paulo | 60.9 | 65.2 | 68.7 | 69.0 | 70.8 | 75.5 | 82.6 | 99.9 | 99.9 | 99.9 |
| Southeast | 56.2 | 57.5 | 60.2 | 60.1 | 60.9 | 63.9 | 70.6 | 99.7 | 99.7 | 99.8 |
| Paraná | 74.8 | 74.6 | 78.5 | 77.0 | 75.5 | 83.3 | 89.5 | 99.7 | 99.8 | 99.8 |
| Santa Catarina | 82.0 | 88.5 | 84.5 | 80.9 | 83.5 | 88.6 | 90.2 | 99.8 | 99.8 | 99.9 |
| Rio Grande do Sul | 53.9 | 53.3 | 49.5 | 44.2 | 52.1 | 77.6 | 79.3 | 99.6 | 99.7 | 99.7 |
| South | 69.5 | 72.6 | 70.6 | 68.3 | 71.3 | 83.6 | 87.7 | 99.7 | 99.8 | 99.8 |
| Mato Grosso do Sul | 23.2 | 39.3 | 51.1 | 49.9 | 37.1 | 48.5 | 91.2 | 99.9 | 99.8 | 99.8 |
| Mato Grosso | 24.9 | 31.2 | 38.9 | 30.0 | 37.0 | 48.0 | 83.0 | 99.3 | 99.5 | 99.7 |
| Goiás | 33.5 | 56.6 | 45.4 | 49.9 | 54.0 | 71.1 | 73.8 | 99.7 | 100 | 99.6 |
| Distrito Federal | 98.1 | 96.0 | 96.9 | 96.2 | 97.4 | 97.1 | 97.8 | 99.9 | 100 | 99.9 |
| Midwest | 41.6 | 55.5 | 55.1 | 54.6 | 56.0 | 67.7 | 83.3 | 99.7 | 99.9 | 99.7 |
| **Brazil** | **53.0** | **56.6** | **57.6** | **55.9** | **57.5** | **63.0** | **72.2** | **97.4** | **97.2** | **97.4** |

# WATER QUALITY AND QUANTITY

In order to assess a country's conditions regarding the quality and quantity of water available for different uses, SDG 6 has set targets 6.3 and 6.4:

**Target 6.3 - By 2030, improve water quality in water bodies by reducing pollution, eliminating dumping and minimizing the release of hazardous materials and substances, halving the proportion of untreated effluent discharges and substantially increasing the recycling and safe reuse locally.**

**Target 6.4 - By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.**

One of the indicators for monitoring Target 6.3 is **Indicator 6.3.1 - Proportion of Wastewater Safely Treated**, which basically aims to quantify the proportion of total, industrial and domestic wastewater flows safely treated in compliance with national or local standards, thus avoiding their in natura launching into water bodies.

This indicator aims to track the portion of wastewater from different specific sources (residences, services, industries and agriculture) that are treated in accordance with national or local standards. It is divided into three categories: domestic wastewater (which can be separated into residential and services), industrial and total. However, most countries, such as Brazil, do not submit systematic data (at national and regional level) regarding the treatment of industrial effluents that allows for the inclusion of this portion in the indicator's calculation, as well as other economic activities.

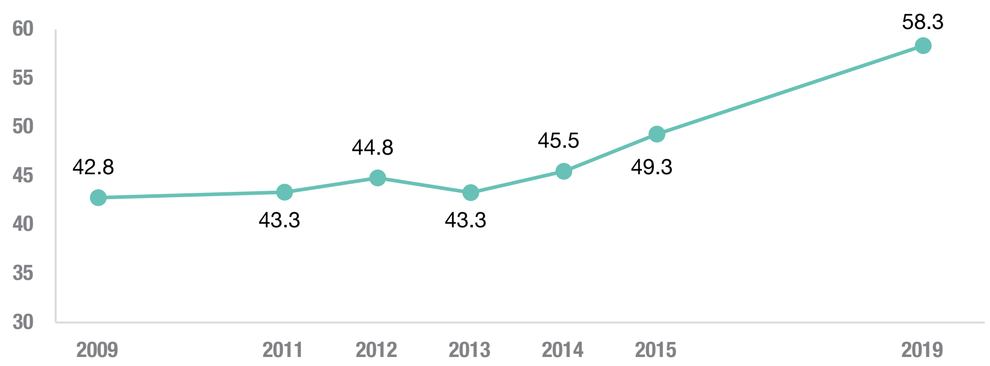
In Brazil, the data used for the calculation of safely treated wastewater is derived from national local service providers survey, aggregated to data regarding septic tanks not connected to the public sewage treatment network. The service provider data pertains to urban users, covering urban economic activities (trade, services) and a small portion of industries located in urban areas. In this sense, the data available in the country for calculating the indicator considers the urban wastewater treatment.

At the household level, the indicator directly relates to indicator 6.2.1, which monitors the portion of the population that is served by sewage collection devices and treatment services. However, while indicator 6.2.1 estimates the data in terms of the parcel of the population served, for indicator 6.3.1 the data is presented in terms of volume of sewage generated that is treated, which may include a portion of the sewage originating from economic activities.

Pit latrines are not considered as "safely treated" unless they are emptied using a method that limits human contact with the wastewater and that it is transported to a designated location, or that they are not emptied, but rather the wastewater is stored on site until it is safe for handling and reuse (for example, as agricultural input). As there is not data available on wastewater collection from pits in Brazil, only septic tanks were considered, as they offer wastewater treatment and are very relevant in rural areas of the country and in areas of dispersed urbanization, in which the implementation of sewage collection networks is not economically justified.

In 2019, about 58.3% of the sewage generated by the urban and rural population was treated in Brazil, with an evolution of 15 percentage points since 2009. The portions of sewage volumes generated and processed in treatment plants represented approximately 42.6% of the total generated in the country in 2019, while the portions of sewage volumes generated and destined for individual solutions represented 15.7%, treated at the user's own place of residence, in septic tanks.

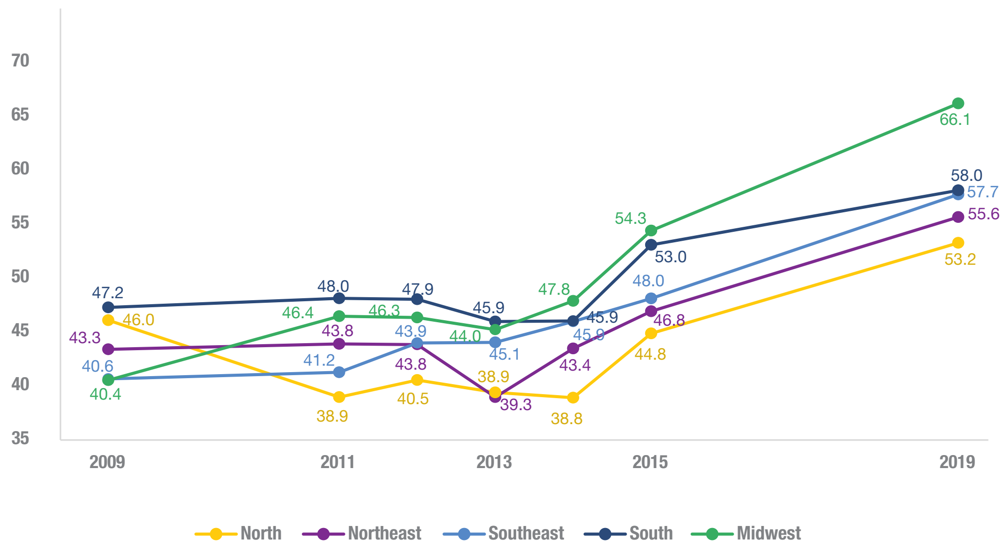
**Evolution of the Proportion of Safely Treated Domestic Wastewater in Brazil** - 2009-2019 (%)




The indicator was only calculated for the years in which PNAD provided septic tank data separately from pit latrines data, which did not occur in the years 2016, 2017 and 2018. Regarding the year 2010, in which the Census was conducted, there was not a concomitant PNAD.

Data sources: IBGE, MDR and ANA.

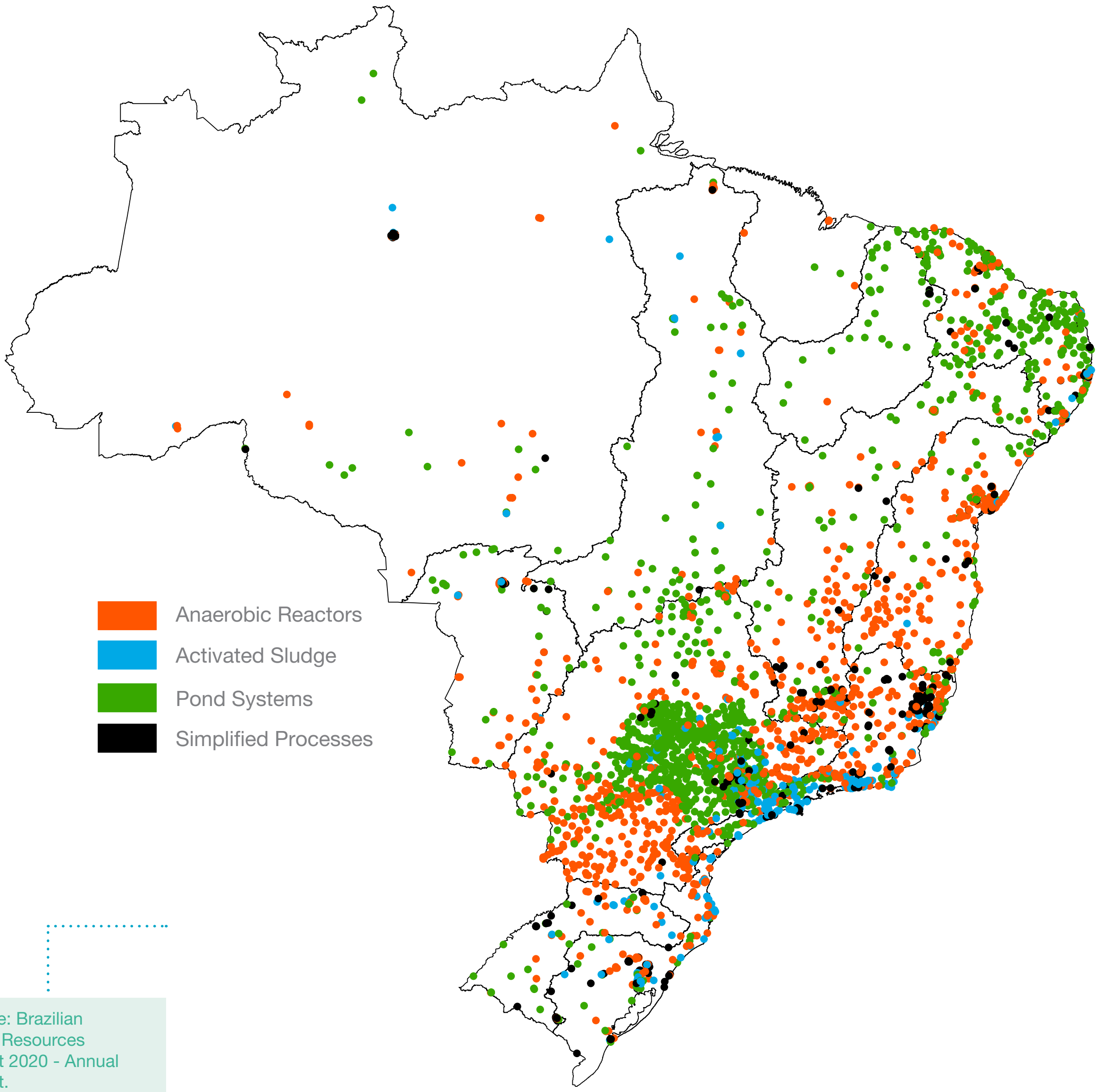
**Evolution of the Proportion of Safely Treated Domestic Wastewater in the Geographical Regions** - 2009-2019 (%)



Unlike previous targets, which provided for universal access to water and sewage collection and treatment, target 6.3 of SDG 6 aims to halve the proportion of untreated wastewater by 2030. It can be seen that the treated volume has been growing over the years, but it is still too slow to reach satisfactory levels in the country.

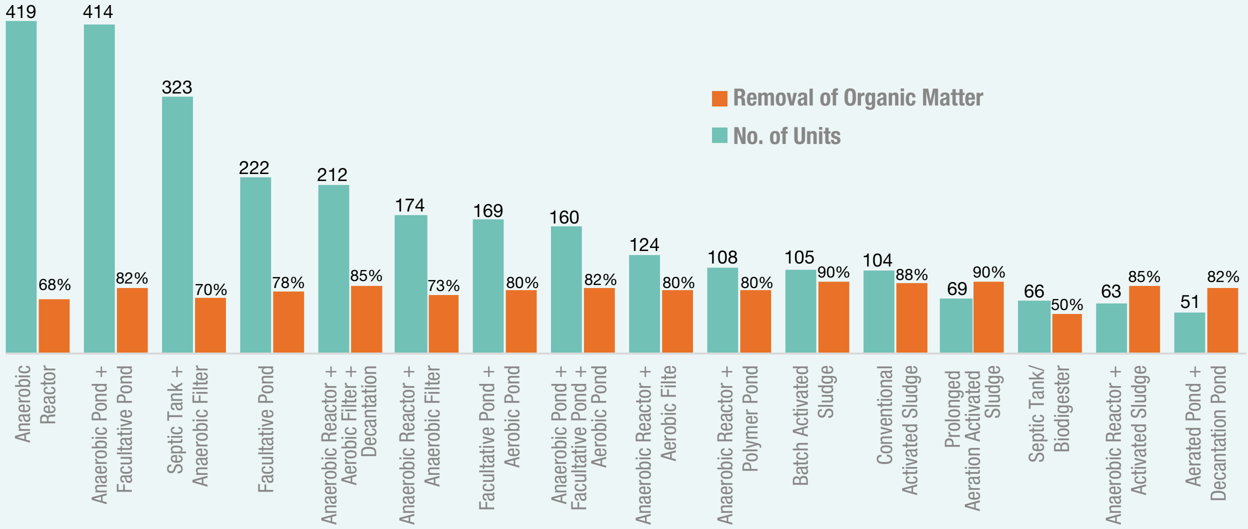
Currently, in Brazil, approximately 40% of the domestic sewage load of the Brazilian population, estimated in the Sewage Atlas by the Biochemical Oxygen Demand (BOD) as 9.1 thousand tons/day, are removed by treatment processes. According to the study, the urban population of Brazil served by sewage collection and treatment systems in WWTPs is of about 82 million people (46.5% of the total Brazilian urban population). There are about 3,700 WWTPs in the country and the systems with the highest BOD removal efficiency are located in the state of São Paulo, in the Southeast Region.

**WWTPs in Brazil by Type Set**




Source: Brazilian Water Resources Report 2020 - Annual Report.

**Most used sewage treatment types and respective organic matter removals (average values)**




The units represented in this graph correspond to 75.9% of the total of 3,668 WWTPs in Brazil. Source: ANA.

Improvements in wastewater treatment monitoring in the country are still necessary, as well as in research that could be used to calculate the sub-indicator of industrial wastewater treatment. It is worth noting that wastewater treatment for specific point discharges from activities such as agriculture, livestock and industry exists in Brazil. However, monitoring data is difficult to obtain for calculating the indicator. Thus, the indicator only addressed domestic sewage (household and services).

In 2020, 56% of all household-generated wastewater in the world was collected and safely treated, but most of the countries that reported data were high-income countries, which is not globally representative. In the last 20 years, 90 countries have reported wastewater statistics, but few have reported data on the volumes of wastewater generated and treated. As for industrial wastewater treatment, since 2013, four rounds of data collection have been conducted and relatively little data has been gathered. Thus, globally, the data is insufficient to assess the progress of the indicator, highlighting the challenges of complexity, cost and aggregation of effluent treatment data at the national level.

# METHODOLOGICAL SHEET

## INDICATOR 6.3.1

### Concept

The indicator aims, in short, to quantify the volume of the sewage generated that is treated, avoiding its *in natura* discharge into water bodies. It is measured by the percentage of domestic and economic activities effluents that is safely handled in the country.

This indicator consists of three components: wastewater treatment of domestic origin, wastewater treatment from industries and treatment of total wastewater from specific point sources (industries, irrigation, livestock, households and services).

Considering that the SNIS data used to calculate the indicator are obtained from information provided by the sanitation service operators, the volume of treated sewage considered in the calculation refers to domestic sewage, also incorporating data from other sources that generate wastewater, existing in urban areas, such as services. In addition, the volumes treated by septic tanks are added, considered as adequate on-site treatment solutions and maintaining consistency with indicator 6.2.1.

### Methodology and data sources

To calculate the indicator, SNIS and PNAD information was used, adopting the following:

Indicator 6.3.1 = [ES006 + ES015 + (VM_rural x POP_ tank)] / [(AG010 – AG019) + (VM_rural x POP_ no water network)]

Where:

Indicator 6.3.1 = Proportion of safely treated wastewater (in % volume)

ES006 = Volume of sewage treated, in thousand $m^3$/ year (SNIS)

ES015 = Volume of exported raw sewage treated at the importer's premises in 1000 $m^3$/year (SNIS)

VM_rural = Average volume of water consumed per capita in rural areas, in L/inhab/day (Handbook of Consumptive Water Uses in Brazil-ANA)

AG010 = Volume of water consumed in thousand $m^3$/ year (SNIS)

AG019 = Volume of treated water exported in thousand m3/year (SNIS)

POP_tank = Population served by septic tanks not connected to the sewage collection network, in % (PNAD)

POP_no network = Population not connected to the public water supply network, in % (PNAD)

Data sources:

**IBGE/SIDRA:** PNAD 2009, 2011-2015 – Tables 1955 and 1956 | IBGE – Continuous PNAD 2019 – Table 7192
**SNIS:** 2009-2019

**ANA:** Handbook of Consumptive Water Uses in Brazil

### Time series available for 2021

2009 to 2019 (except 2010[1], 2016[2], 2017[2] e 2018[2])

[1] Year in which the Census was conducted, there was not a concomitant PNAD

[2] The indicator was only calculated for the years in which PNAD provided septic tank data separately from pit latrines data, which did not occur in the years 2016, 2017 and 2018. In the first edition of this report, we used projections of septic tanks (connected and not connected to the network) for the years mentioned. However, as the 2019 PNAD re-submitted the septic tank data, it was decided against using the projections again and to just keep the indicator for the years that have official data.

### Spatial unit for calculation

Federation Unit

### Spatial level

Federation Unit, Geographical Region, Brazil

### Step by step

**1.** 1.Data collection:

**1.1.** Data is obtained from ES006, ES015, AG010 and AG019 of SNIS, aggregated basis, available by

## Proporção de Águas Residuais Tratadas de Forma Segura

Federation Unit, which represent the volumes of consumed water and treated sewage referring to the network.

**1.2.** The percentage of the urban and rural population served by septic tanks not connected to the network for the years in which the data was made available (PNAD) is obtained and multiplied by a rural per capita water consumption coefficient (Handbook of Consumptive Water Uses in Brazil).

**1.3.** The population that is not supplied by the network (PNAD) is calculated and multiplied by the rural per capita water consumption coefficient.

**1.4.** The treated sewage (added to the treated parcel of septic tanks not connected to the network) is divided by the volume of water consumed (added to the parcel that uses alternative supply sources). The volume of water consumed is used as a proxy for estimating the volume of sewage generated.

**2.** Indicator 6.3.1 is calculated according to the presented equation.

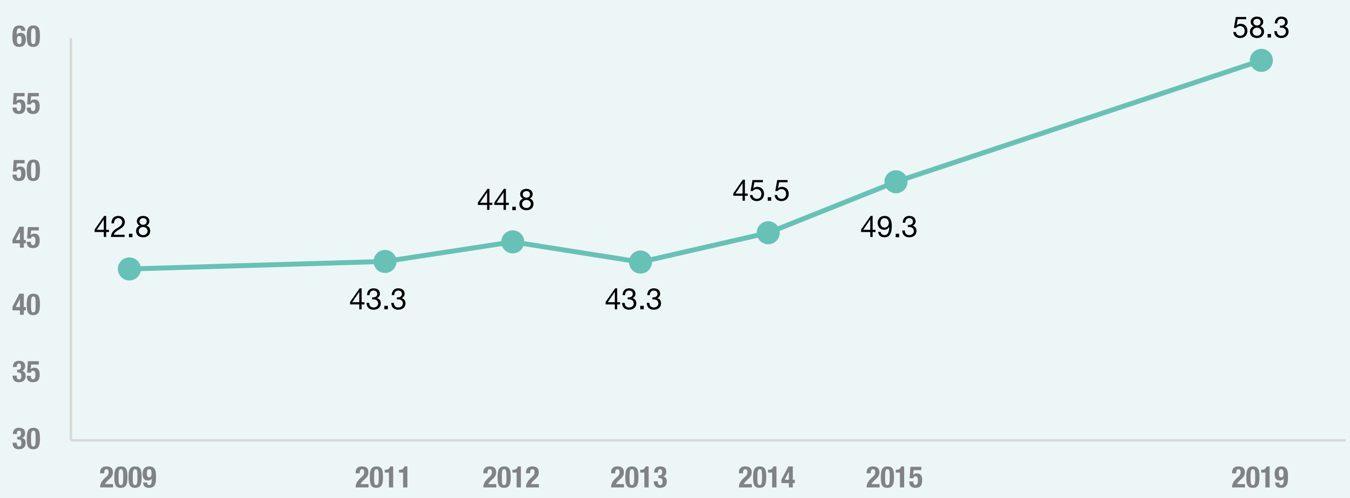
**3.** The indicator is added for each Federation Unit, Geographical Region and Brazil.

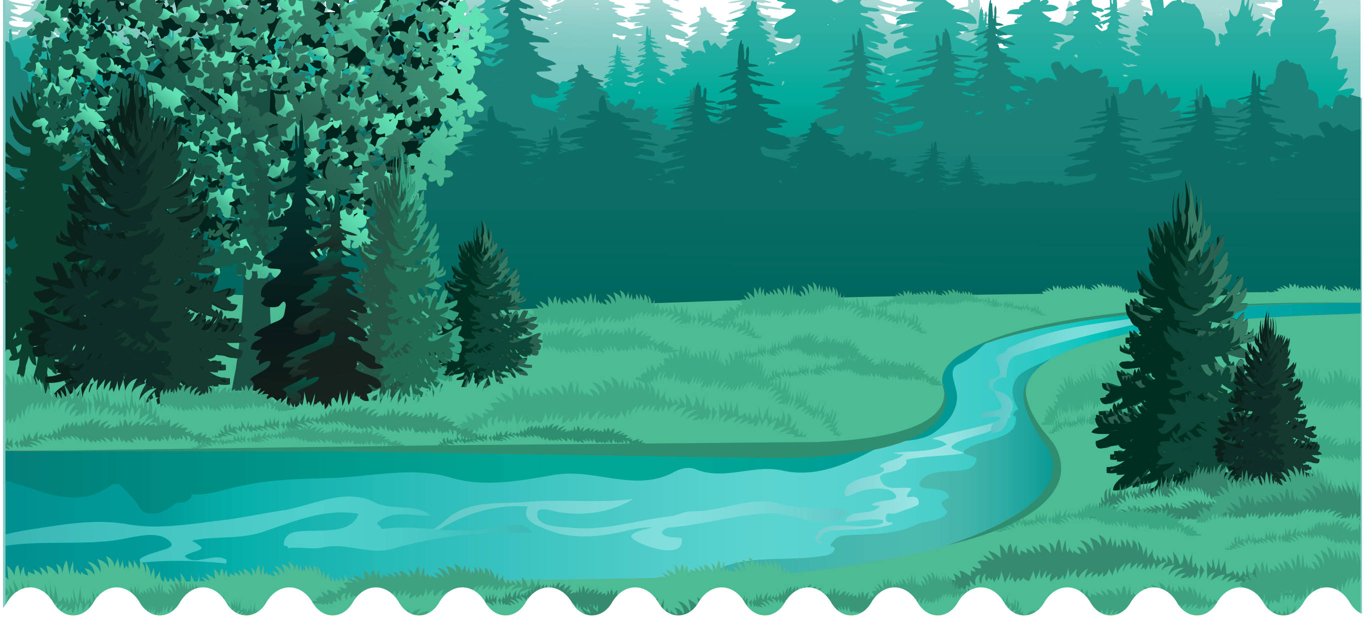
### Time Series for Indicator 6.3.1 (%)

| Geographical Region | 2009 | 2011 | 2012 | 2013 | 2014 | 2015 | 2019 |
|---|---|---|---|---|---|---|---|
| North | 46.0 | 38.9 | 40.5 | 39.3 | 38.8 | 44.8 | 53.2 |
| Northeast | 43.3 | 43.8 | 43.8 | 38.9 | 43.4 | 46.8 | 55.6 |
| Southeast | 40.6 | 41.2 | 43.9 | 45.1 | 45.9 | 48.0 | 57.7 |
| South | 47.2 | 48.0 | 47.9 | 45.9 | 45.9 | 53.0 | 58.0 |
| Midwest | 40.4 | 46.4 | 46.3 | 45.1 | 47.8 | 54.3 | 66.1 |
| **Brazil** | **42.8** | **43.3** | **44.8** | **43.3** | **45.5** | **49.3** | **58.3** |

*The calculated Indicator only includes variables related to sewage treatment of predominantly household origin and/or nature, and does not consider in its calculation metrics the treatment of industrial wastewater by its own systems.

### Evolution of Indicator 6.3.1 in Brazil – 2009-2019 (%)





Indicator 6.3.1 is related to basic sanitation, maintaining a close relationship with water quality since the inappropriate treatment of wastewater discharged into water bodies leads to the degradation of its quality.

The assessment of a country's water quality conditions is done through the monitoring of **Indicator 6.3.2 - Proportion of Water Bodies with Good Ambient Water Quality**. The 'good' condition indicates quality that presents no harm to the ecosystem or to human health.

The indicator considers the number of rivers, reservoirs and aquifers monitored by river basin in the country and the percentage of these water bodies that present good quality in the analyzed period. It is calculated based on a water quality index that uses the measurement of a set of five parameters (electrical conductivity, dissolved oxygen, total ammoniacal nitrogen, total phosphorus and pH) for surface water and three basic parameters (electrical conductivity, pH and nitrate) for groundwater.

Depending on the availability of data for the country, the data can be reported for Indicator 6.3.2 at one of the three spatial disaggregation levels, according to the level of lowest complexity to highest: National, by basin or hydrographic region or by water bodies. Water bodies are the highest-resolution spatial units and therefore require a more complex data organization process, providing high-quality information. For Brazil, the information was reported by water bodies and subsequently aggregated in Hydrographic Regions and for the national level.

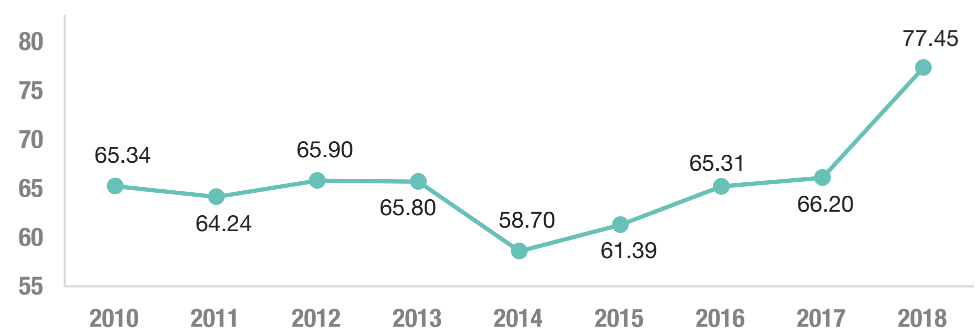
To define "good water quality", the recommendation is to adopt national standards. For Brazil, there were considered the standards defined by the National Environment Council (CONAMA) Resolution no. 357/2005 for surface and groundwater in Brazil as Class 2 and also in Ordinance no. 5/2017 of the Ministry of Health (MS), for groundwater. In 2018, 77.45% of Brazil's water bodies had good water quality. This condition was assessed by analyzing a total of 8,946 monitoring points located in 3,000 water bodies (rivers, reservoirs and aquifers), in the period from 2010 to 2018, with an annual average of 4,300 water quality monitored stations and 44,393 entries. ANA (through the National Hydro meteorological Network) and the Federation Units (through their own networks and the National Water Quality Monitoring Network) monitor the pH, dissolved oxygen (DO), electrical conductivity, ammoniacal nitrogen and total phosphorus parameters. The groundwater data was obtained from the monitoring of Geological Survey of Brazil (through the Integrated Groundwater Monitoring Network), for the electrical conductivity, pH and nitrate parameters.

CONAMA establishes 5 quality classes for freshwater in Brazil. For the purposes of calculating the indicator, the points that met the class 2 limits were considered to be of good quality, which is intended for demanding uses in terms of water quality, such as urban supply through conventional water treatment.

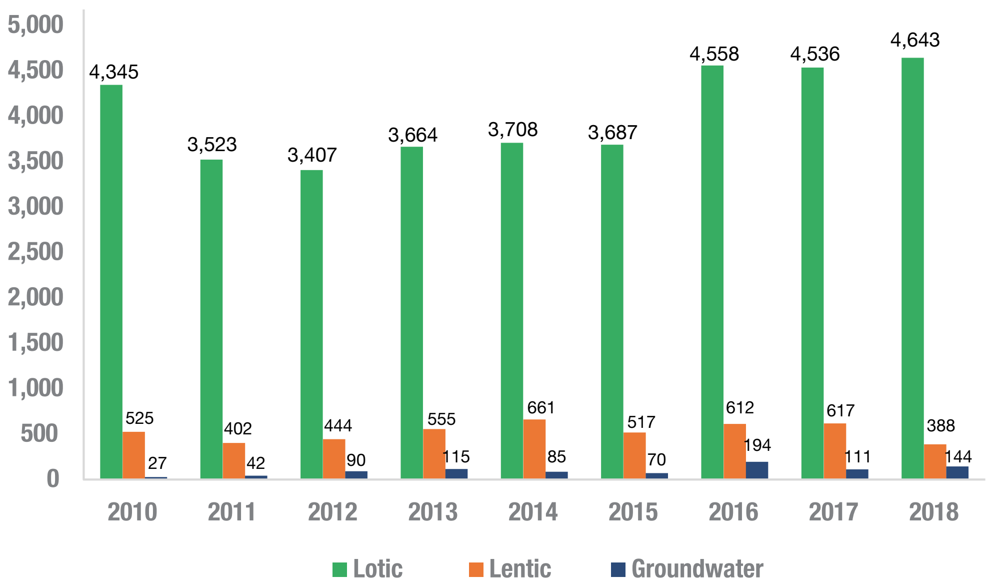
In the first edition of the report, which covered the period between 2010-2015, the indicator showed that 69% of the monitored water bodies, comprising reservoirs and rivers, had good quality. In this indicator update, measurements carried out in groundwater were added, and the indicator was updated for the period from 2010 to 2018, by systematizing the data in the files made available by the Global Environmental Management Initiative / Water (GEMS WATER).

CONAMA Resolution no. 357/2005 defines pH, DO, Total Ammoniacal Nitrogen and Total Phosphorus limits for surface water. For groundwater, CONAMA Resolution no. 396/2008 only addresses the limits for Nitrogen, and the reference values for pH analysis were extracted from Ordinance no. 5/2017 of the Ministry of Health. As Brazilian regulations do not address limits for the Electrical Conductivity (EC) parameter, an empirical method was adopted based on a literature review, which correlates the standards of total dissolved solids based on the EC, obtaining the value of 782 µS/cm as a limit for surface water and 1500 µS/cm for groundwater.

**Proportion of water bodies with good ambient water quality in Brazil** – 2010-2018 (%)

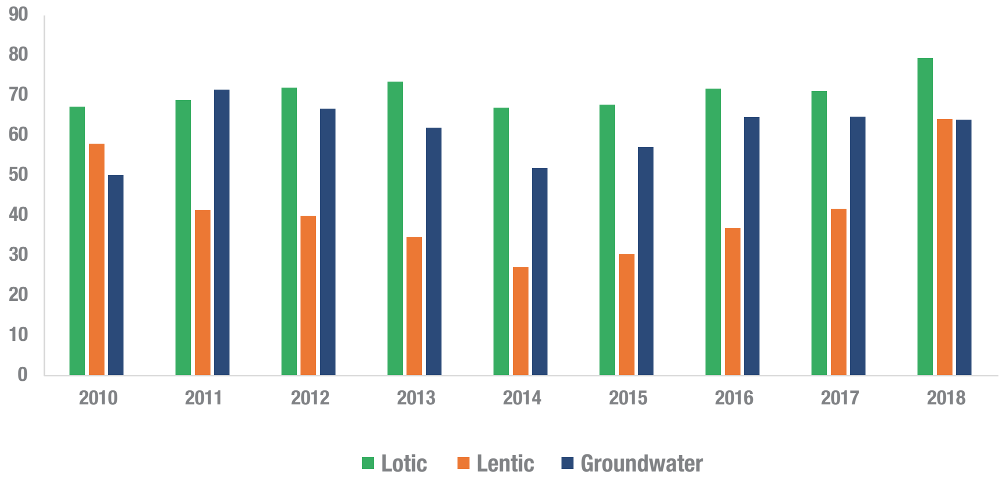



**Number of points monitored by type of water body in Brazil in the period** 2010-2018



The monitoring points that cover the main bodies of surface water total 97%, 84% of which are located in rivers and 13% in reservoirs, while only 3% of the points are located in groundwater. The lentic bodies (reservoirs) presented lower values for the indicator in the analyzed period, with the reservoirs being more sensitive environments to drought events, which may contribute to a drop in the quality of the stored water. If we just consider the surface water monitoring data, indicator 6.3.2 reaches 77.60% in 2018.

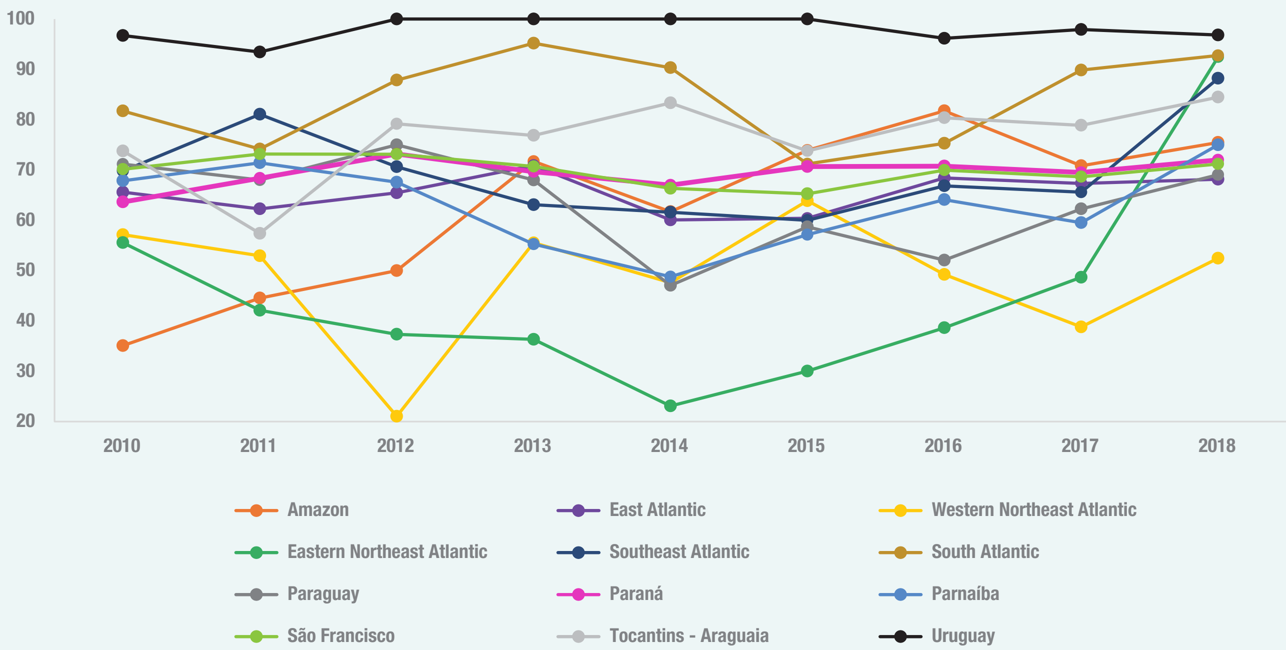
**Proportion of lotic, lentic and groundwater bodies with good ambient water quality -** 2010-2018 (%)




Data sources: ANA, water resource management agencies of the Federation Units and CPRM.

The aggregate results for Brazil arise from each Hydrographic Region's (HR) behavior, which mainly depends on the density of the existing monitoring points, the amount of logged data, and the variability of the incidence of rainfall, which is reflected in the greater or lesser availability of water for dilution of polluting loads.

**Proportion of water bodies with good ambient water quality by Hydrographic Region** 2010-2018 (%)



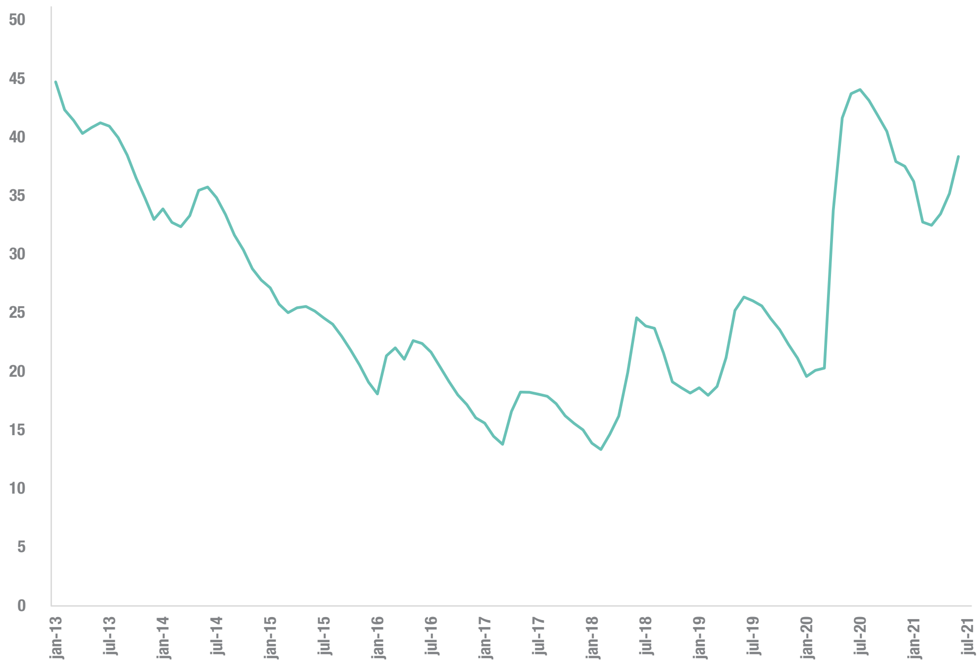
Analyzing the results, one observes that the hydrographic regions Uruguay, Tocantins-Araguaia, South Atlantic and Amazon present the best assessments in the indicator, with over 70% of their water bodies with good ambient quality water in the last four years of the period. The hydrographic regions Eastern and Western Northeast Atlantic are the ones with the lowest average water quality throughout the time series. However, in 2018, the HR that showed the highest increase in the indicator was precisely the Eastern Northeast Atlantic, followed by Southeast Atlantic, Parnaíba and Western Northeast Atlantic.

This improvement of the indicator in 2018 is probably due to the increase in reservoir volumes in the Northeast, since 2018 presented a rainy season closer to the historical average in most of the northeastern states. This fact can be corroborated by the increase of approximately 56% in the indicator for lentic bodies in Brazil from 2017 to 2018. Other increments in the indicator over the years may also be a reflection of a significant number of WWTPs that came into operation in Brazil between 2013 and 2019, with 900 new undertakings in this period, according to the Update of the Database of Wastewater Treatment Stations published by ANA. Even so, it is worth noting that 67% of municipalities in Brazil still do not have sewage treatment in WWTPs.

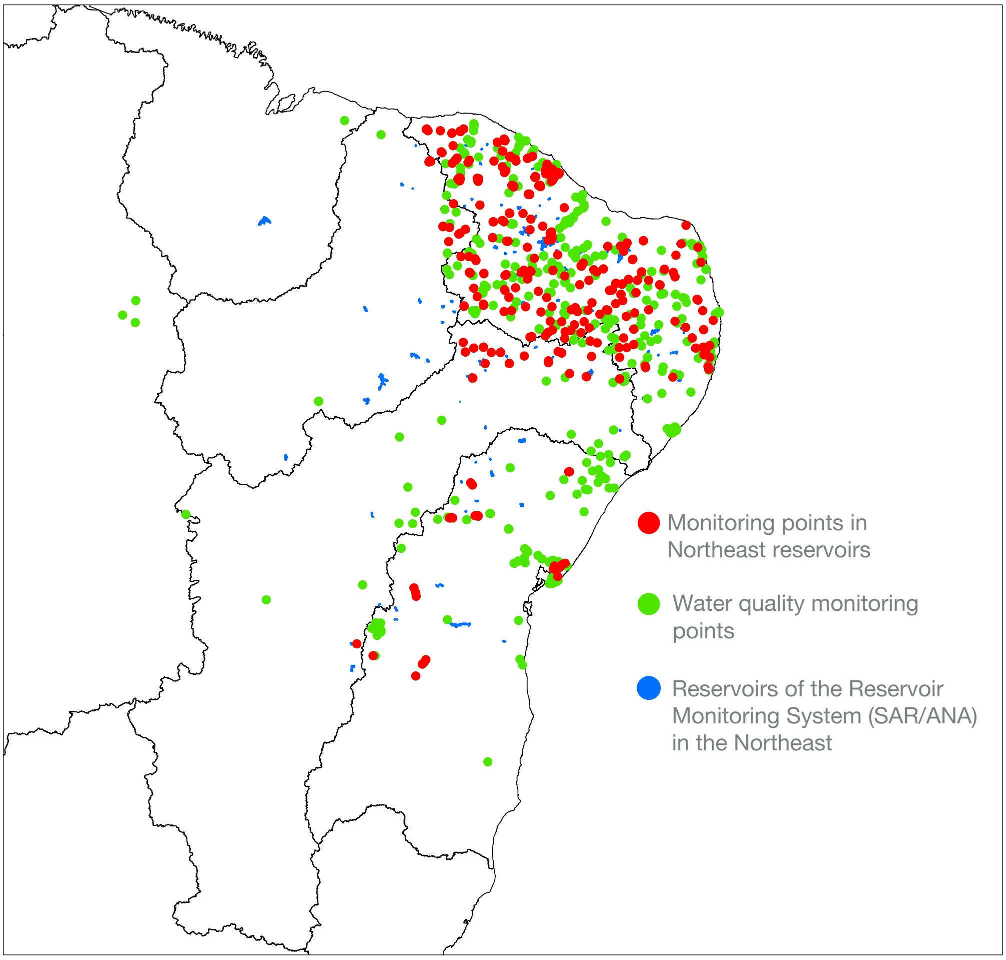
An Equivalent Reservoir corresponds to the sum of the volume of the representative reservoirs of a region. In the Northeast, it represents the set of 272 reservoirs with a storage capacity equal to or more than 10 million m³.

Data sources: SAR/ANA.

**Evolution of the Volume of the Equivalent Reservoir of Northeastern Brazil** – 2013-2020
In % of stored volume in relation to the capacity of the reservoirs



**Monitored reservoirs and water quality monitoring stations in reservoirs**




Source: ANA.

To calculate the indicator, it was decided to maintain 5 mg/L of DO as a limit of good quality, with the exception that the results obtained should not be understood as pollution but due to natural phenomena such as the decoada phenomenon that occurs in the Pantanal. For the Amazon Region, where pH values are naturally lower in clear water and black water rivers, an exception was applied in relation to limits established for this parameter, using the naturally observed minimum values as limits.

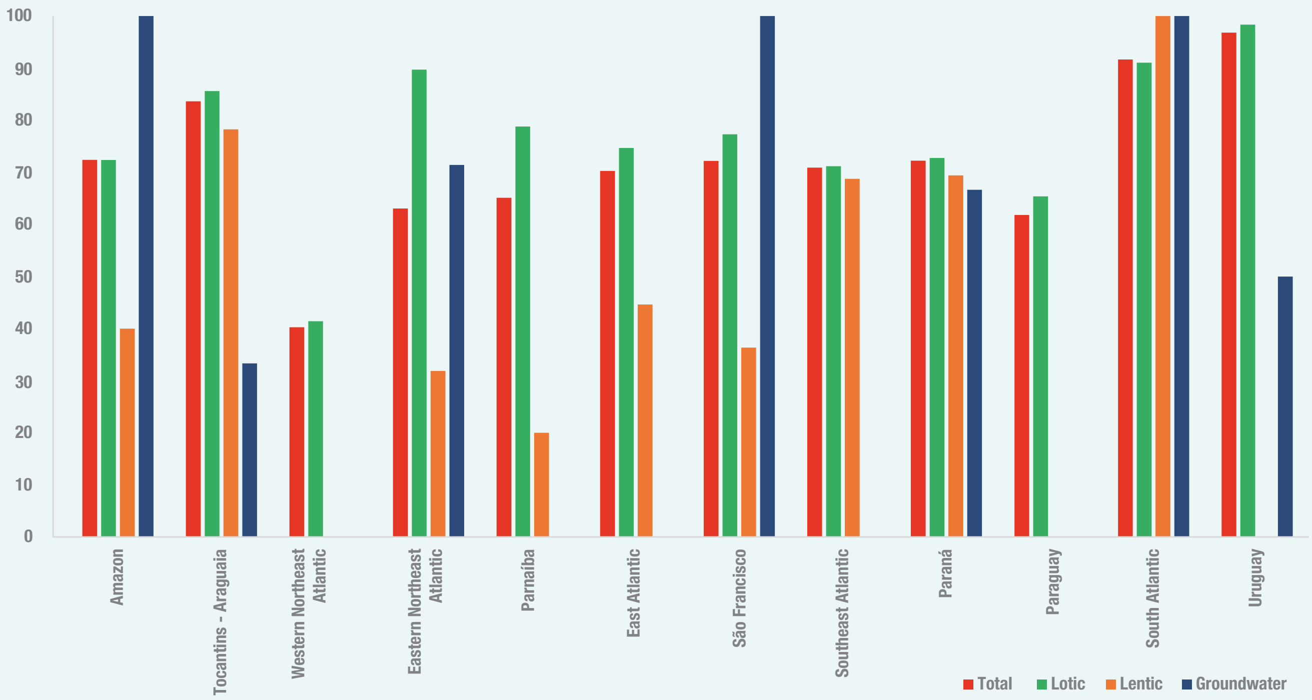
Due to Brazil's great natural diversity, water quality varies greatly from one Hydrographic Region to another, following climatic variations as well as the seasonality of natural phenomena resulting from the flow pulses of watercourses in periods of rising and falling water. To calculate the indicator, these intrinsic characteristics of specific environments are relevant to correctly interpret the results and were considered to determine the natural situation of water quality in the regions of the Pantanal and the Amazon.

From 2017 to 2018, 71% of water bodies had good quality, corresponding to 1,980 water bodies in the country:

- 705 monitoring points located in 460 reservoirs; and 47% of them have good quality;
- 5,559 monitoring points located in 2,300 rivers; and 76% of them have good quality;
- 166 monitoring points located in 28 groundwater bodies; 68% of them have good quality.

The last data collection of the indicator, carried out in 2020 by UNEP, recommended carrying out the analysis for the last three years, i.e., from 2017 to 2019. However, the 2019 data was not yet available at the time of collection.

**Proportion of water bodies with good ambient water quality by type and Hydrographical Region -** 2017-2018 (%)




Among the 5 parameters assessed in lotic bodies (rivers), the parameter with the lowest compliance in 2017 and 2018 was Dissolved Oxygen, with values in the range of 80-85%. Of a total of 5,482 points, 16% did not meet this standard, with the exception of the HR Amazon and Paraguay, due to their intrinsic natural characteristics. The monitoring points that did not meet the standard are mainly concentrated in the largest urban areas or in stretches with a dilution capacity lower than that necessary to purify the dispersed pollutant load.

In the lentic bodies (reservoirs), the parameter that most presented non-compliance was Total Phosphorus, with values in the range of 35-79%. Of the 535 points, 61.5% did not meet this standard. The total phosphorus values in non-compliance were concentrated in the Northeast, with the semi-arid reservoirs being potentially more susceptible to eutrophication. This region has high evaporation rates, intermittent rivers and low rates of sewage treatment.

In the aquifers, the parameter that showed the lowest compliance was pH, with values in the range of 57-83%. Of the 166 points assessed, 48% were not within the established limits and an acidic pH was found in most samples that did not meet the standard. For groundwater monitoring, the result is restricted to a network of piezometric wells.

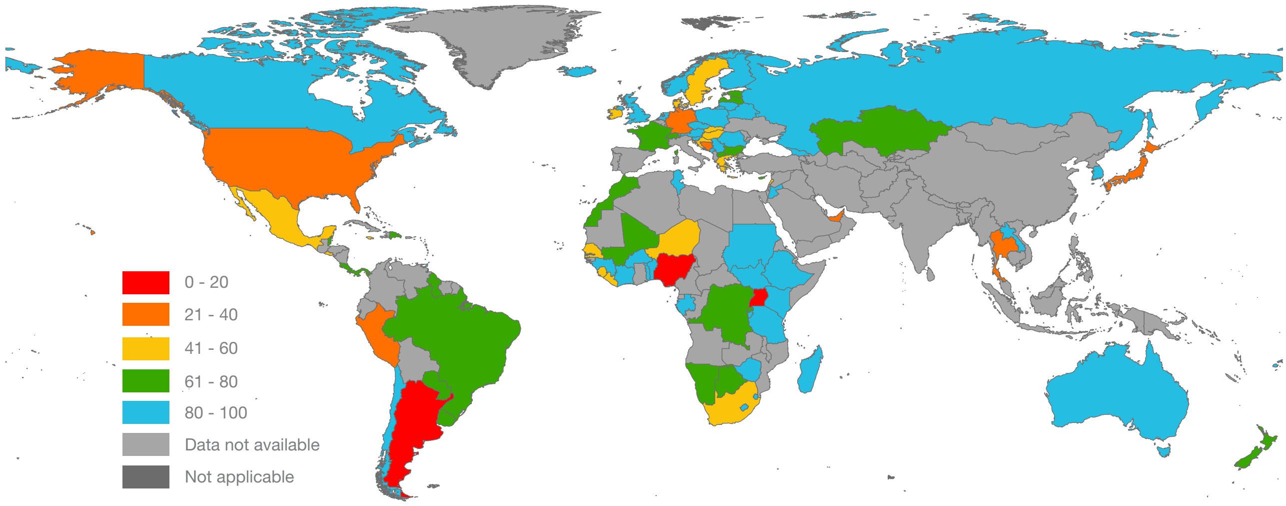
It should be noted that the monitoring points considered are located in sedimentary basins, preferably in the recharge areas, registering, consequently, acidic pH values, i.e., due to the influence of rainwater, the pH is approximately 5 or 6, in addition to the interaction with soils and the humic layer in these areas being more significant.

According to the UN, 60% of the water bodies analyzed in the world (45,966 of 76,151) have good water quality. Nitrogen and phosphorus presented more non-compliance with the limits than the other parameters, where agriculture and untreated wastewater are the two biggest threats to environmental water quality, releasing excess nutrients in rivers, lakes and aquifers and altering ecosystem functions. It is essential to improve agricultural management practices and to increase wastewater treatment, especially in regions with high population growth, in addition to expanding monitoring networks in all regions and establishing national water quality standards. In addition, almost half of the countries reporting data do not have information on groundwater quality.

*Brazil's data is represented for the 2017-2018 period.

Source: UNEP´s SDG 6.3.2 2021 Report.

**Proportion of water bodies with good quality in the world from 2017 to 2019 (%)**




Data from the National Hydrometeorological Network of Brazil is available at http://www.snirh.gov.br/hidroweb/

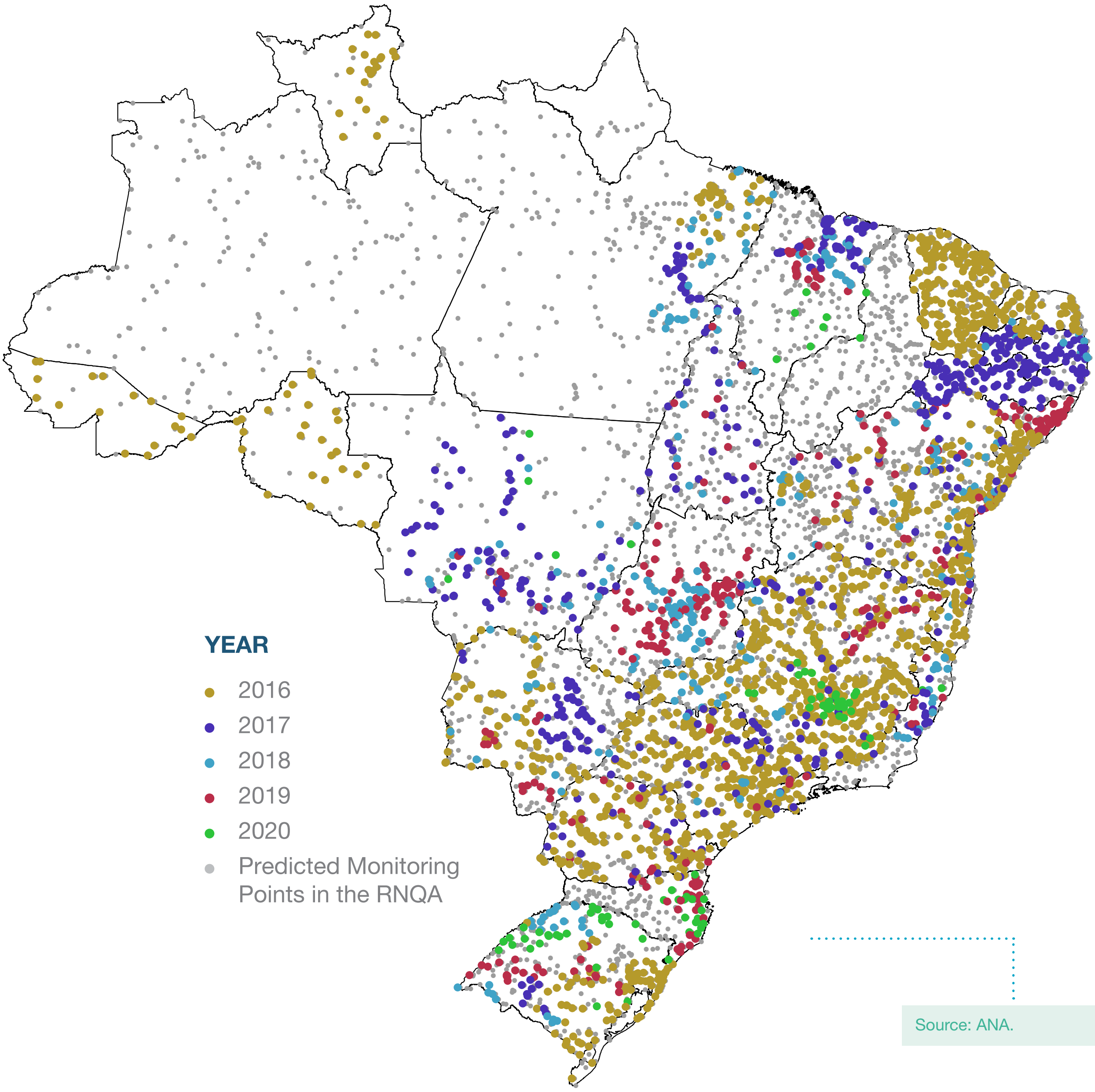
Data available on SNIRH at: goo.gl/6fcpEz

Brazil has a considerably representative network of qualitative monitoring of lotic and lentic surface waters. This network is formed by the National Hydrometeorological Network (RHN), coordinated by ANA, by the National Water Quality Monitoring Network (RNQA), coordinated by ANA and operated by the Federation Units and by networks of some States and the Federal District.

The objective of the RNQA is to optimize, expand and improve the water quality monitoring networks of the Federation Units, standardizing the monitoring and improving the quality of the data generated. In this sense, the Program to Stimulate the Dissemination of Water Quality Data (Qualiágua) was launched with the objective of signing contracts between ANA and the Federation Units so that they receive financial resources as a way of stimulating the production of water quality data, thus aiming to foster the implementation of the RNQA and the monitoring, based on the standardization of criteria and methods, in order to make it comparable at the national level. It should be noted that some Federation Units are still in the implementation phase of their water quality monitoring networks. The sampling points of the aquifers considered correspond to those of the Integrated Groundwater Monitoring Network (RIMAS), operated by the Geological Survey of Brazil (CPRM). The inclusion of groundwater did not significantly change the result of indicator 6.3.2. Although the monitoring of groundwater bodies in Brazil is incipient, it is important to start the assessments of the indicator with the data that is available, seeking to expand the partnerships between ANA and other agencies, as well as with the Federation Units´ own networks, aiming at progress in the calculation of the indicator for the country.

For more information, visit: http://rimasweb.cprm.gov.br/layout/

**Evolution of the implementation of RNQA points in Brazil** – 2016-2020




Source: ANA.

# METHODOLOGICAL SHEET

## INDICATOR 6.3.2

### Concept

The indicator aims to quantify the percentage of water bodies of a country, including rivers, reservoirs and groundwater with good ambient water quality. 'Good' indicates that it does not affect the ecosystem and human health.

### Methodology and data sources

For the purposes of calculating the indicator, the points that met the Class 2 standards (of CONAMA resolution no. 357/2005) were considered to be of good quality. It is verified if the records of the pollutant parameters approved meet the established quality standards. If 80% or more do meet the quality standard, good water quality is assigned to the monitored water body.

Data sources:

Qualitative Monitoring Databases (ANA)

Integrated Groundwater Monitoring Network – RIMAS (CPRM)

CONAMA Resolutions 357/05[1] and 396/08[2]

Ordinance 5/2017[3] of the Ministry of Health

EUGENE W. RICE, RODGER B. BAIRD, ANDREW D. EATON, Lenore S. Clesceri. Standard Methods For the Examination of Water and Wastewater, 23nd edition. 2017.[4]

CSUROS, Maria. Environmental Sampling and Analysis for Technicians. 2018.[5]

[1] Reference for "good water quality" limit values in the case of surface waters based on Class 2 for pH, DO, Total Ammoniacal Nitrogen and Total Phosphorus.

[2] Reference for "good water quality" limit values in the case of groundwater based on Class 2 for Nitrogen.

[3] Reference for "good water quality" limit values in the case of groundwater based on potability standards of water for human consumption for pH.

[4] In the absence of Brazilian regulations that address limits for Electrical Conductivity, the reference was used to adopt an empirical method that correlates total dissolved solid standards based on CE.

[5] To convert nitrate to nitrogen (NO3-N) or nitrate (NO3), it was multiplied by 4.428 (conversion factor)*, represented in the following equation:

$$NO_3 = 4.428 * NO_3 - \mathrm{N}$$

Where $NO_3$ is expressed in mg/L and $NO_3$-N in mg/L.

### Time series available for 2020

2010-2018[6] (full series)

2017-2018[7]

[6] All data from the previous collection carried out in 2017 by GEMS Water/UNEP were resubmitted by ANA to maintain consistency with the methodology used in the 2020 collection.

[7] The last period collected in 2020 was from 2017 to 2019. However, as the 2019 data is not available and systematized on the collection date, indicator 6.3.2 was calculated for 2017 and 2018.

### Spatial unit for calculation

Water quality monitoring station

### Spatial level

Water Body, Hydrographic Region

### Step by step

1. Qualitative monitoring stations are consolidated and the water body and the respective Hydrographic Region are identified.
2. The data series of qualitative monitoring records for each station is consolidated.
3. It is verified for each entry if it meets the quality standards established for the 5 parameters considered for surface water (DO, pH, electrical conductivity, ammoniacal nitrogen and total phosphorus) and for the

3 parameters considered for groundwater (electrical conductivity, pH and nitrate). The defined limits are:

**EC:** Electrical Conductivity: < 782 µS/cm for surface water and 1500 µS/cm for groundwater.

**DO:** Dissolved Oxygen: > 5 mg/L

**NAm** in surface water: Total Ammoniacal Nitrogen (NAm or N-NH3): < 3.7 mg/L for pH ≤ 7.5; < 2.0 mg/L for pH between 7.5 and 8.0; < 1.0 mg/L for pH between 8.0 and 8.5; < 0.5 mg/L for pH > 8.5.

**$NO_3$:** Nitrate in groundwater: Nitrogen (NO-3-N) 10 mg/L, equivalent to 45 mg/L Nitrate ($NO_3$).

**TP:** Total Phosphorus: < 0.030 mg/L for lentic environments (reservoirs), < 0.10 mg/L for lotic environments.

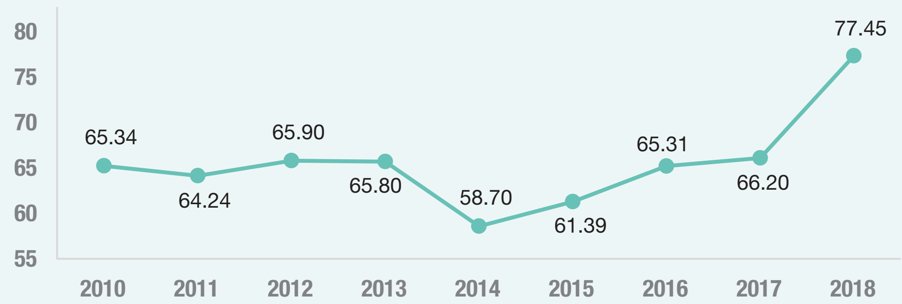
**pH:** 6.0 to 9.0, except for Amazon rivers, where the limit may be lower, according to the different types of water in the Region. Clear waters: 5.2 to 9.0; Black waters: 4.0 to 9.0.

4. For each water body (river, reservoir and aquifer), in each year of the series from 2010 to 2018 and in the period from 2017 to 2018, the percentage of compliance with the set of monitored parameters (number of entries that meet the quality standard / number of total entries) is verified. A water body is considered to be of good quality if the calculated value is above 80%.
5. The information by Hydrographic Region is calculated as the proportion between the number of water bodies with good quality and the total number of water bodies in the region.
6. Spatial intersection is performed with the Ottocodified Hydrographic Base (BHO), water mass base and delimitation of ANA´s aquifer systems, for the purpose of obtaining attributes related to the monitored water bodies.

### Time series for Indicator 6.3.2 (%)

| Hydrographic Region | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|
| Amazon | 50.00 | 44.55 | 50.00 | 71.72 | 61.70 | 73.91 | 81.75 | 70.83 | 75.47 |
| East Atlantic | 35.09 | 62.26 | 65.46 | 70.91 | 60.07 | 60.40 | 68.40 | 67.32 | 68.15 |
| Western Northeast Atlantic | 65.58 | 52.94 | 21.05 | 55.56 | 47.62 | 63.89 | 49.23 | 38.81 | 52.46 |
| Eastern Northeast Atlantic | 57.14 | 42.11 | 37.35 | 36.34 | 23.10 | 30.03 | 38.64 | 48.67 | 92.46 |
| Southeast Atlantic | 55.56 | 81.06 | 70.63 | 63.09 | 61.60 | 60.00 | 66.84 | 65.59 | 88.22 |
| South Atlantic | 69.79 | 74.16 | 87.85 | 95.19 | 90.32 | 71.21 | 75.29 | 89.86 | 92.75 |
| Paraguay | 81.72 | 68.00 | 75.00 | 68.00 | 47.06 | 58.70 | 52.08 | 62.26 | 69.05 |
| Paraná | 71.15 | 68.37 | 73.17 | 69.65 | 67.00 | 70.68 | 70.76 | 69.51 | 72.00 |
| Parnaíba | 63.64 | 71.43 | 67.57 | 55.26 | 48.78 | 57.14 | 64.10 | 59.52 | 75.00 |
| São Francisco | 67.86 | 73.16 | 73.13 | 70.70 | 66.35 | 65.26 | 69.97 | 68.65 | 71.20 |
| Tocantins | 70.16 | 57.39 | 79.17 | 76.87 | 83.33 | 73.79 | 80.37 | 78.87 | 84.47 |
| Uruguay | 73.77 | 93.44 | 100.00 | 100.00 | 100.00 | 100.00 | 96.15 | 97.92 | 96.83 |
| **Brazil** | **96.72** | **64.24** | **65.90** | **65.80** | **58.70** | **61.39** | **65.31** | **66.20** | **77.45** |

### Evolution of Indicator 6.3.2 in Brazil - 2010-2018 (%)



Target 6.4 aims to monitor the water use efficiency in economic activities and to assess the water availability stress compared to the existing demands. In this manner one seeks to provide an overview of the degree of water resource appropriation of a country for the supply of water to the population and to productive activities. It proposes to substantially increase water-use efficiency and to reduce the number of people suffering from water scarcity.

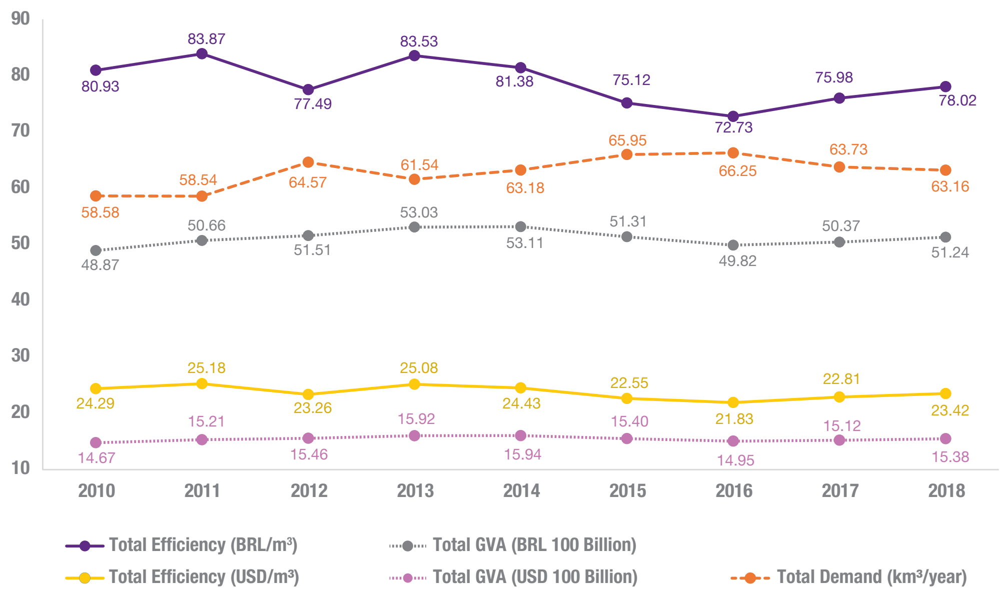
**Indicator 6.4.1: Changes in Water-Use Efficiency Over Time**, from Target 6.4, provides information on "increasing the water use efficiency in all sectors". It highlights to what extent a country's economic growth depends on the use of water resources, allowing decision-makers to direct interventions in sectors with high water consumption and low efficiency levels.

Gross Value Added (GVA) is the value of "production without duplication". It is obtained by discounting from the Gross Value of Production (GVP) the value of inputs used in the production process.

It is measured by the ratio between the gross value added (GVA) and the water demand for withdrawal from surface and groundwater bodies for agriculture, industry and services, over time, which enables trends in water use efficiency to be identified. To allow the comparison between the indicator values of all countries, the results are also given in USD/m³ For the period between 2010 and 2018, there was a reduction in the efficiency of water use, accompanied by recovery in recent years. During this period, there was a total water use efficiency in economic activities (agriculture, industry and services sectors), ranging from 80.93 BRL/m³ in 2010 to 78.02 BRL/m³ in 2018, and from 24.29 USD/m³ in 2010 to 23.42 USD/m³ in 2018.

Both the values in Reais and Dollars are converted from nominal values to real values through a deflator of Gross Domestic Product (GDP) - implicit price deflator - including sectoral and regional, with base year 2015, to remove the effect of price changes over the years.

**Evolution of water use efficiency in Brazil** in the period from 2010 - 2018




Data sources: ANA and IBGE.

To provide adequate monitoring of target 6.4, indicator 6.4.1 needs to be combined with indicator 6.4.2, which addresses water stress. In addition, the combination with additional indicators for the country is important, including the monitoring of irrigation, of water distribution networks and the evolution of cooling processes and industrial water use. Indicator 6.4.1 is an economic indicator, assessing the extent to which economic growth depends on the use of water resources, while indicator 6.4.2 is an environmental indicator, tracking the physical availability of freshwater and the impact of water use.

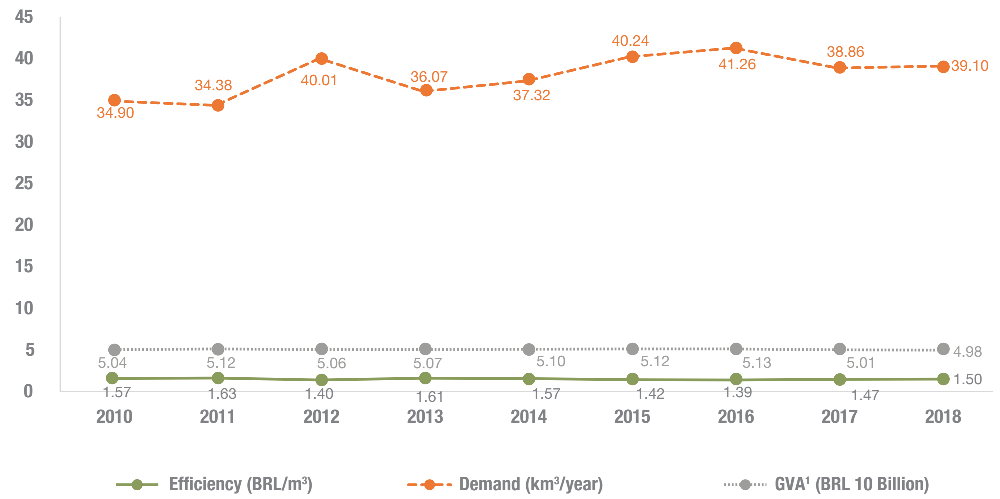
In Brazil, the main uses of water are irrigation, human and animal supply, energy generation, mining, aquaculture, navigation, tourism and leisure. The need to preserve water resources and avoid waste in water use by the population and economic activities was even more evident during the water crises that severely affected the country between 2013 and 2020. As of 2012, the volume of water stored in the Northeast Equivalent Reservoir significantly reduced. In 2014, the lack of rainfall hit the Southeast region, where metropolitan regions such as São Paulo and Rio de Janeiro faced unprecedented water crises, reflected in the reduction of the water available for public supply (reduction of the volume stored in the reservoirs). As of 2016, these effects were verified in the Midwest region and in some parts of the North region, whose impacts also caused a reduction in the flow of important rivers and in the storage capacity of the reservoirs for public supply. In the Federal District, the lack of rain caused a drastic drop in the volume of water stored, which led to the need for the population to ration water. From 2019 onwards, the drought became more intense in the South region, with emphasis on the Iguaçu, Paranapanema and Uruguay basins, and the extreme drought in the Pantanal, Paraguay basin. As a result, cities such as Curitiba, for example, also began to face restrictions on public supply.

## Evolution of water use efficiency by sector in Brazil (Agriculture*, Industry and Services) in the 2010 - 2018 period (BRL/m³)

*Economic activities were grouped in the appropriate sectors according to the methodology proposed by the UN, based on the International Standard Industrial Classification of All Economic Activities (ISIC).*

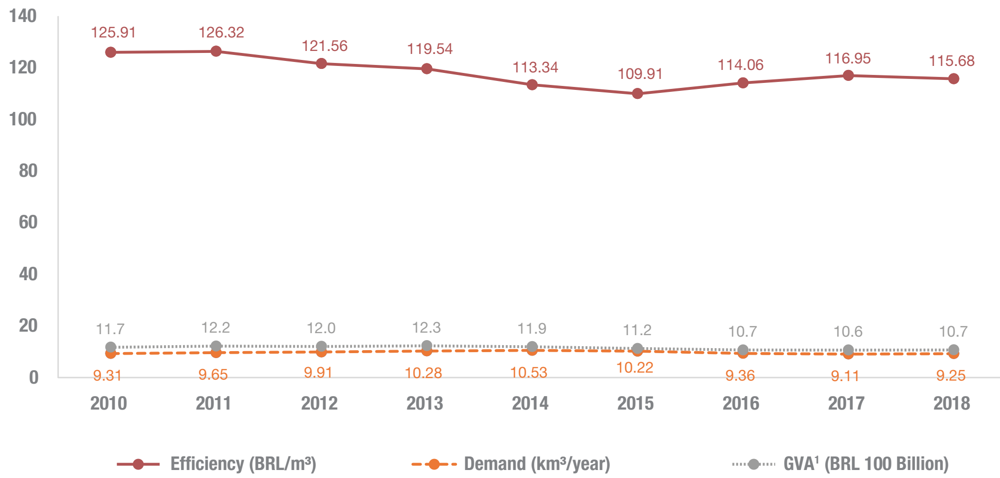
Data sources: ANA and IBGE.

### Agriculture

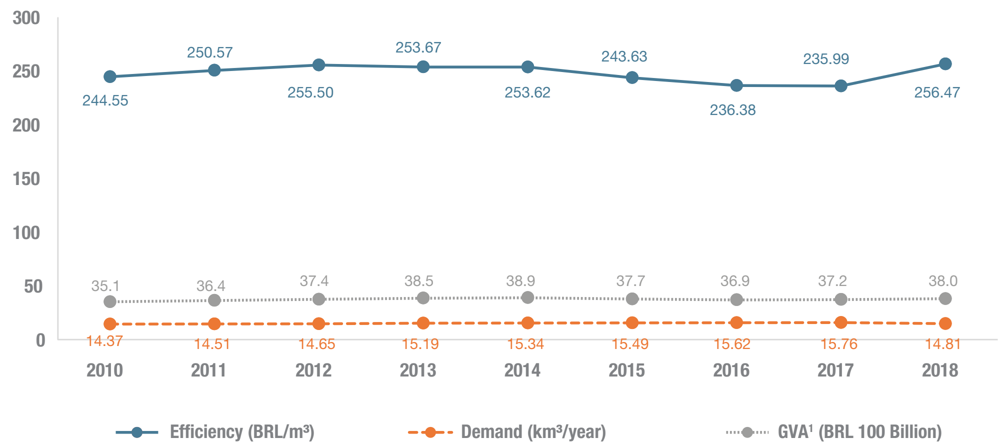



* Agriculture corresponds to the sum of crop irrigation and livestock activities. It does not include forestry, fishing or aquaculture.

### Industry




### Services




[1] Base year 2015 (constant prices)

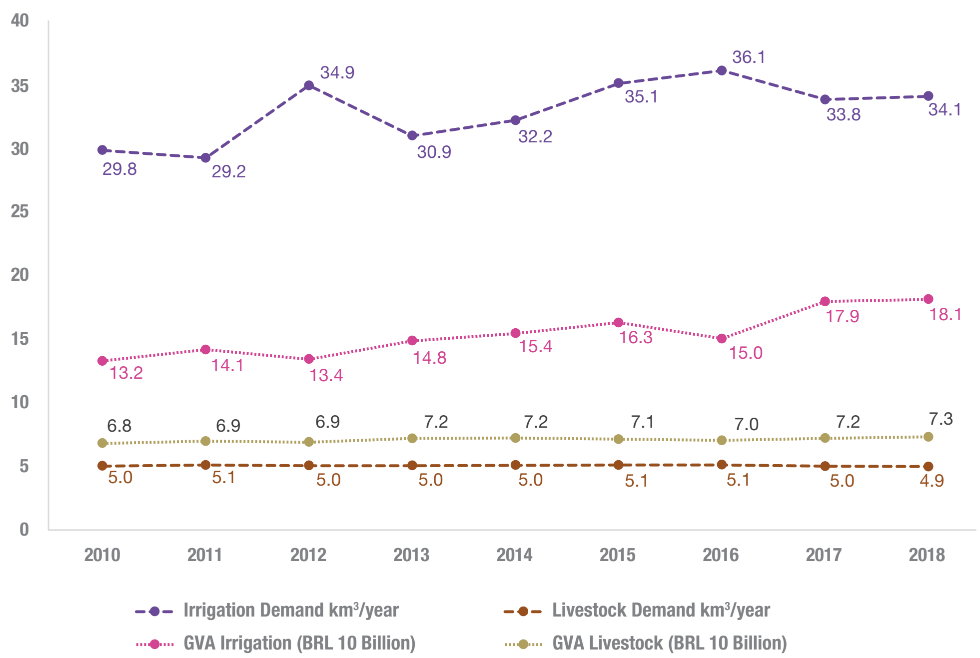
In regions with relevant water stress, such as the Eastern North Atlantic where a majority of its area is located in the Brazilian Semi-arid Region, and the South Atlantic where there is a high demand for rice cultivation through flooding, it is important to increase the efficiency of water use to ensure that scarcity does not limit the capacity for growth of the Region, both economically and socially.

The market can play an important role in increasing efficiency of the country's water use, supporting hydro-intensive uses of greater value. In most cases, the formulation of policies that take water from one economic sector to another in order to increase the efficiency of water use would be ineffective as it can create distortions and affect food security or sanitation. Furthermore, conflicts should be avoided between the domestic and the economic use of water, particularly in relation to agriculture, through the development of tools and mechanisms that allow a fair allocation of water resources.

Brazil has been rogressively implementing, in recent years, the System of Environmental-Economic Accounting (SEEA-Water), coordinated by IBGE. In conjunction with ANA, the Environmental-Economic Accounts for Water (EEAW) are produced. The first edition, for the 2013-2015 period, was released in 2018, and the second one, comprising regionalization of the data and extension of the time series until 2017, in 2020. The third edition is expected to be released in 2023, with data up to 2020. More information at: https://www.ibge. gov.br/geociencias/informacoes-ambientais/estudos-ambientais/20207-contas-economicas-ambientais-da-agua-brasil.html

The agriculture sector is the largest user of water and the one that least adds GVA (254.7 billion reais in 2018, base year 2015 - constant prices). Irrigated agriculture is a highly water-intensive activity when compared to other activities and it is the one that consumes the most water in the world. In general terms, food production may not be "efficient" from a hydric point of view, but it is important to feed a growing world population, to generate jobs, among other factors. It is important to seek a balance between food security, sustainable water use and economic growth.

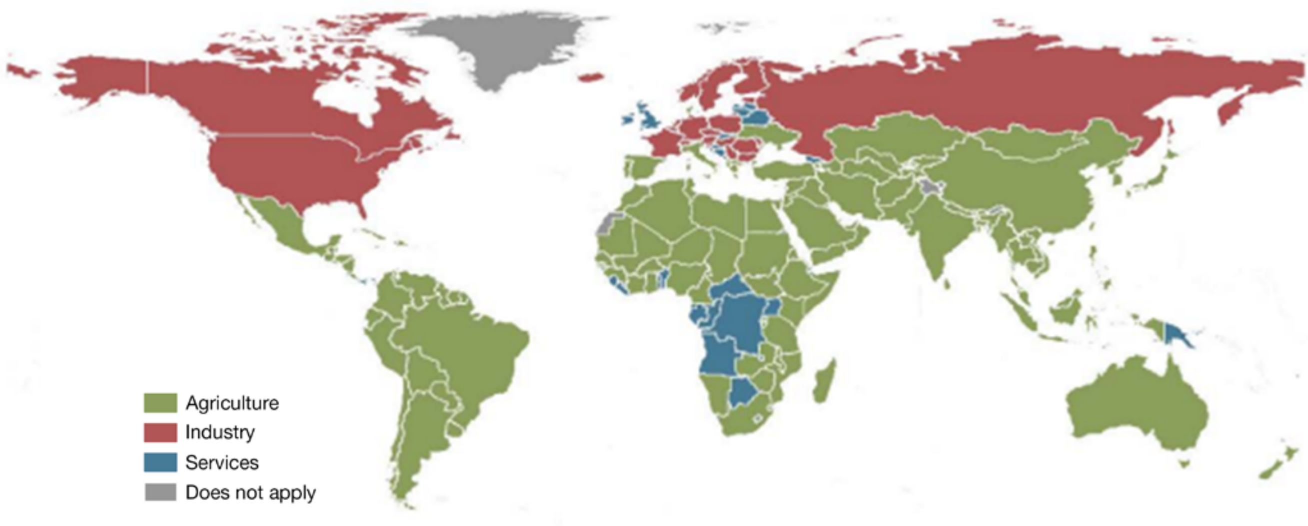
**Livestock and Irrigation Efficiency Components** - 2010-2018



Source: FAO´s
SDG 6.4.1 2021 Report.

The service sector, which has the highest added values and the lowest water consumption, is the one with the highest efficiency in the country. In 2018, the efficiency for this sector reached 256.47 BRL/m3. The GVA of the Services economic sector is the largest among the economic sectors of the country: in 2018, it was approximately 3.8 trillion reais (base year 2015 - constant prices).

**Dominant sectors for freshwater withdrawals in the world** in 2018




Increasing water use efficiency is a complex task that involves coordination and collaboration between various institutions and stakeholders in the country. The process of implementing integrated water management is assessed by the SDG 6.5.1 indicator and provides support for increasing the efficiency of water use from a political point of view. In Brazil, advancement of the integrated water resources management increasingly facilitates interaction between institutions and between sectors, with ANA having the role of implementing the Policy and stimulating more efficient uses of water by promoting the implementation of water resources charges in river basins, as well as other economic instruments.

Thus, possible reasons for improving the efficiency of water use in Brazil would be mainly associated with water demand management actions, such as the progressive reduction of water use for irrigation promoted by the replacement of inefficient methods with technologies that minimize waste, the implementation of water reuse processes by industries and more efficient technologies, the implementation of the instrument of charging for water use in some regions of the country, water scarcity and the change in habits of the population, in addition to more dynamic cores of the economy, among others. On the other hand, reductions in the efficiency of water use in Brazil may be a reflection of the decline in Brazilian economic growth in recent years or changes in the participation of different economic activities in the overall for the country.

**Change in water use efficiency in Brazil**

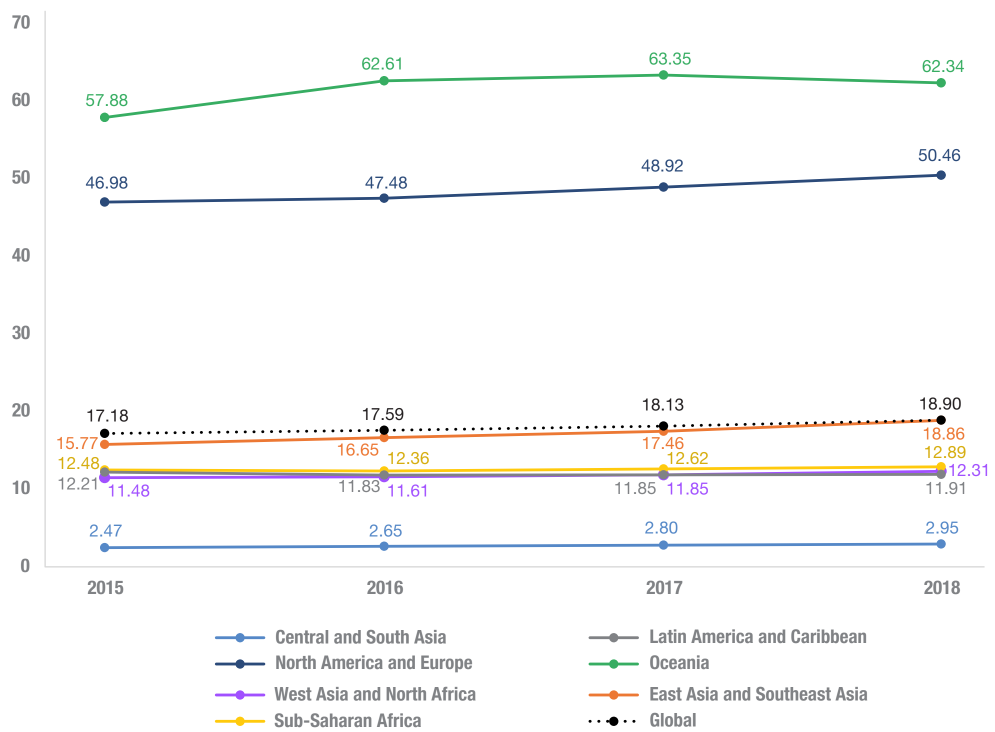
| Sector | 2010 | | 2015 | | 2018 | | Percentage change 2010-2018 | Percentage change 2015-2018 |
|---|---|---|---|---|---|---|---|---|
| | BRL$/m³ | USD/m³ | BRL$/m³ | USD/m³ | BRL$/m³ | USD/m³ | | |
| Agriculture | 1.57 | 0.47 | 1.42 | 0.43 | 1.50 | 0.45 | -5% | 5% |
| Industry | 125.91 | 37.80 | 109.91 | 32.99 | 115.68 | 34.73 | -8% | 5% |
| Services | 244.55 | 73.41 | 243.63 | 73.13 | 256.47 | 76.99 | 5% | 5% |
| Total | 80.93 | 24.29 | 75.12 | 22.55 | 78.02 | 23.42 | -4% | 4% |

Differences in the value of the percentage change in water use efficiency calculated in this report from FAO´s report are likely due to the aggregation of Water, Sewage, Energy and Gas activities. For this report, these activities were regrouped in relation to what is published by IBGE for the economic sectors in the National Accounts in order to correctly achieve the proposed methodology (Water and Sewage placed in Services and Electricity and Gas placed in MIMEC/ Industry). In addition, the GVA of economic activities of Forest Production, Fisheries and Aquaculture were not included in Agriculture activity calculations, as there is no data on the use of water by these activities.

Worldwide, water use efficiency increased from USD 17.3/m³ in 2015 to USD 18.9/m³ in 2018, representing a 9% increase. In 2018, the industry sector had an efficiency of water use equivalent to 32.2 dollars/m³, the service sector 112.2 dollars/m³ and the agriculture and livestock sector 0.60 dollars/m³. Compared to 2015, this factor represents an increase of 15% in the industry sector, 8% in the services sector and 8% in the agriculture and livestock sector. The industry sector experienced the greatest net efficiency gain, probably due to transformations in thermal cooling processes for energy production, industrial processes and heating systems. This reflects a significant reduction in water abstraction in industry sectors over time.

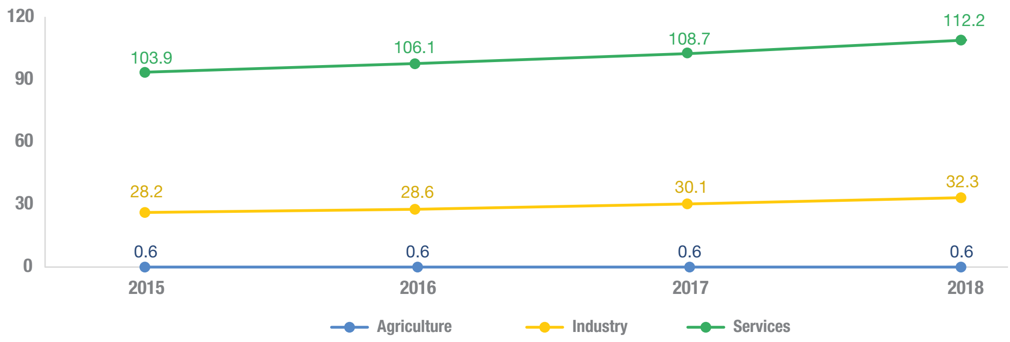
Data for 166 countries, extracted from the FAO´s SDG 6.4.1 2021 Report.

**Evolution of water use efficiency in the world** - 2015-2018 (USD/m³)



Data for 166 countries, extracted from FAO´s SDG 6.4.1 2021 Report

**Evolution of water use efficiency by economic sector in the world** - 2015 - 2018 (USD/m³)




Brazil presented a total efficiency above the global average in 2018. Analyzing the sectors, industry surpassed the average, while agriculture and services were below average. Worldwide, the interdependence between water use and GVA in the agriculture and services sectors seems to be a continuous trend. In the industry sector, the use of water has been reduced for the generation of added value, resulting in greater efficiency in the use of water. An analysis of this global data over the years reveals a potential dissociation of economic growth from water use since 2016. Therefore, greater monitoring over time is necessary for conclusions on the subject.

# METHODOLOGICAL SHEET

## INDICATOR 6.4.1

### Concept

The indicator aims, in short, to evaluate water use efficiency in the following user sectors: agriculture, industry and services. Greater efficiency may reflect reductions in water demand or increase in gross value added (GVA).

As it is an economic indicator, its evaluation over time allows us to observe to what extent the growth of a country depends on the use of water resources.

### Methodology and data sources

The indicator is officially calculated in questionnaires of the Global Information System on Water Resources and Agricultural Water Management (AQUASTAT) of the Food and Agriculture Organization of the United Nations (FAO), based on water use and irrigated area data filled out by countries annually, along with data from other databases such as the United Nations Statistical Division (UNSD). However, for a more accurate and appropriate calculation to the country's data, methodological adjustments were made, in addition to the use of other data sources.

The calculation considers the sum of the efficiency of water use by the three economic sectors, obtained by the quotient between the Agriculture, Industry and Services GVAs and the withdrawals from surface and groundwater bodies for water use in the respective economic activities.

The sectors are defined according to the international standard classification of 4 codes of the International Standard Industrial Classification of All Economic Activities (ISIC):

1. agriculture; forestry; fishing (ISIC A) – agriculture*
2. mining and quarrying; manufacturing; electricity, gas, steam and air-conditioning supply; constructions (ISIC B, C, D and F) – industry, also called MIMEC
3. all the service sectors (ISIC E and ISIC G – T) - services.

To calculate efficiency:

$$WUE = Awe \times PA + Mwe \times PM + Swe \times PS$$

Where:

WUE = Water use efficiency [USD/$m^3$ or BRL/$m^3$]

Awe = Agriculture water use efficiency* [USD/$m^3$ or BRL/$m^3$]

Mwe = industry water use efficiency [USD/$m^3$ or BRL/$m^3$]

Swe = Services water use efficiency [USD/$m^3$ or BRL/$m^3$]

PA = Proportion of water used by the agriculture sector* over total use

PM = Proportion of water used by the industry sector over total use

PS = Proportion of water used by the service sector over total use

Volume units: 1 $km^3$ = 1 billion $m^3$ = 1.000 million $m^3 = 10^9$ $m^3$

To calculate efficiency in each sector:

**Agriculture *:**

$$A_{we} = \frac{GVA_a \times (1 - C_r)}{V_a}$$

Where:

Awe = Agriculture water use efficiency* [USD/$m^3$ or BRL/$m^3$]

GVAa = Gross value added of agriculture* (GVA), excluding river and marine fishing and forestry [USD or BRL]

Cr = Proportion of agricultural GVA produced by rainfed agriculture [%]

Va = Volume of water used by the agriculture sector* (considering irrigation and livestock) [$m^3$]

*For this report, the activity Forest production; fishing and aquaculture was not considered, because, despite the GVA available of the activity, there is no data on the demand for water use in the excavated tanks.

# METHODOLOGICAL SHEET

INDICATOR 6.4.1

To calculate Cr:

$$C_r = \frac{1}{1 + \frac{A_i}{(1 - A_i) * Y_{ri}}}$$

Where:
Ai = proportion of irrigated land in total cultivated land, in decimals
Yri = ratio between rainfed and irrigated yields
If the country has disaggregated irrigated agriculture and livestock data:

$$A_{we} = \frac{GVA_{al} + [GVA_{ac} \times (1 - C_r)]}{V_a}$$

Where:
GVAal = Gross value added of the livestock sub-sector - GVA [USD or BRL]
GVAac = Gross value added of the crop cultivations sub-sector - GVA [USD or BRL]

**Industry:**

$$Mwe = GVAm \ / \ Vm$$

Where:
Mwe = Efficiency of water use of the industry sector (MIMEC) [USD/m³ or BRL/m³]
GVAm = Gross value added of industry (MIMEC), including energy and gas - GVA - [USD or BRL]
Vm = Volume of water used by industry (MIMEC) (including energy) [m³]

**Services:**

$$Swe = GVAs \ / \ Vs$$

Where:
Swe = Efficiency in water use of the services sector [USD/m³ or BRL/m³]
GVAs = Gross value added of services, including Water, sewage, waste management and decontamination activities - GVA [USD or BRL]
Vs = Volume of water used by the service sector [m³]
To calculate the change in water use efficiency in a period:

$$TWUE = \frac{WUE_t - WUE_{to}}{WUE_{to}} * 100$$

Where:
TWUE: change in water use efficiency
$WUE_t$: water use efficiency at the end of the period
$WUE_{t0}$: water use efficiency at the beginning of the period

Data sources:
**IBGE:** Gross Values Added for the Economic Sectors - National Accounts System (SCN) and Regional Accounts System (SCR);
**ANA:** Time series of harvested areas equipped for irrigation and water withdrawal demands of consumptive uses by municipality and by year (Water Database/ Handbook of Consumptive Uses of Water in Brazil);
**Mapbiomas:** Time series of cultivated area for agriculture[1], available at https://mapbiomas.org/
**IPEADATA:** Market exchange rate

[1]The Agriculture class was used, which includes Temporary Cultivation (Soy, Sugarcane, Others) and Perennial Farming. The Mosaic class of Agriculture and Pasture was not used

**Time series available for 2021**

2010-2018

**Spatial unit for calculation**

Federation Unit

**Spatial level**

Geographic Region and Brazil

**Step by step**

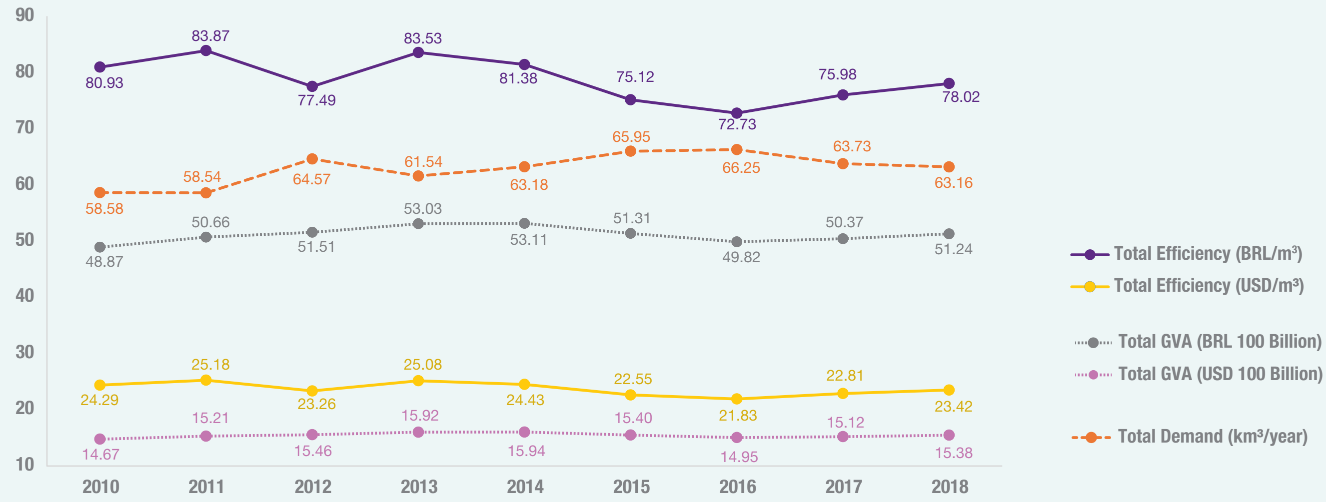
1. For calculating the GVA by sector, the economic activities were grouped according to the methodology proposed by the UN based on the ISIC classification. It is worth mentioning that there is a difference in the grouping of activities in economic sectors in relation to IBGE´s methodology in the National Accounts: according to the UN´s methodology, Water, sewage, waste management and decontamination activities must be computed in Services and the Electricity and Gas activity must be computed in MIMEC/Industry. For the grouping of the agriculture sector activities, the Forest production; fishing and aquaculture activity was excluded because there was no available water use data.

## Changes in Water Use Efficiency

In the calculations per Federation Unit, to compute the GVA of the Electricity and Gas activity in Industry and the Water, sewage, waste management and decontamination activities in Services (according to the UN´s methodology, which differs from the methodology of the National Accounts of IBGE), it was necessary to use the percentage of representativeness of these two activities in the Electricity and gas, water, sewage, waste management and decontamination activities at the National level to apply in the Federation Units. This is because such disaggregation is only available in the National Accounts and are not included in this form in the Regional Accounts.

2. GVA values are converted to 2015 Brazilian real values using regional and sector-specific value-added deflators. Next, it is converted to 2015 U.S. dollars using the foreign exchange market rate. For this purpose, the average commercial credit rate for sale and the commercial exchange rate for purchase (annual average) were used, in the amount of BRL 3.3312 / USD.
3. In order to calculate the demands by sector, the urban and rural human demands are computed in the "Services" sector, the demand for livestock and crop irrigation in the "Agriculture" sector and the demand for thermopower, mining and manufacturing industry in the "Industry" sector.
4. For the calculation of agriculture efficiency, the following are used:
   - the harvested area equipped for irrigation considering not the physical area but the harvest areas, i.e., areas with double crops are counted twice, if both cycles are irrigated. It is worth noting that the data contains recovery irrigation for sugarcane.
   - the cultivated area of agriculture, *i.e.* physical area, where there is no accounting for overlapping areas under multiple crops.
   - FAO's constant rainfed/irrigated yields, estimated as an average of the yield rates of 95 countries and equal to 0.5625.
5. The efficiency values of the use of water resources by economic sector (including the livestock and irrigation sub-sectors – also called agricultural crops by FAO) are calculated for each Federation Unit, Geographical Region and Brazil.
6. Finally, the change in water use efficiency by sector is calculated for each Federation Unit, Geographical Region and Brazil, from 2010 to 2018 and from 2015 to 2018 (period presented in FAO´s 6.4.1 global indicator report).

**Evolution of water use efficiency in Brazil** in the 2010 - 2018 period



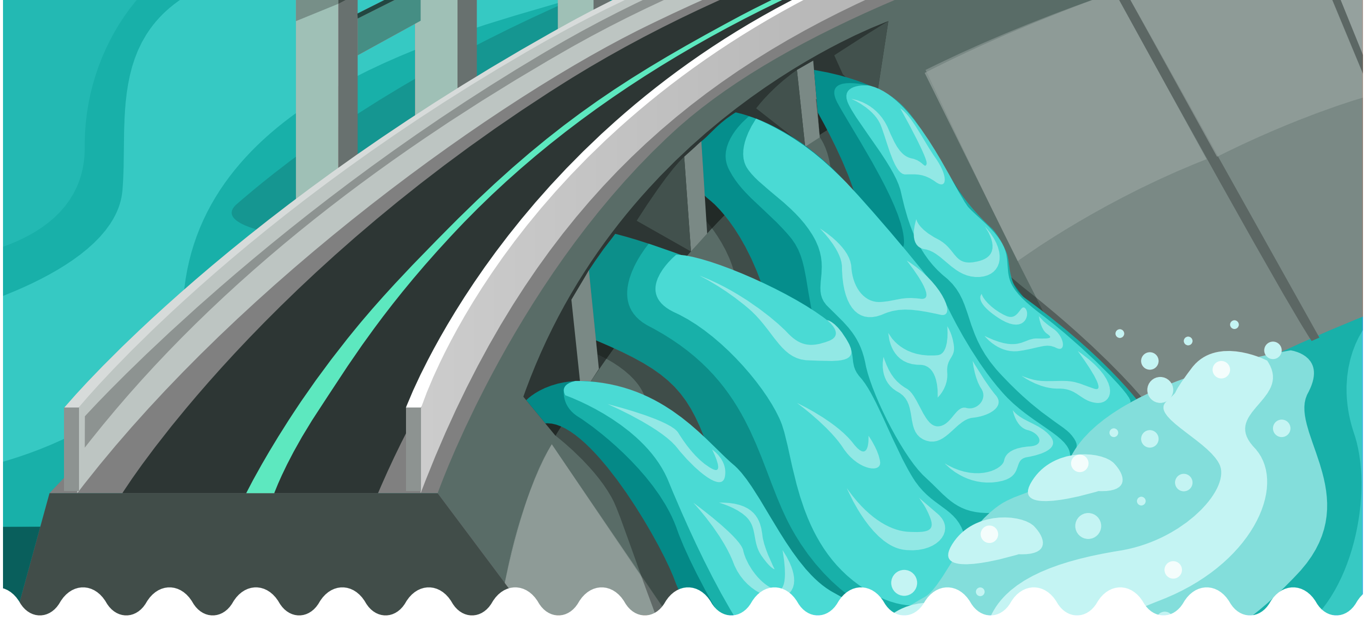
# METHODOLOGICAL SHEET

## INDICATOR 6.4.1

**Indicator 6.4.1 for Brazil, Geographical Regions and Federation Units in 2015 and 2018**

| | Agriculture* Efficiency BRL/m³ | | Industry Efficiency BRL/m³ | | Services Efficiency BRL/m³ | | Total efficiency BRL/m³ | | Total efficiency USD/m³ | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2015 | 2018 | 2015 | 2018 | 2015 | 2018 | 2015 | 2018 | 2015 | 2018 |
| Rondônia | 5.57 | 5.42 | 250.24 | 240.33 | 136.41 | 138.60 | 41.89 | 37.50 | 12.58 | 11.26 |
| Acre | 20.02 | 15.58 | 291.76 | 350.00 | 108.64 | 101.98 | 77.02 | 72.26 | 23.12 | 21.69 |
| Amazonas | 124.43 | 79.31 | 49.11 | 100.73 | 134.70 | 134.93 | 86.52 | 116.98 | 25.97 | 35.12 |
| Roraima | 3.54 | 13.61 | 488.94 | 515.95 | 132.39 | 126.51 | 32.42 | 40.85 | 9.73 | 12.26 |
| Pará | 3.76 | 4.49 | 56.55 | 51.51 | 126.10 | 123.52 | 57.10 | 56.31 | 17.14 | 16.90 |
| Amapá | 1.74 | 1.54 | 251.57 | 225.00 | 85.21 | 78.17 | 73.50 | 69.86 | 22.06 | 20.97 |
| Tocantins | 1.41 | 1.43 | 187.00 | 202.16 | 206.47 | 225.57 | 22.69 | 21.57 | 6.81 | 6.48 |
| North | 2.93 | 3.17 | 62.12 | 75.73 | 129.96 | 142.95 | 50.55 | 53.19 | 15.17 | 15.97 |
| Maranhão | 2.31 | 3.15 | 43.82 | 41.36 | 82.33 | 84.00 | 39.01 | 44.43 | 11.71 | 13.34 |
| Piauí | 1.33 | 1.52 | 236.00 | 143.10 | 150.50 | 148.97 | 54.56 | 54.37 | 16.38 | 16.32 |
| Ceará | 1.03 | 1.75 | 148.05 | 144.60 | 148.15 | 144.39 | 50.73 | 58.32 | 15.23 | 17.51 |
| Rio Grande do Norte | 1.09 | 1.44 | 196.81 | 188.81 | 164.41 | 162.91 | 68.27 | 72.76 | 20.49 | 21.84 |
| Paraíba | 30.46 | -46.53 | 81.27 | 74.86 | 176.82 | 175.64 | 107.06 | 91.68 | 32.14 | 27.52 |
| Pernambuco | -0.25 | -0.34 | 52.60 | 55.25 | 166.85 | 162.58 | 50.23 | 52.96 | 15.08 | 15.90 |
| Alagoas | -2.32 | -3.06 | 18.05 | 19.63 | 156.42 | 157.82 | 37.50 | 40.95 | 11.26 | 12.29 |
| Sergipe | 8.20 | 26.54 | 118.06 | 128.65 | 175.89 | 192.69 | 68.41 | 78.19 | 20.54 | 23.47 |
| Bahia | 0.49 | 0.48 | 157.54 | 152.91 | 183.70 | 184.00 | 31.57 | 33.63 | 9.48 | 10.09 |
| Northeast | 0.82 | 1.02 | 79.32 | 78.35 | 153.05 | 173.49 | 44.05 | 49.08 | 13.22 | 14.73 |
| Minas Gerais | 0.34 | 0.21 | 92.13 | 85.85 | 206.89 | 209.35 | 49.00 | 51.02 | 14.71 | 15.32 |
| Espírito Santo | -0.98 | -1.16 | 124.77 | 111.51 | 211.58 | 205.84 | 29.70 | 43.53 | 8.92 | 13.07 |
| Rio de Janeiro | 0.44 | 3.34 | 147.18 | 148.73 | 256.17 | 237.37 | 198.98 | 194.41 | 59.73 | 58.36 |
| São Paulo | 1.83 | 1.44 | 159.23 | 168.01 | 328.18 | 325.46 | 204.41 | 192.03 | 61.36 | 57.65 |
| Southeast | 0.77 | 0.81 | 136.62 | 137.25 | 281.42 | 281.80 | 118.69 | 123.52 | 35.63 | 37.08 |
| Paraná | 15.31 | 11.10 | 139.32 | 137.64 | 304.77 | 305.49 | 174.97 | 159.33 | 52.52 | 47.83 |
| Santa Catarina | 4.11 | 2.90 | 63.25 | 99.75 | 283.98 | 294.01 | 87.27 | 86.23 | 26.20 | 25.89 |
| Rio Grande do Sul | 0.47 | 0.47 | 145.08 | 182.60 | 279.04 | 282.76 | 25.75 | 26.11 | 7.73 | 7.84 |
| South | 1.31 | 1.27 | 105.63 | 134.49 | 289.38 | 316.20 | 50.86 | 51.43 | 15.27 | 15.44 |
| Mato Grosso do Sul | 5.74 | 5.15 | 53.76 | 39.87 | 233.59 | 226.01 | 56.62 | 49.34 | 17.00 | 14.81 |
| Mato Grosso | 2.33 | 2.22 | 169.16 | 157.81 | 207.29 | 207.75 | 50.55 | 47.07 | 15.18 | 14.13 |
| Goiás | 2.76 | 2.74 | 101.19 | 95.68 | 255.86 | 244.07 | 49.26 | 48.23 | 14.79 | 14.48 |
| Distrito Federal | -0.82 | -1.41 | 688.28 | 720.66 | 953.45 | 960.15 | 516.87 | 519.22 | 155.16 | 155.86 |
| Midwest | 3.03 | 2.90 | 102.81 | 85.94 | 357.86 | 366.86 | 78.85 | 75.49 | 23.67 | 22.66 |
| **Brazil** | **1.42** | **1.50** | **109.91** | **115.68** | **243.63** | **256.47** | **75.12** | **78.02** | **22.55** | **23.42** |

*Except forestry, fishing and aquaculture



The relationship between water availability and water demands in a country allows one to verify the level of water stress exerted by the population and by economic activities on surface and groundwater resources.

## This ratio is measured by a water stress indicator, which is predicted by Target 6.4, by **Indicator 6.4.2: Water Stress Level: Proportion between Freshwater Withdrawal and Total Freshwater Resources Available in the Country.**

In addition to providing an estimate for the renewable freshwater resources pressure exerted by the country's total demands for all uses, indicator 6.4.2 also considers the environmental water needs, that is, the amount of water that is essential to the conservation of aquatic ecosystems.

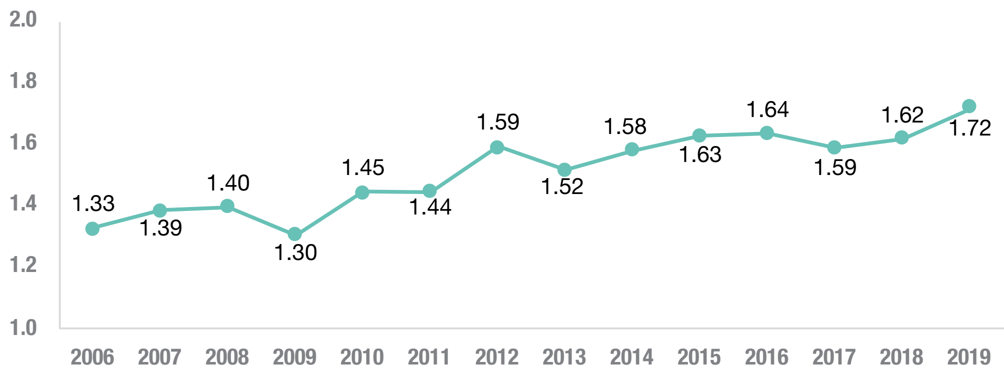
Brazil has no defined methodology for environmental flow calculation. On the other hand, regular uses in the country are only allowed based on minimum flows: a percentage of water availability, in the case of federal rivers (rivers regulated by ANA, for example). The Federation Units also adopt percentage drought flows in order to permit or prohibit water withdrawal. Therefore, the remaining flow is considered for ecological uses.

Water availability is an estimate of the quantity of water available for diverse uses, which for management purposes, usually considers a certain level of guarantee. In order to perform water balances in river reaches, ANA adopts as water availability the flow rate of Q95% (flow which passes through the river in at least 95% of the time, that is, in 95% of the time the flow of the river is equal to or greater than that value). In rivers with regularization, the effect of artificial reservoirs is also considered.

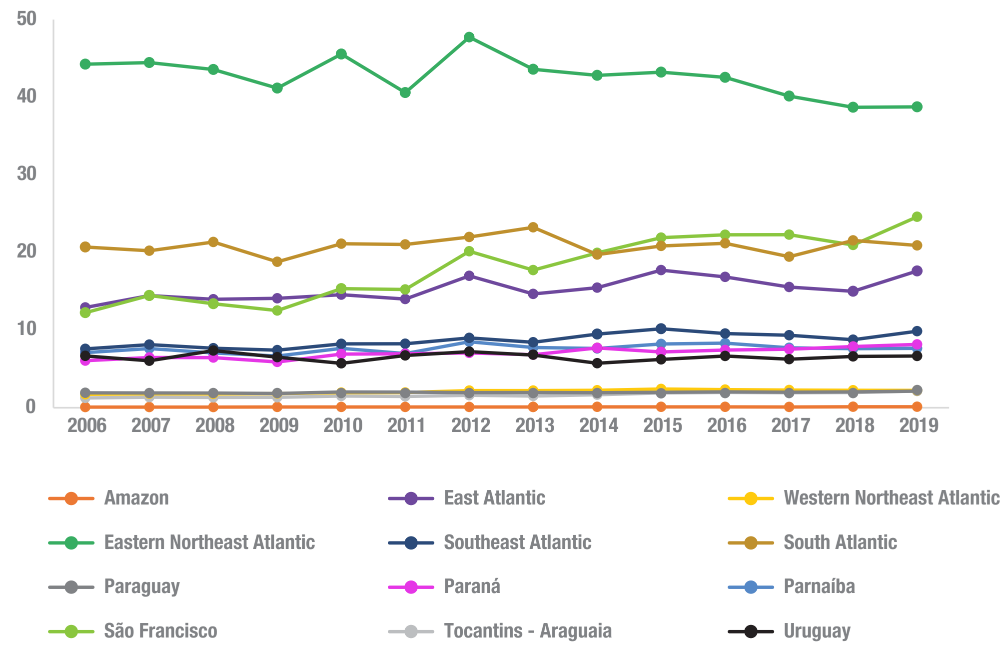
The growth in water demands, which stems from increases in population and economic activities that demand water, contributes to a yearly increase in water stress, even though when examining the country's water balances as a whole, the relationship between water demand and availability tends to be "very satisfactory" (according to the UN below 10%), ranging from 1.3% to 1.7% (from 2006 to 2019). An unfavorable water balance between water demand and water supply can generate scarcity and conflicts for use in certain regions. It is important, therefore, to monitor the intensity of these demands and regulate these uses trough water resources management instruments to minimize or avoid impacts and conflicts.

Data sources: ANA.

**Evolution of the Water Stress Level in Brazil** – 2006-2019 (%)




**Evolution of the Water Stress Level in the Hydrographic Regions** – 2006-2019 (%)

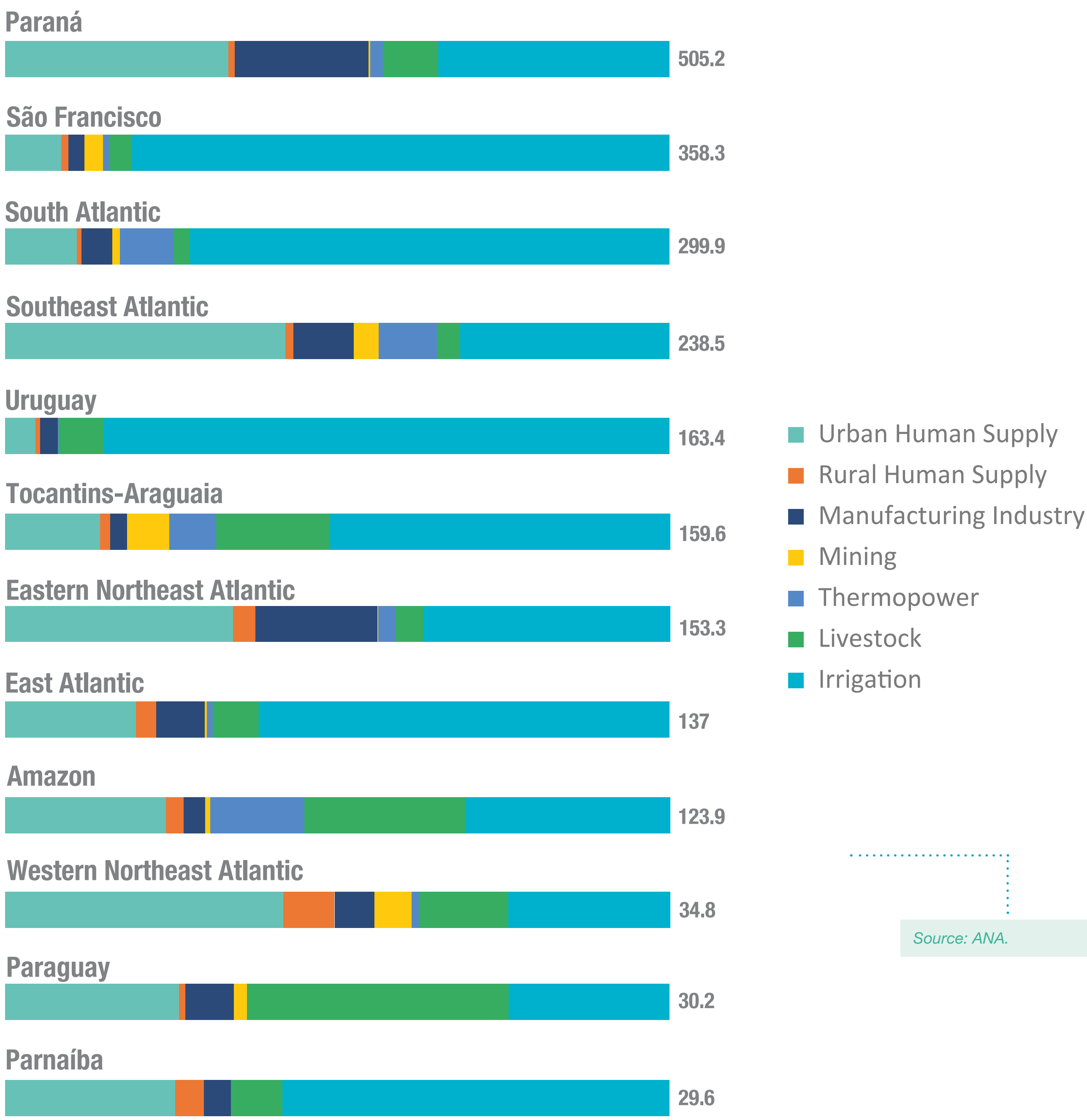



Due to the large differences that characterize the national territory, a single value for indicator 6.4.2 does not reflect the specificities of all 12 Brazilian Hydrographic Regions. It is possible to identify the areas that more urgently need management actions from the relationship between water demand and water availability. The most critical regions are the Eastern Northeast Atlantic, placed in Brazil's semi-arid region, and the South Atlantic, in which water withdrawal for rice crop irrigation by flooding is expressive. Attention should also be paid to the East Atlantic and the São Francisco situations, regions which have considerable demands in relation to water availability. The Southeast Atlantic and Paraná stand out for the greater demands for human supply, as they house large urban centers, in addition to the largest industrial hubs in the country.

The demand for water use in Brazil is increasing, with an estimated increase of approximately 80% in the total water withdrawn in the last two decades. Withdrawal is expected to increase by 23% by 2030. The history of evolution of water uses is directly related to economic development and the process of urbanization of the country.

In Brazil, the use of water that presents the highest withdrawal demands is irrigation, reaching approximately 50% of the total withdrawal in 2019 with an estimated 8.2 million hectares equipped for irrigation in Brazil in 2019, 35.5% of them with reuse water fertirrigation (for sugarcane) and 64.5% with irrigation using water from sources. The second largest use is urban human supply, which corresponds to 24% of the average annual total. Other uses are thermopower, industries, livestock, rural human supply and mining.

**Demands for water withdrawal by consumptive use by Hydrographic Region in 2019 ($m^3/s$)**

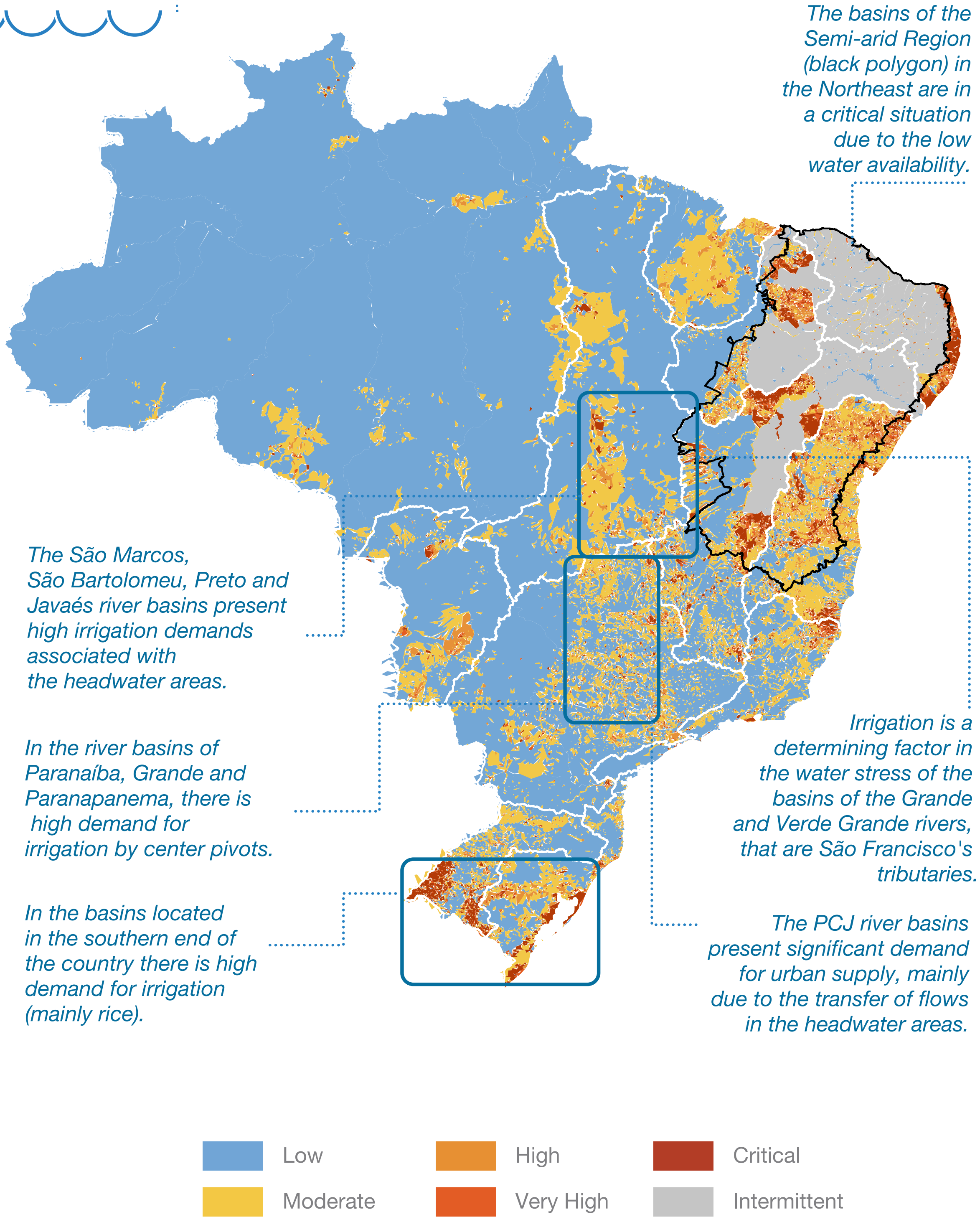



Source: ANA.

The water balance calculated in the smallest hydrographic unit (otto micro-basin level 7 of the Oto Pfafstetter coding system) is carried out mainly for the purpose of regulating the water resources, in the analysis of the water use permits. For indicator 6.4.2, the water balance was aggregated in Hydrographic Regions and it is possible to reaggregate to other levels such as the Water Resources Management Units (UGRHs) used as territorial sections to elaborate the new National Water Resources Plan (PNRH 2022-2040). It is presented in the Brazilian Water Resources Report 2021 – Full Report, available at http://conjuntura.ana.gov.br/.

ANA constantly makes improvements and refinements in water demand and in water availability data, as it is the basis for carrying out its activities as a regulatory agency, especially with regard to the planning and regulation of water resources. Thus, Brazil has disaggregated information on water demand and water availability by municipality and by areas of hydrographic contribution, the so-called otto micro-basins, totaling approximately 450,000 areas with disaggregated information. Due to this form of organization and detailing of the information necessary to calculate the water balance, Brazil is participating in a pilot project with FAO for spatial disaggregation of indicator 6.4.2 by watershed.

**Water Balance by micro-basin in Brazil**



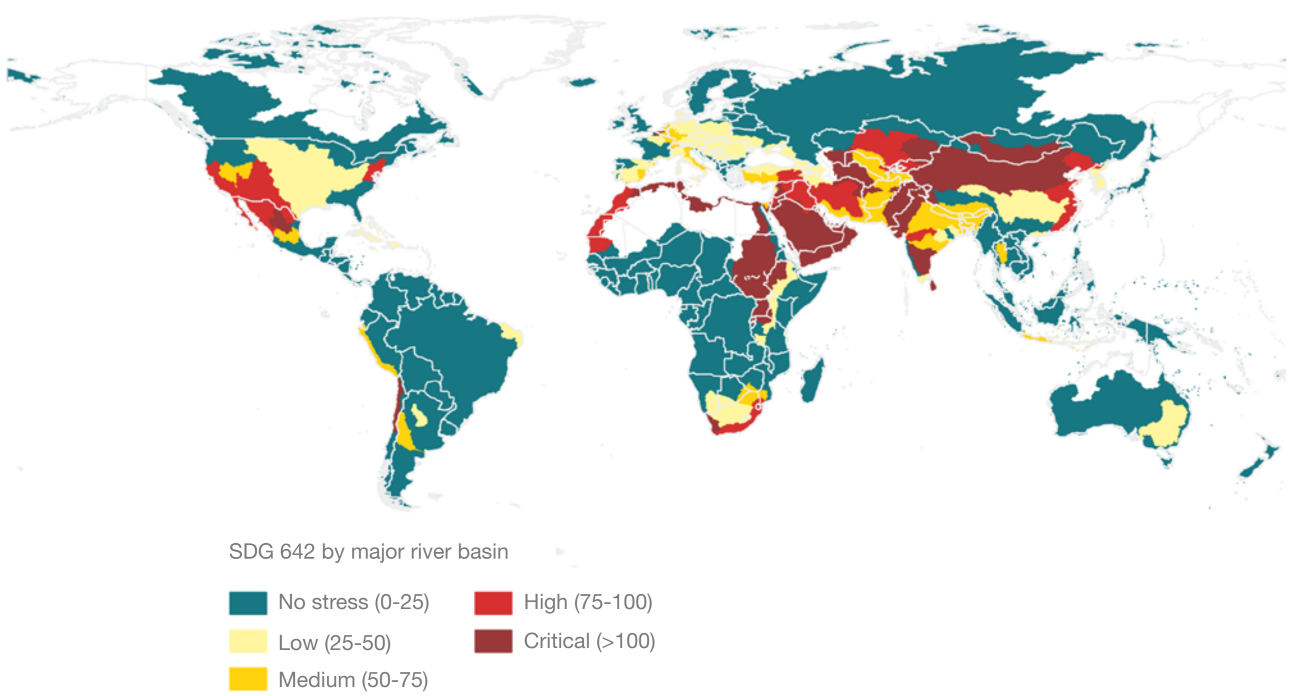
In addition, even though the water balances by Hydrographic Region indicate more critical situations in the Northeast Atlantic and South Atlantic, there are problems located in several Brazilian river basins, which require interventions to resolve conflicts connected to multiple uses of water resources. An example is the water crises that the country has been facing since 2012 and that affect all water uses, with greater or lesser intensity, including non-consumptive uses such as navigation, fishing, tourism and leisure. The causes of a water crisis are not just linked to lower rainfall rates in a given period. Other factors related to the guarantee of supply and the management of water demand, whether due to lack of planning and coordinated institutional actions or lack of investments in water infrastructure and sanitation, are important to aggravate or mitigate its occurrence. In 2021, the water and energy crisis faced by the country focuses entirely on Paraná HR, mainly where important reservoirs are located for energy generation and for supply national demand.

Faced with the complexity and adversity of water supply conditions for the population and economic activities, ANA and the MDR launched the National Water Security Plan (PNSH) in April 2019. The PNSH defined the main structuring interventions of a strategic nature and regional relevance, necessary to ensure water supply for human use and for use in productive activities, as well as to improve the management of risks associated with critical events (droughts and floods). Information available at: https://pnsh.ana.gov.br/.

Globally, 72% of all water withdrawn is destined for agriculture and the strategic aim is to expand the sustainability of this activity, in addition to efficient water distribution and wastewater reuse systems. Still, it is essential to stimulate conscious water use and awareness campaigns to reduce use in homes. In 2018, 18.4% of total renewable freshwater sources available in the world were being withdrawn for use. Although this number may seem safe, it hides large regional, national and subnational variations.

**Global map of the level of water stress level by major river basin in the world in 2018**

Biancalani R, Marinelli M. Assessing SDG indicator 6.4.2 'level of water stress' at major basins level. UCL Open: Environment. 2021;(3):05. Available at: https://dx.doi.org/10.14324/111.444/ucloe.000026



# METHODOLOGICAL SHEET

## INDICATOR 6.4.2

### Concept

This indicator provides an estimate of the renewable freshwater resources stress due to the pressure exerted by the country's total demands for all use purposes; it also considers the environmental variable, essential to the conservation of aquatic ecosystems. It is, in short, a global water balance between water availability and water demand in a country.

### Methodology and data sources

The indicator is calculated by the ratio between the total demand for freshwater withdrawal for population and economic activities supply, and the total renewable freshwater resources available in the country. It also considers environmental requirements represented by an ecological flow, that is a portion of surface water resources that should be reserved for the maintenance of the aquatic ecosystems.

Its formulation is as follows:

$$Sh = \frac{Dt}{(Erh - Qeco)}$$

Where:

Sh = Water stress level, given in %;

Dt = Total withdrawal water demands, in $m^3/s$;

Erh = Total freshwater stock for the country, including surface and groundwater and water inputs from other countries; in $m^3/s$

$Q_{eco}$ = Ecological flow, in $m^3/s$.

Data sources:

**ANA:** Time Series of demands by use purpose and by micro-basins of the database of the Handbook of Consumptive Water Uses in Brazil in the 2006-2019 period. Series of long-term average flows by Hydrographic Region presented in the Brazilian Water Resources Report 2017.

Groundwater reserves were not considered in the indicator's calculation as they are considered to contribute to the base flow of surface water bodies.

### Time series available for 2018

2006-2019

### Spatial unit for calculation

Hydrographic Region

### Spatial level

Hydrographic Region, Brazil

### Step by step

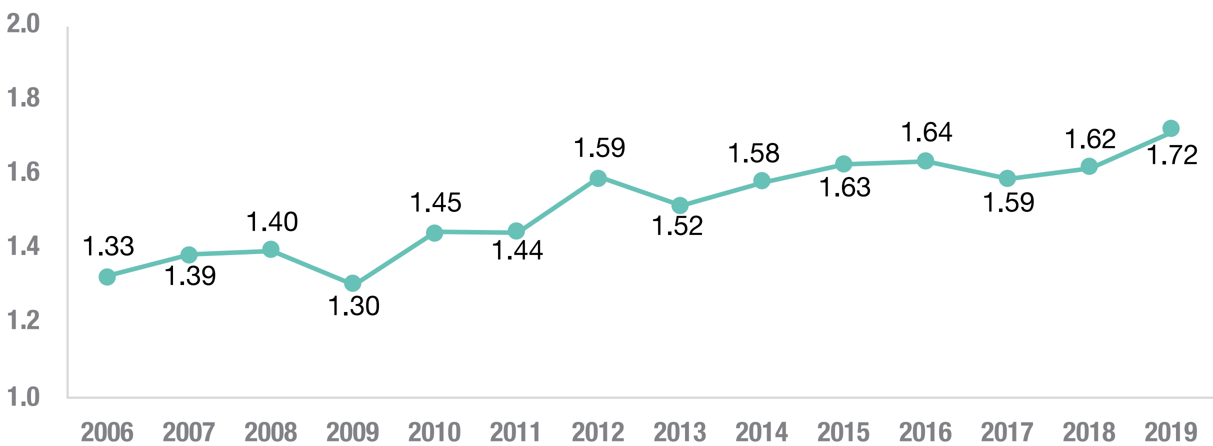
1. The otto micro-basin is associated to each Hydrographic Region.
2. Average long-term flow is obtained for each Hydrographic Region (average Q)
3. 50% of the average Q is calculated as indicative of ecological flow.
4. The demands are grouped by purpose for each Hydrographic Region and for each year.
5. The indicator is calculated for each year by the total demand ratio/ $[E_{rh} - (Q_{eco})]$

## Water Stress Level: Proportion of Freshwater Withdrawal Compared to Total Freshwater Resources Available in the Country

**Evolution of indicator 6.4.2 in the Hydrographic Regions** - 2006-2019 (%)

| Hydrographic Region | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Amazon | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Tocantins-Araguaia | 1.3 | 1.3 | 1.3 | 1.3 | 1.5 | 1.4 | 1.6 | 1.5 | 1.7 | 1.9 | 2.0 | 1.9 | 2.0 | 2.1 |
| North Atlantic Western | 1.7 | 1.8 | 1.8 | 1.8 | 1.9 | 2.0 | 2.2 | 2.2 | 2.2 | 2.4 | 2.3 | 2.3 | 2.2 | 2.2 |
| Northeast Atlantic Eastern | 44.3 | 44.5 | 43.6 | 41.2 | 45.6 | 40.6 | 47.7 | 43.6 | 42.8 | 43.2 | 42.6 | 40.1 | 38.7 | 38.8 |
| Parnaíba | 7.1 | 7.6 | 7.1 | 6.7 | 7.6 | 7.0 | 8.5 | 7.8 | 7.6 | 8.2 | 8.3 | 7.7 | 7.6 | 7.6 |
| Eastern Atlantic | 12.9 | 14.5 | 14.0 | 14.1 | 14.6 | 14.0 | 17.0 | 14.7 | 15.5 | 17.7 | 16.8 | 15.5 | 15.0 | 17.6 |
| São Francisco | 12.2 | 14.5 | 13.4 | 12.5 | 15.3 | 15.2 | 20.1 | 17.7 | 20.0 | 21.9 | 22.3 | 22.3 | 21.0 | 24.6 |
| Southeast Atlantic | 7.6 | 8.1 | 7.7 | 7.4 | 8.2 | 8.2 | 9.0 | 8.4 | 9.5 | 10.2 | 9.6 | 9.3 | 8.8 | 9.8 |
| Paraná | 6.1 | 6.5 | 6.5 | 5.9 | 6.9 | 6.9 | 7.1 | 6.8 | 7.7 | 7.2 | 7.4 | 7.5 | 7.9 | 8.1 |
| Paraguay | 1.9 | 1.9 | 1.9 | 1.8 | 2.0 | 2.0 | 1.9 | 2.0 | 1.9 | 2.0 | 2.0 | 2.0 | 2.0 | 2.1 |
| South Atlantic | 20.7 | 20.2 | 21.3 | 18.8 | 21.1 | 21.0 | 22.0 | 23.2 | 19.7 | 20.8 | 21.2 | 19.5 | 21.5 | 20.9 |
| Uruguay | 6.7 | 6.0 | 7.4 | 6.5 | 5.7 | 6.7 | 7.2 | 6.8 | 5.7 | 6.2 | 6.7 | 6.2 | 6.6 | 6.7 |
| **Brazil** | **1.3** | **1.4** | **1.4** | **1.3** | **1.4** | **1.4** | **1.6** | **1.5** | **1.6** | **1.6** | **1.6** | **1.6** | **1.6** | **1.7** |

**Time series for Indicator 6.4.2 in Brazil** - 2006-2019 (%)



# Management: Sanitation and Water Resources

In view of the necessity of managing water resources in an integrated manner, SDG 6 provides a specific target, which deals with both surface and groundwater resources located in the country and cross-borders:

**Target 6.5 - By 2030, implement integrated water resources management at all levels, including through transboundary cooperation.**

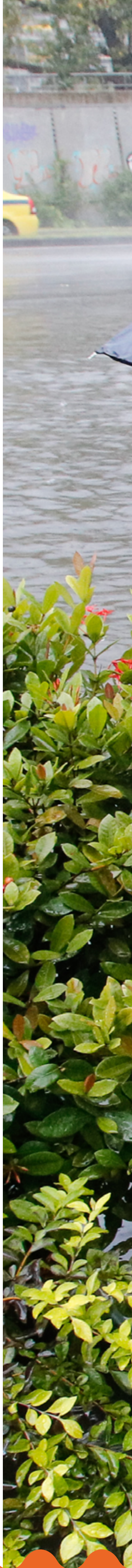
The SDG 6 includes three other targets, which seek to monitor aquatic ecosystems, control investments from external financial resources received by the countries in relation to projects and actions relating to water and sanitation, and monitor the level of participation of society in Water Resources and Sanitation Management:

**Target 6.6 - By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes, reducing the impacts of human action.**

The “Progress on Freshwater Ecosystems: GLOBAL INDICATOR 6.6.1 UPDATES AND ACCELERATION NEEDS/2021” report mentions that although the official wording of target 6.6 indicates 2020, it is assumed that the date will be updated to 2030.

**Target 6.a - By 2030, expand international cooperation and capacity-building support to developing countries in water and sanitation-related activities and programs, including, among others, water resources management, water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies.**

**Target 6.b - Support and strengthen the participation of local communities in improving water and sanitation management.**



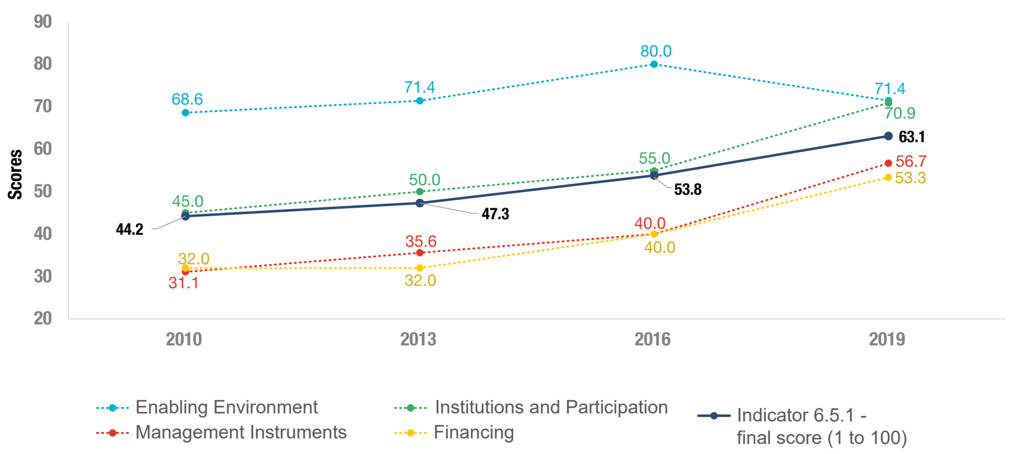
Target 6.5 is monitored by **IIndicator 6.5.1: Degree of Management Implemented Integrated Water Resource Management (IWRM)**. This indicator assesses the status of IWRM in a country, considering the following themes: the existence of a favorable context; the institutional basis and the participatory process to support the implementation of IWRM; management and monitoring tools geared to supporting the decision-making process in the context of IWRM; and the status of the existent funding mechanisms for the operationalization of IWRM.

Integrated Water Resource Management (IWRM) is defined by the UN as a process that promotes the development and pursues three main objectives of sustainable water resource management: economic efficiency, social equity and environmental sustainability.

Every three years, the evolution of IWRM is assessed by the UN with the aim of achieving a “very high” level of implementation (score between 91 and 100) by 2030. For 2020, Brazil responded to the indicator survey in a participatory manner, in compliance with the UN´s recommendations. The members of the Technical Chamber of Planning and Articulation of the National Council of Water Resources (CTPA/CNRH) were able to contribute to the completion, extending the scope of the vision regarding implementation in the country, and in order to cover sectors that use water, public power, other entities of SINGREH and civil society. There is a positive evolution of Integrated Water Resource Management in Brazil, with an increase in the score from 44.2 in 2010 to 63 in 2019; as well as in the four elements assessed: enabling environment, institutions and participation, management instruments and financing.

The CNRH is the highest advisory and deliberative body of the National Water Resources Policy, a member of SINGREH. It analyzes and proposes mediation rules between the various water users, one of the main bodies responsible for the implementation of water resources management in the country. The CTPA's main duties are to study, assess and express its opinion on relevant topics of the water resources policy within the river basin committees.

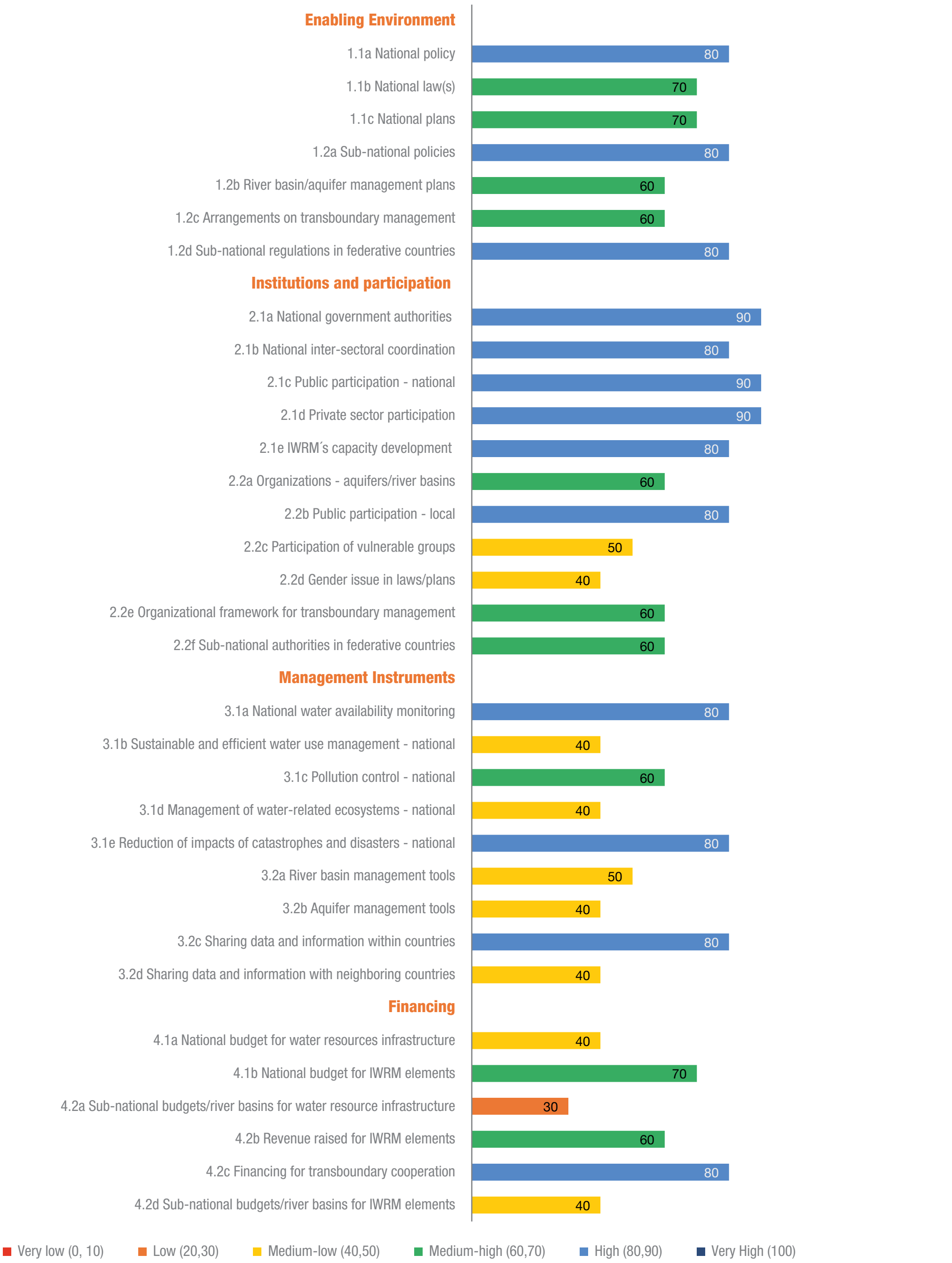
**Evolution of Integrated Water Resource Management in Brazil** – 2010-2019




The data collected for the indicator in 2019 was answered in a participatory manner. Such participation led to a methodological difference in relation to previous collections, which may justify divergences between years.

Data sources: ANA and CTPA/CNRH.

**Assessment of Indicator 6.5.1 – Degree of implementation of integrated water resource management in Brazil in 2019**



The integrated management of water resources in Brazil is relatively new, compared to sanitation management, for example. The National Water Resource Management System (SINGREH), created and instituted after the Brazilian Constitution of 1988, involves several agencies, entities and civil society. It is regulated by Law no. 9,433 of 1997, which instituted the National Water Resource Policy, its foundations, objectives and instruments. ANA is the central agency that performs this management and regularly presents statistics and indicators for identifying the implementation results of the policy in the country and monitoring the National Water Resources Plan.

The Dublin Declaration on Water and Sustainable Development, 1992, addressed the theme in its Principle no. 3 "Women play a central role in the supply, management and safeguarding of water".

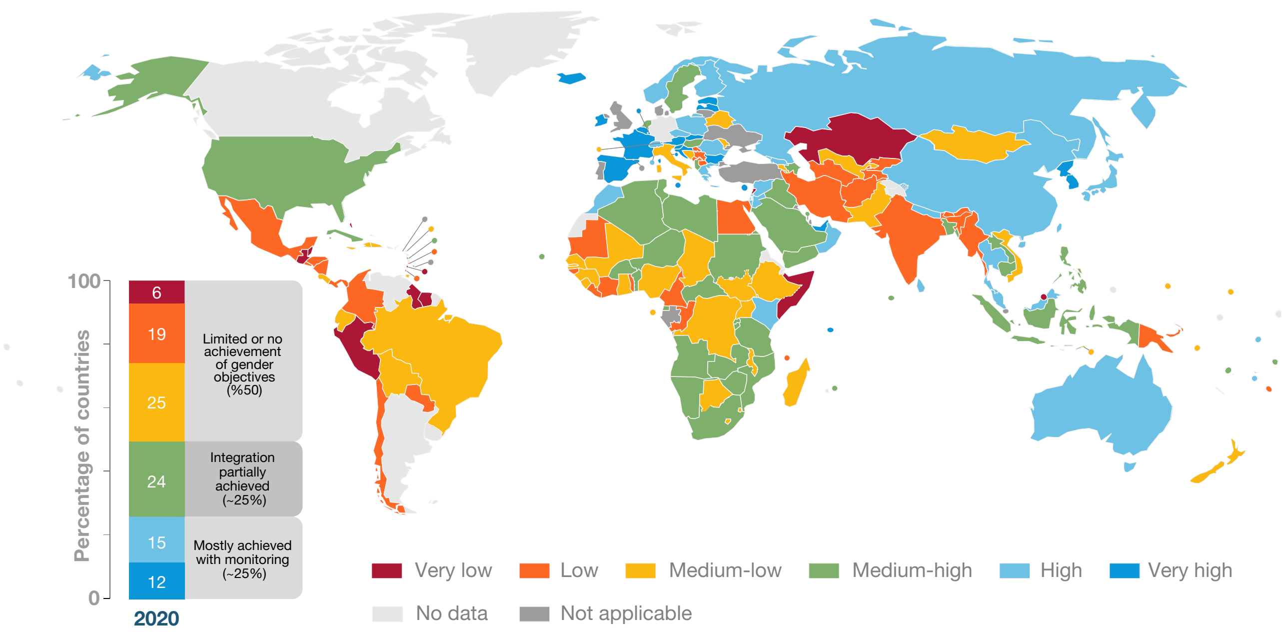
The specific issue of gender inclusion (2.2d) in laws and water resource management plans highlights the importance of disaggregated data by gender in Agenda 2030. The burdens of water-related work carried out predominantly by women have been recognized for decades, which led to a focus on the practical needs of women in relation to water, especially with regard to the transportation and management of water within the home. In the context of water resource management, there has been a growing recognition that a strategic and practical focus on increasing the voice and influence of women at all levels of decision-making should become a priority. In addition, gender mainstreaming in the water sector supports a number of goals in the SDGs, including Goal 5 of achieving gender equity and empower all women and girls.

The SDG 5 goal "Achieving gender equity and empowering all women and girls" seeks to ensure the full and effective participation of women and equal opportunities for leadership in all levels of decision-making in political, economic and public life.

Many countries have developed gender mainstreaming policies and strategies, although evidence has revealed a clear gap between high-level commitments and practices. Half of the countries report limited or no achievement of gender objectives in water resource management, with 25% of the countries having no gender objectives in their policies and management plans related to water. A significant gap is the lack of monitoring and assessment processes, with only a quarter of countries reporting adequate monitoring of gender activities and outcomes.

Data from UNEP´s Report (2021) Progress on Integrated Water Resource Management. Tracking SDG 6 series: global indicator 6.5.1 updates and acceleration needs, available at https://www.unwater.org/publications/progress-on-integrated-water-resources-management-651-2021-update/

**Global gender mainstreaming in water resource management (Q. 2.2d) in 2019**

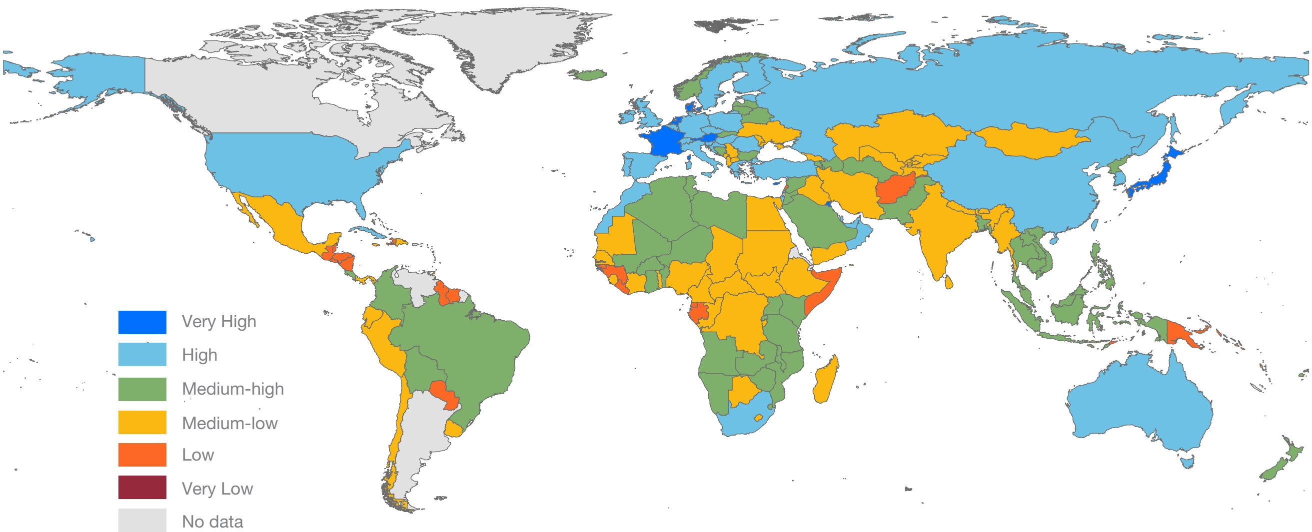



Source: UNEP´s SDG6.5.1 2021 Report.

Even though there have been many advances in integrated water resource management in recent years in Brazil, there are several gaps that must still be overcome, especially regarding the financing mechanisms and the effective application of financial resources in actions directed at the implementation of IWRM, besides the inclusion of gender issues in the legislation, not explicit in Law no. 9,433/97. Although the standard determines that water resource management must be decentralized and count on the participation of the Government, users and communities, adjustments in the legislation are pertinent due to new views on the subject 24 years after the creation of the National Water Resources Policy and in light of SDGs 5 and 6. Globally, indicator 6.5.1 has made insufficient progress toward meeting the target.

Source: UN-Water´s SDG6 Summary Progress Update 2021 Report.

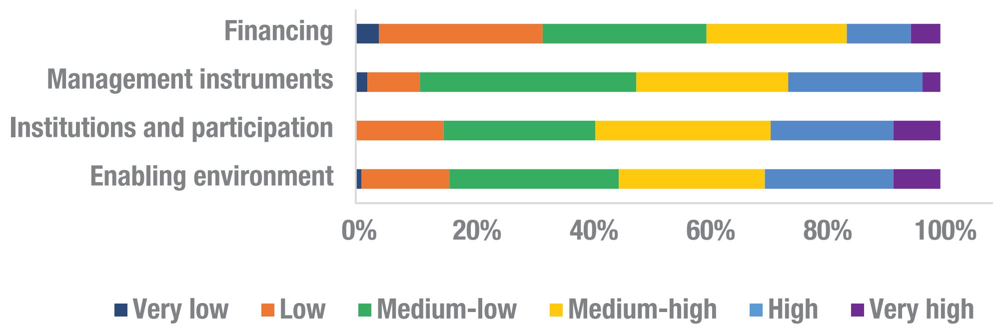
**Degree of IWRM implementation in the world in 2019**




Data from 186 countries.

Source: UNEP´s SDG 6.5.1 2021 Report.

**Percentage of countries by level of IWRM implementation in each dimension of the SDG 6.5.1 indicator in 2019**



# METHODOLOGICAL SHEET

## INDICATOR 6.5.1

### Concept

Integrated Water Resources Management (IWRM) is defined as a process that promotes the coordinated development and management of water, land and related resources, in order to maximize the economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems, taking into account climatic and hydrological aspects, as well as economic, political, and environmental aspects.

The indicator aims to identify the degree of IWRM implementation in a country. The questions are divided into 4 sections, each of which has two subsections: one covering the national level and another covering other levels such as sub-national, river basins, local and transboundary. The 4 sections are:

**1.** Enabling environment for integrated management

**2.** Instituições e participação

**3.** Instrumentos de gestão

**4.** Financiamento

Data source:

**ANA:** Annual Brazilian Water Resources Reports and consultation with members of the CTPA/ CNRH.

### Methodology and data sources

The indicator is calculated by filling in the survey (Country Survey for Indicator 6.5.1), prepared by the United Nations Environment Program (UNEP), divided into four sections, each one containing specific questions on the aforementioned topics, totaling 33 questions. The survey was answered in a participatory manner*, involving various actors in the country linked to water resources, more specifically the members of the CTPA/CNRH (Technical Chamber of Planning and Articulation of the National Council of Water Resources).

*For data collections from previous years, the question had only been answered by ANA´s technicians, which represented a significant change in methodology. Thus, an analysis of the responses presented by CTPA/CNRH was carried out, in association with the ANA assessment, aiming at aligning the time series already presented for the indicator.

### Time series available for 2021

2010-2019

### Spatial unit for calculation

The survey presents questions for analysis at the national sub-national level, for river basins and/or Federation Units.

### Spatial level

Brazil

### Step by step

For each survey question, a score with the following classification is assigned:

Very low: 0 | Low: 20 | Low to medium: 40 | Medium to high: 60 | High: 80 | Very High: 100

The answers are consolidated into a single survey.

The scores of each question are summed up and the sum divided by the total of questions in the Session, and the scores the S1, S2, S3 and S4 are obtained

Indicator 6.5.1 is calculated by the equation below:

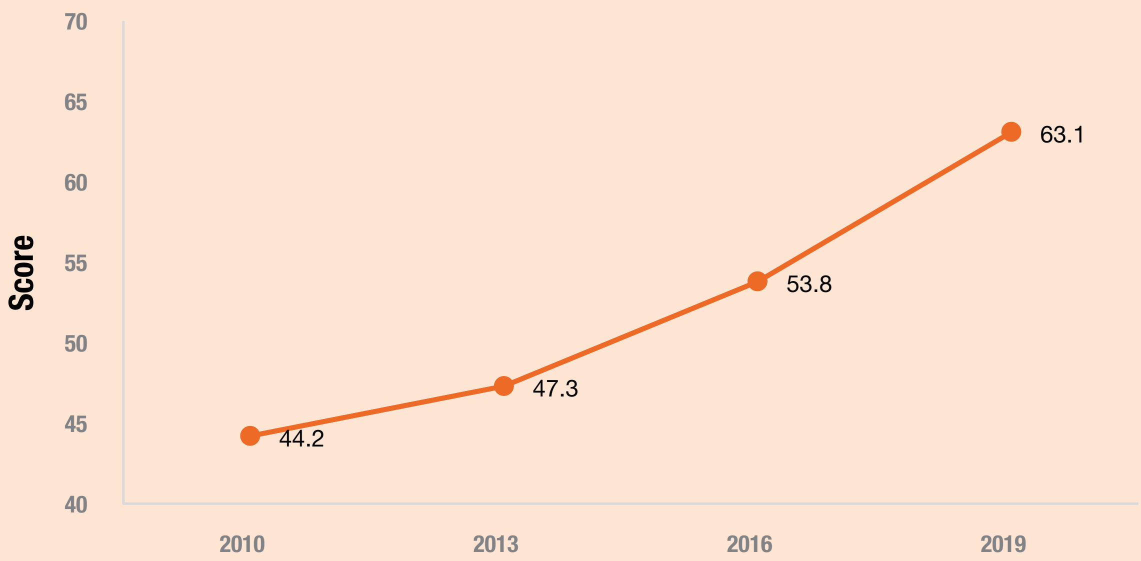
$$\text{Indicator 6.5.1} = \frac{S1 + S2 + S3 + S4}{4}$$

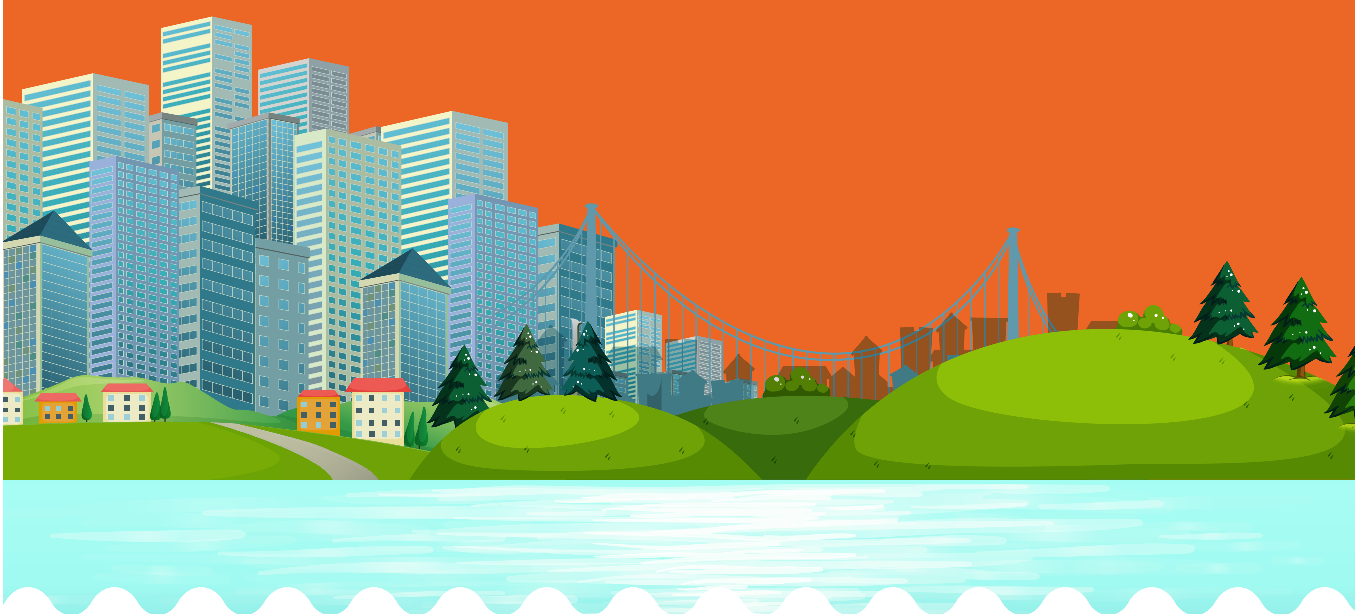
# Degree of Implementation of Integrated Water Resource Management (IWRM)

## Série Histórica do INDICATOR 6.5.1 – 2010-2019

| Survey session | 2010 | 2013 | 2016 | 2019 |
|---|---|---|---|---|
| Enabling environment | 68.6 | 71.4 | 80.0 | 71.4 |
| Institutions and participation | 45.0 | 50.0 | 55.0 | 70.9 |
| Management instruments | 31.1 | 35.6 | 40.0 | 56.7 |
| Financing | 32.0 | 32.0 | 40.0 | 53.3 |
| **Indicator 6.5.1 - final score (1 to 100)** | **44.2** | **47.3** | **53.8** | **63.1** |

## Evolution of indicator 6.5.1 in Brazil – 2010 -2019





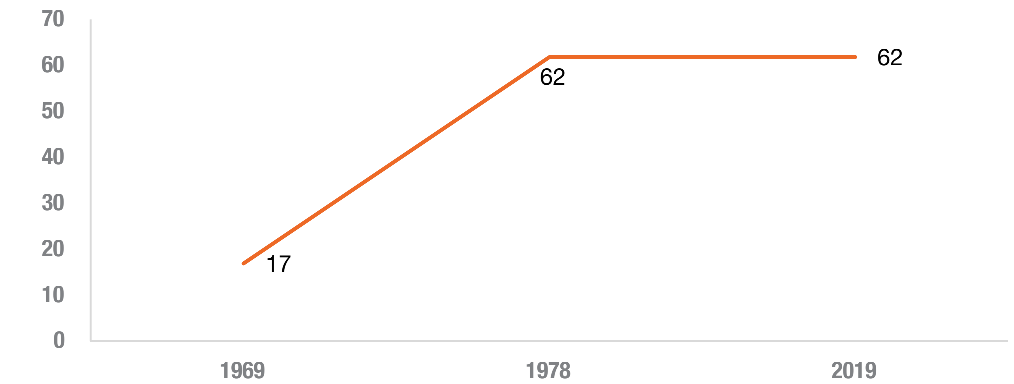
## Target 6.5 aims to monitor the evolution of transboundary water resource management actions in countries through **Indicator 6.5.2: Proportion of Transboundary Water Basins and Aquifers with an Operational Arrangement for Water Cooperation.**

This indicator assesses the progress of shared management of Transboundary Water Resources through the monitoring of agreements signed between countries over time, considering the areas covered by the agreements in relation to the total area of the country's transboundary water basins and aquifers. Due to its great territorial extension, Brazil shares river basins (including for the largest river in the world, the Amazon river) and aquifers, with a number of other countries in South America. This requires the formalization of international agreements for the integrated management of water resources that cross national borders.

For this edition, and considering the data collected by UNESCO and UNECE in 2020, the operation of the existing arrangements began to be incorporated into the indicator for Brazil, using the four metrics proposed by the UN: (I) existence of a common body, mechanism, or joint commission (e.g. a river basin organization) for transboundary cooperation; (II) existence of regular formal communications between the countries in the form of meetings (either at the political or technical level) at least once a year; (III) existence of a joint water management plan or definition of common objectives; and (IV) existence of regular data and information sharing at least once a year. In 2019, 62% of all Brazilian transboundary water resources were covered by operational international cooperation arrangements.

Assessment of the indicator for data collection carried out in 2020 was supported by ANA's International Advisory Service (ASINT). The survey was answered in cooperation with the focal points of the main transboundary basin arrangements. In this way, the information was measured with greater quality, as an unprecedented survey of existing transboundary cooperation and its operability was carried out.

**Evolution of the Proportion of transboundary river basins and aquifers with an operational arrangement for water cooperation** – 1969-2019 (%)




Data sources: ANA and MDR.

**Area of transboundary river basins and aquifers covered by operational arrangements for water cooperation**

| | Transboundary aquifers | Transboundary river basins | Total area (%) |
|---|---|---|---|
| 1969 | 0.00% | 27.28% | 16.91% |
| 1978 | 0.00% | 99.76% | 61.82% |
| 2019 | 0.00% | 99.76% | 61.82% |
| Total area (km²) | 3,166,450.00 | 5,158,168.00 | |

| Name of the transboundary basin | Basin or sub-basin? | Countries that share it | Object of the Arrangement (complete/ partially/ no) | Criterion I* | Criterion II | Criterion III | Criterion IV |
|---|---|---|---|---|---|---|---|
| Amazon | Basin | Bolivia, Colombia, Ecuador, Guyana, Peru, Venezuela | completely | ✓ | ✓ | ✓ | ✓ |
| Plata | Basin | Argentina, Paraguay, Bolivia, Uruguay | completely | ✓ | ✓ | ✓ | ✓ |
| Quaraí | Sub-basin (Plata) | Uruguay | completely | ✓ | ✓ | ✓ | ✓ |
| Apa | Sub-basin (Plata) | Paraguay | completely | ✗ | ✗ | ✓ | ✓ |
| Lagoa Mirim | Basin | Uruguay | completely | ✓ | ✓ | ✓ | ✓ |
| Oiapoque | Basin | France (French Guiana) | no | ✓ | ✓ | ✗ | ✗ |

*The criteria for assessing the operability of the arrangement are listed on the previous page.

Of 5,158,168 $km^2$ of transboundary surface water basins, 99.76% are covered by arrangements, leaving only 0.24% to include the entire area. The area devoid of an international arrangement for shared management corresponds to the Oiapoque hydrographic basin, of 12,277 $km^2$. The basin is shared between areas of the Brazilian territory and the Overseas Department of French Guiana (France). At present, there are no transboundary arrangements for the basin, either in the context of bilateral cooperation or multilateral cooperation, despite technical cooperation initiatives in the region. Negotiating actions for technical, scientific and technological cooperation between Brazil and French Guiana were discussed in the past, without records of effective implementation of the projects.

The Government of France, through institutions such as Institut de Recherche pour le Développment (IRD), has cooperation initiatives in the Amazon region that may involve French Guiana, including the Amazon Regional Observatory (ORA), an initiative of the IRD and the Amazon Cooperation Treaty Organization (ACTO), on water quality in the Amazon basin. The French government, on behalf of French Guiana, participates in the Association of Caribbean States, an organization of cooperation and action focused on the field of trade, transport, sustainable tourism and natural disasters in the Greater Caribbean.

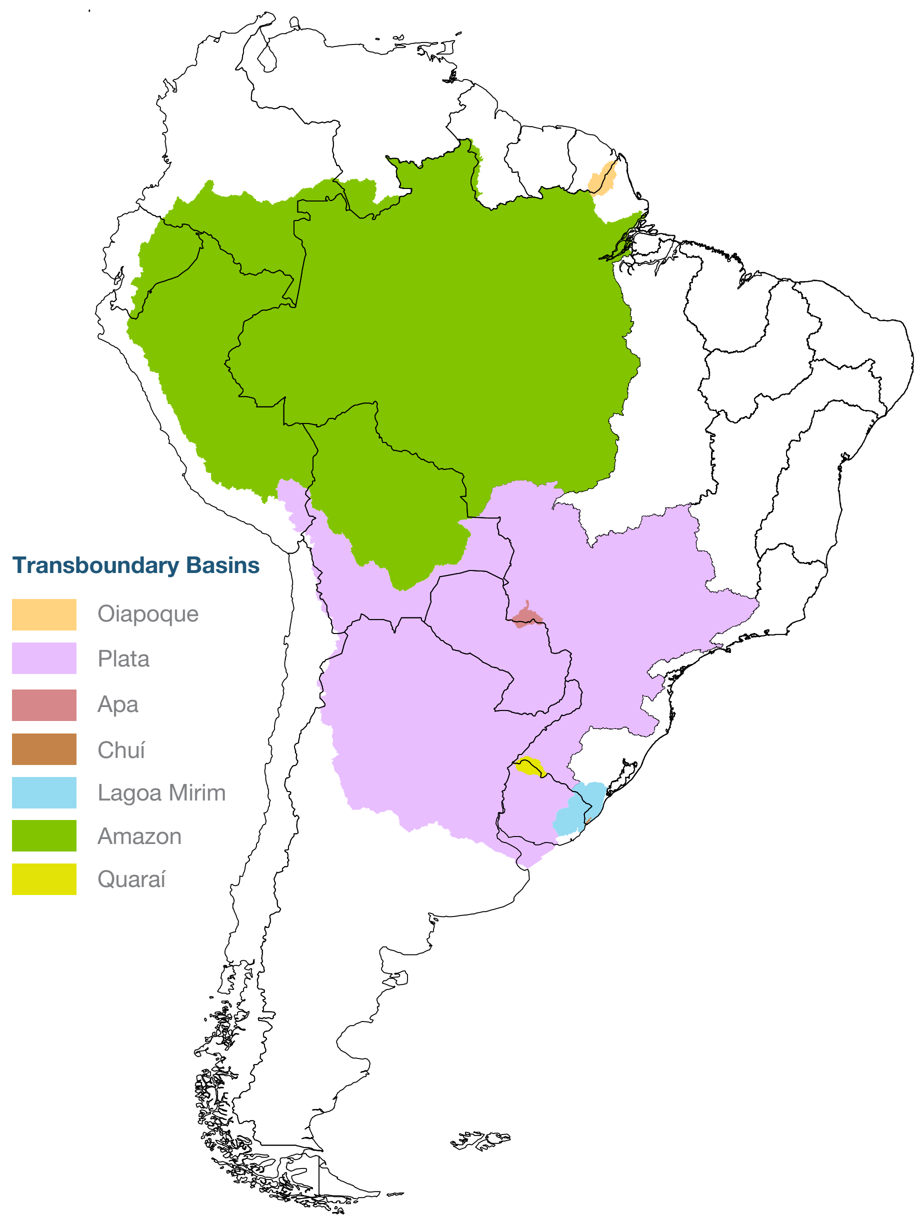
Suriname does not effectively have territory in the Amazon basin, but given its integration into the regional reality, participates in the treaty and cooperation actions.

The Treaty of La Plata Basin, signed in 1969 between the governments of Argentina, Bolivia, Brazil, Paraguay and Uruguay, was the first international arrangement signed for the shared management of Brazilian transboundary water resources. Subsequently, in 1978, the Amazon Cooperation Treaty was signed by Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela, and the Cooperation Agreement to promote the full development of the Lagoa Mirim Basin, located on the border of Brazil with Uruguay, which includes the area of the Arroio Chuí basin.

With regard to aquifers, Brazil does not have operational arrangements for cooperation in the management of water resources. There are 11 (eleven) shared transboundary aquifers, which represent a relevant aspect for water governance in the South American continent.

The Guarani Aquifer Agreement was signed in August 2010 between Argentina, Brazil, Paraguay and Uruguay, based on the Declaration of the United Nations Conference on the Environment (1972), Rio-92, Agenda 21, the United Nations Assembly on the Law of Transboundary Aquifers, the Summit on Sustainable Development and the Mercosur Maritime Environmental Agreement. The Arrangement aims at greater cooperation for scientific knowledge and responsible management on water resources, of great economic importance for countries. It was initially ratified by Argentina and Uruguay in 2012, by Brazil on May 2, 2017 (Legislative Decree no. 52 of May 3, 2017) and, finally, the Arrangement was ratified by Paraguay in 2018.

### Brazil's Transboundary River Basins



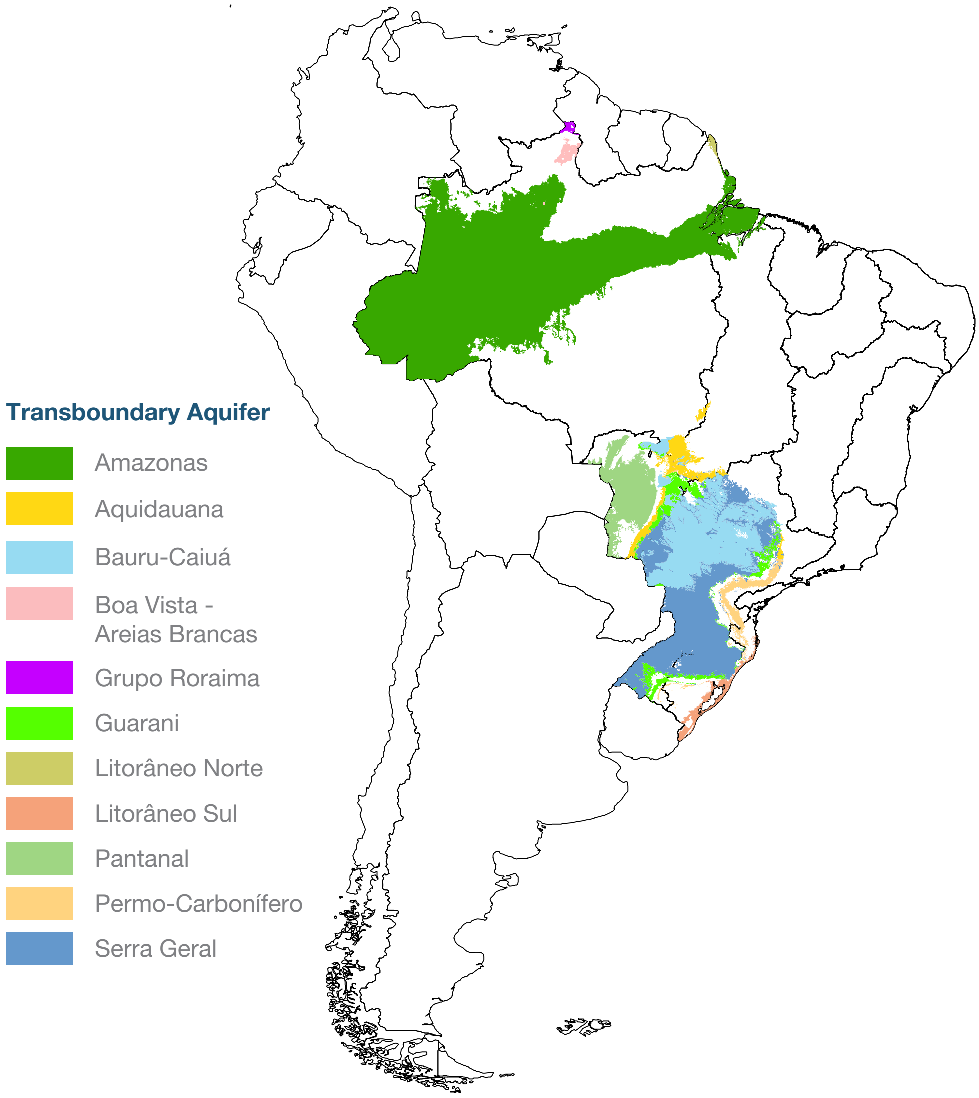

Source: ANA.

### Transboundary river basins and areas in the Brazilian territory that are subject of an operational arrangement

| Transboundary River Basin | Shared countries | Basin Area within the Brazilian Territory (km²) | Basin Area within the Brazilian Territory (km²) that is subject of an operational arrangement |
|---|---|---|---|
| Amazon | Bolivia, Colombia, Ecuador, Guiana, Peru, Venezuela | 3,712,354 | 3,712,354 |
| Plata | Argentina, Paraguay, Bolivia, Uruguay | 1,407,280 | 1,407,280 |
| *Quaraí | Uruguay | | |
| *Apa | Paraguay | | |
| Lagoa Mirim | Uruguay | 26,257 | 26,257 |
| Oiapoque | France (French Guiana) | 12,277 | 0 |
| **Total** | | **5,158,168** | **5,145,891** |

*The Quaraí and Apa basins are sub-basins of La Plata river basin*

### Transbounding Aquifers of Brazil




Source: ANA.

### Transboundary aquifers and outcrop areas in the Brazilian territory that are subject of the operational arrangement

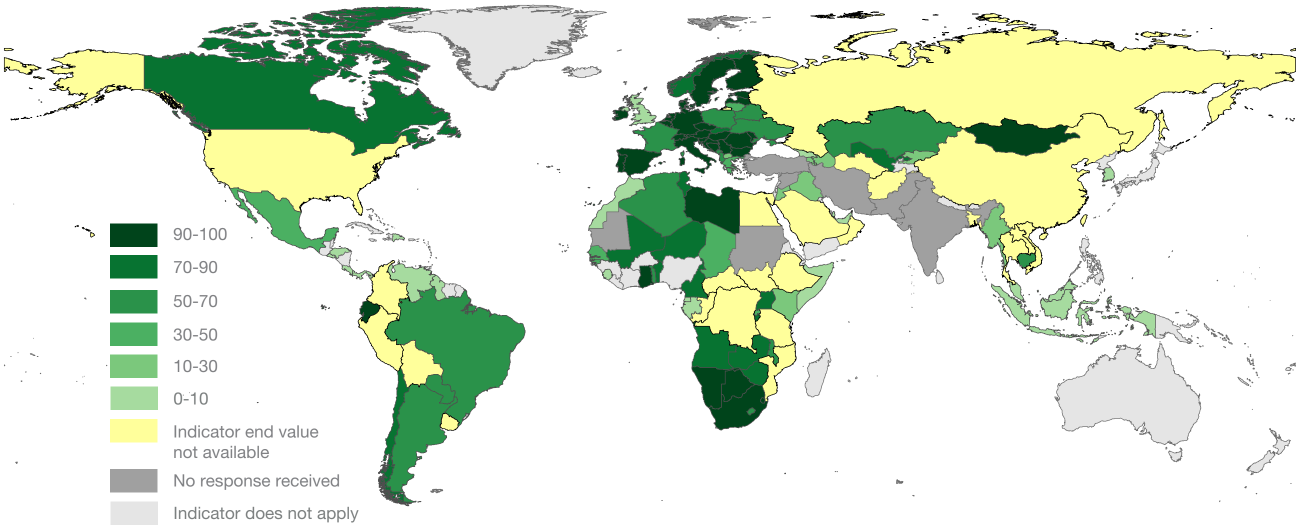
| Transboundary Aquifers | Shared countries | Aquifer Area within the Brazilian Territory (km²) | Aquifer Area within the Brazilian Territory (km²) that is subject of an operational arrangement |
|---|---|---|---|
| Amazonas | Bolivia, Colombia, Ecuador, Peru, Venezuela | 2,000,000 | 0 |
| Serra Geral | Argentina, Paraguay, Uruguay | 420,593 | 0 |
| Bauru-Caiuá | Paraguay | 353,374 | 0 |
| Pantanal | Bolivia, Paraguay | 162,318 | 0 |
| Guarani | Argentina, Paraguay, Uruguay | 67,976 | 0 |
| Aquidauana | Paraguay | 73,027 | 0 |
| Permo-Carbonífero | Uruguay | 37,388 | 0 |
| Litorâneo Sul | Uruguay | 26,564 | 0 |
| Litorâneo Norte | France (French Guiana) | 5,351 | 0 |
| Grupo Roraima | Guiana, Venezuela | 5,010 | 0 |
| Boa Vista-Areias Brancas | Guiana | 14,849 | 0 |
| **Total:** | | **3,166,450** | **0** |

The history of technical cooperation on the continent, whether bilateral or regional, has included projects and initiatives that address the transboundary issue of water. The results contribute to broader regional integration and to addressing the challenges of monitoring water resources, technical training and addressing issues on the regional agenda, such as water security and adaptation to climate change. For Brazil, the current regime of treaties between the country and its neighbors has been opportune in establishing non-conflict and cooperative relations, relying on a proactive and cooperative stance in its international relations regarding water.

Around the world, 153 countries share transboundary basins and the number of basins covered by operational arrangements in each country varies significantly. Data collected from 2017 and 2020 in 101 countries showed that the global average area of transboundary rivers, lakes and aquifers covered by an operational arrangement on water resources is 58%.

Source: UN-Water´s SDG6 Summary Progress Update 2021 Report.

**Proportion of transboundary basins and aquifers covered by operational arrangements around the world (%)**




It is important to highlight the relevance of Target 6.5 and Indicator 6.5.2, notably in South America, where large transboundary hydrographic systems represented by the Amazon Basin, La Plata Basin and the Orinoco Basin are located.

The Treaties and Arrangements and, in particular, technical cooperation actions between countries, are important instruments for Water Governance in the South American continent, in general, and for strengthening the management of these water resources in each country, in particular.

# METHODOLOGICAL SHEET

## INDICATOR 6.5.2

### Concept

This indicator assesses the proportion of river basins and aquifers in the country with international technical cooperation agreements for Water Resources Management.

A cooperation agreement for water management may be a treaty, convention, or other formal bilateral or multilateral instrument between neighboring countries, which provides a reference for cooperation in transboundary water management.

The criteria for the arrangement to be considered "operating" is based on the substantive cooperation in water management's key aspects: the existence of a formally created group with representatives from the countries; the formal communication between the countries involved (at least once per year); the existence of objectives and management plans set; and a regular exchange of data and information (at least once a year).

### Methodology and data sources

This indicator is calculated at the national level, adding together transboundary water resources areas with an operational water resource management arrangement and dividing the result by the total area of all transboundary water resources within the country. For the purpose of this indicator, "area" is defined, for surface water, as river basin extent, and for groundwater, as aquifer extent.

Countries must answer a specific survey for the indicator prepared by UN Water.

The final indicator is calculated as follows:

$$\text{Indicator 6.5.2} = [(A + C) / (B + D)] \times 100$$

Where:

A = Total area of transboundary river basins covered by technical cooperation agreements, in km$^2$
B = Total Area of Transboundary River Basins in km$^2$
C = Total Area of transboundary aquifers covered by technical cooperation agreement in km$^2$
D = Total area of transboundary aquifers, in km$^2$

Data sources:
Information from ANA, the National Secretariat for Water Security (SNSH)/MDR and the Ministry of Foreign Affairs (MRE).

### Time series available for 2020

1969-2019

### Spatial unit for calculation

The survey presents questions for analysis at the national level, considering the areas of transboundary river basins and aquifers as the basis for the calculation.

### Spatial level

Brazil

### Step by step

1. The total areas of the country's river basins and transboundary aquifers are verified
2. There are areas of river basins and transboundary aquifers of the country covered and not covered by international cooperation arrangements
3. The operability of each arrangement is evaluated based on the following criteria:

(1). The existence of a joint body, mechanism or commission for transboundary cooperation;

(2). The existence of regular formal communications (at least once a year) between riparian countries in the form of meetings;

(3). The existence of a joint or co-ordered water management plan or plans or joint objectives; and

(4). Regular exchange (at least once a year) of data and information between riparian countries.

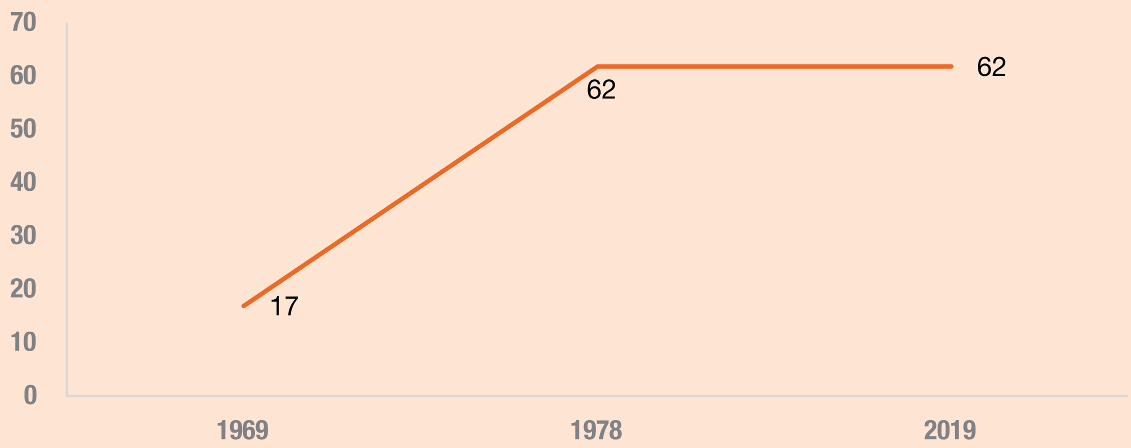
3. Calculate A, B, C and D
4. The predefined equation for calculating the Indicator is applied

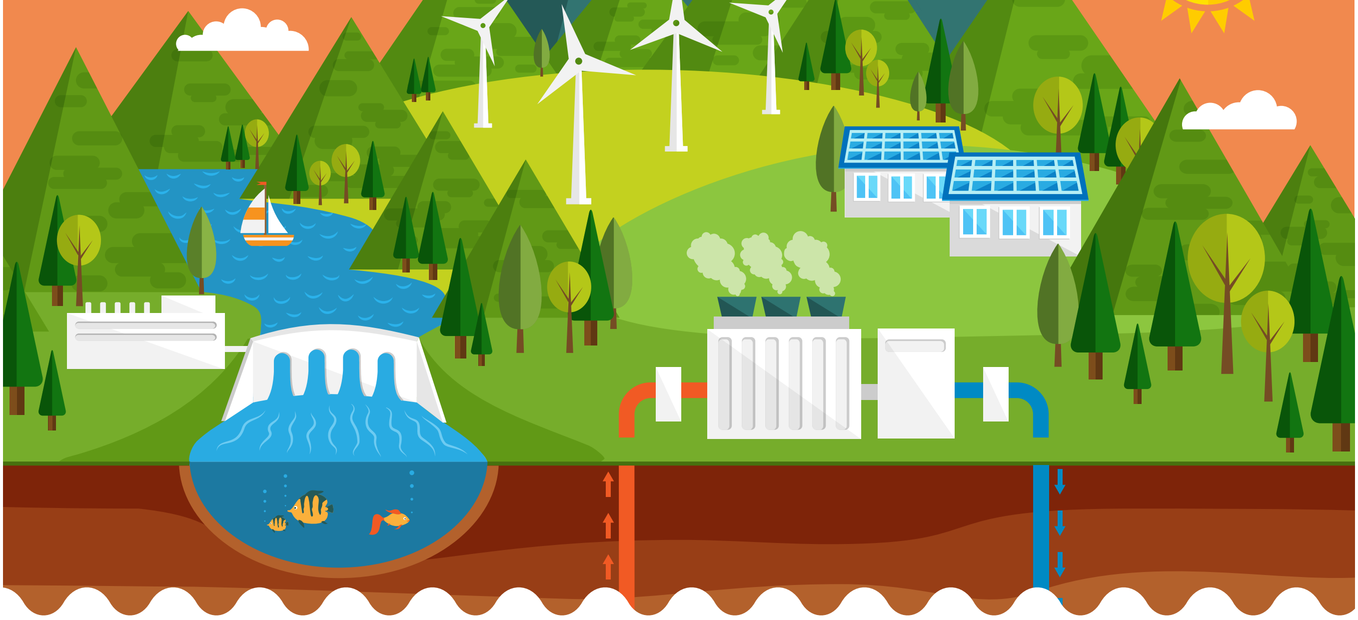
## Proportion Of Transboundary River Basins and Aquifers With An Operational Arrangement For Water Cooperation

### Time series for Indicator 6.5.2 in Brazil

| Year | Transboundary aquifers with operational agreement | Transboundary river basins with operational agreement | Total area with operational agreement (%) |
|---|---|---|---|
| 1969 | 0.00% | 27.28% | 16.91% |
| 1978 | 0.00% | 99.76% | 61.82% |
| 2019 | 0.00% | 99.76% | 61.82% |
| Total Area (km²) | 3,166,450.00 | 5,158,168.00 | |

### Evolution of Indicator 6.5.2 – 1969–2019 (% da área)





To monitor changes in water-related ecosystems over time and assist in the recovery of those already degraded, Target 6.6 provides **Indicator 6.6.1: Change in the Extent of Water-Related Ecosystems Over Time**, which aims to trace the successive changes in aquatic ecosystems, considering the following sub-components: area, quantity and quality of water.

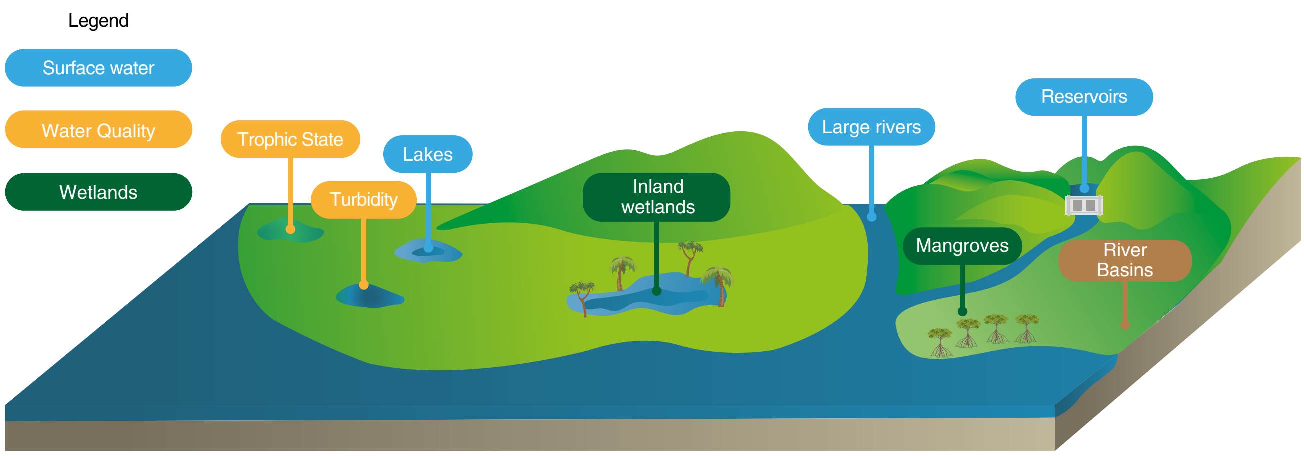
Source: Reid et al, 2019 - Reid AJ, Carlson AK, Creed IF, Eliason EJ, Gell PA, Johnson PT, Kidd KA, MacCormack TJ, Olden JD, Ormerod SJ. 2019. Emerging threats and persistent conservation challenges for freshwater biodiversity. Biological Reviews. 94: 849–873

Freshwater, in sufficient quantity and quality, is essential for all aspects of life and fundamental for sustainable development. Water-related ecosystems supply and provide food for billions of people, providing unique habitats for a diversity of plants and animals and protecting human populations from droughts and floods. While inland water-related ecosystems hold less than 1% of all water on Earth, these ecosystems harbor exceptional diversity, hosting 40% of all plant and animal species, including more fish species than found in the world's oceans. Covered by high biological, environmental, social, educational and economic value, they provide a range of goods and services on which people and all life depend. The economic use of these ecosystems includes activities such as agriculture, energy management, navigation and tourism.

Indicator 6.6.1 monitors changes in the surface area of lakes, reservoirs, wetlands and mangroves, changes in the water quality of lakes, reservoirs and rivers, and changes in the amount of river flow and water kept underground in aquifers. All are pure freshwater ecosystems, except mangroves, which contain brackish water. Although they are not natural ecosystems, reservoirs are included, as they retain significant amounts of water. Although mentioned in target 6.6, forests are not part of the monitoring of indicator 6.6.1 and the data is included in SDG 15 – Terrestrial Life. Currently, the indicator also does not capture data on biological health or connectivity of ecosystems, although the importance of such data is widely recognized.

**Landscape containing different types of freshwater ecosystems considered in the SDG indicator 6.6.1**

Source: Adapted from UNEP´s SDG 6.6.1 2021 report.



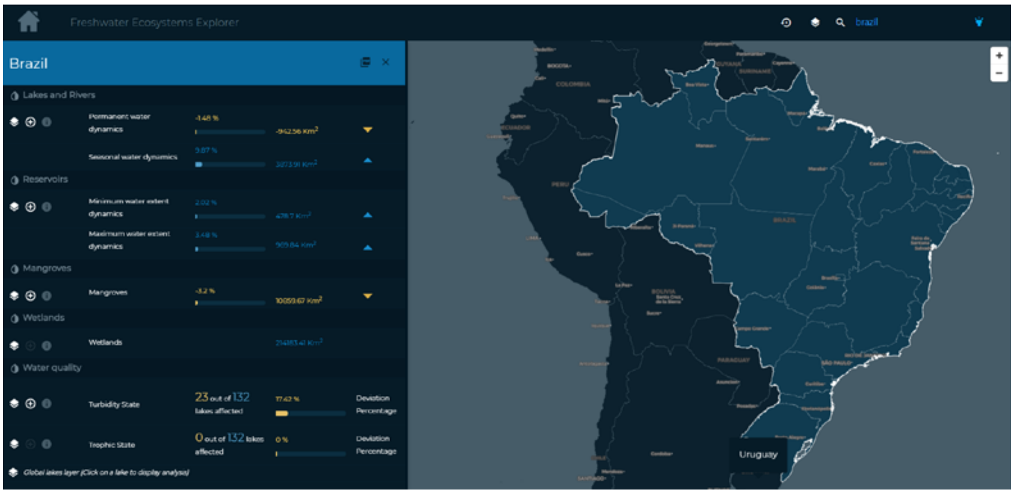

Observations of the Earth through satellite images are used to determine the temporal and spatial changes of ecosystems. Through images of the Landsat satellite series, for example, the Earth's surface is mapped at intervals of a few days at a spatial resolution of 30 x 30 meters. The data from the most recent 20 years were used by the United Nations Environment Programme (UNEP), which is the UN´s Custodian Agency for this indicator, to generate statistics and information on changes in the surface water area (lakes, rivers, mangroves, reservoirs), in order to contribute to the monitoring of target 6.6. Recent advances in the analysis of satellite images also provided global data sets on the water quality of lakes and the turbidity and trophic state of these environments analyzed for recent years (2017-2019) in relation to a baseline (2006-2010), for each lake. On the other hand, river flow and aquifer level data come from monitoring and modeling and must be additionally reported by countries.

The "Freshwater Ecosystems Explorer" platform, a free and easy-to-use tool, is available at https://www.sdg661. app/home, was launched in March 2020 by UNEP and provides aquatic ecosystem extension data to all countries over the years.

The data is updated annually, providing updated observations by ecosystem that represent long-term trends and annual and monthly records. Brazil was consulted in 2020 by UNEP on the validation of surface data of aquatic ecosystems from the Freshwater Ecosystems Explorer platform, which makes them available for consultation and online download as well as on sending aquifer level monitoring data.

**Freshwater Ecosystems Explorer platform screen showing data and information for Brazil from satellite monitoring**

Available data vary by ecosystem type, with surface water data available since 1984, mangroves since 2000, and lake water quality since 2017. For inland wetlands, the current date is adopted (data form the baseline for future comparisons).




Data extracted in September 2021 from the Freshwater Ecosystems Explorer platform.

**Data for Brazil extracted from the Freshwater Ecosystems Explorer platform**

| Brazil | Change in the Extension (%) | Change in the Extension (km²) | Quantity of water bodies affected |
|---|---|---|---|
| **Lakes and rivers** | | | |
| Dynamics of permanent water bodies | -1.48 | -942.56 | |
| Dynamics of seasonal water bodies | 9.87 | 3,873.91 | |
| **Reservoirs** | | | |
| Minimum extension dynamics | 2.02 | 478.7 | |
| Maximum extension dynamics | 3.48 | 969.84 | |
| **Mangroves** | | | |
| Mangroves | -3.20 | 10,859.67 | |
| **Wetlands** | | | |
| Wetlands | | 214,183.41* | |
| **Water quality** | | | |
| Turbidity | 17.42 | | 23 out of 132 lakes affected |
| Trophic state | 0 | | 0 out of 132 lakes affected |

**Total wetlands mapped in the country.*

More recent data from the MapBiomas project, which monitors Brazilian ecosystems through satellite images, showed that the water surface area of the country has reduced by 15% since the 1990s. Source: https://mapbiomas.org/superficie-de-agua-no-brasil-reduz-15-desde-o-inicio-dos-anos-90.

With regard to permanent rivers and lakes, i.e., water bodies of natural origin, the largest losses in the period considered were observed in the states of Sergipe, Paraíba, Pernambuco, Bahia and Ceará, all located in the Northeast Region. The largest gains were identified in Rondônia, Mato Grosso do Sul and Goiás. Tocantins, Minas Gerais and Rio Grande do Sul presented the largest losses in relation to seasonal rivers and lakes, while the largest gains were identified in the Federal District, also in Rondônia, and in Rio de Janeiro. Regarding the dynamics in the extension of the artificial reservoirs, Paraíba, Ceará and Rio Grande do Norte presented the greatest losses, and the greatest gains were identified in Amapá, Santa Catarina, Tocantins and Maranhão. In relation to the country as a whole, 21% of the river basins experienced high surface water extent changes in the last 5 years (2015 – 2020) compared to the 2000-2020 period. We highlight losses in the extension of rivers and permanent lakes, and gains in the extension of rivers and seasonal lakes and in artificial reservoirs.

**Data on the change in the extension of the surface area of permanent and seasonal water bodies, and reservoirs, by Federation Unit***

| Federation Unit | Rivers and Lakes | | | | Reservoirs | | | |
|---|---|---|---|---|---|---|---|---|
| | Dynamic of permanent water bodies | | Dynamic of seasonal water bodies | | Dynamic of minimum extension | | Dynamic of maximum extension | |
| | Variation (%) | Gain/loss (km²) | Variation (%) | Gain/loss (km²) | Variation (%) | Gain/ loss (km²) | Variation (%) | Gain/ loss (km²) |
| Acre | -18.45 | -15.4 | 24.94 | 62.01 | NA | 0 | NA | 0 |
| Alagoas | -17.74 | -19.77 | 3.85 | 2.75 | -4.89 | -1.54 | -0.13 | -0.05 |
| Amapá | -12.41 | -50.84 | 17.25 | 117.03 | - | - | - | - |
| Amazonas | -1.49 | -491.88 | 15.65 | 2,147.11 | -5.06 | -107.3 | 0.41 | 9.89 |
| Bahia | -23.87 | -171.59 | -12.35 | -85.33 | -3.75 | -95.96 | -11.72 | -384.12 |
| Ceará | -21.44 | -133.08 | 22.83 | 174.84 | -54.02 | -127.39 | -39.96 | -112.77 |
| Distrito Federal | -1.73 | -0.08 | 75.61 | 2.88 | -0.01 | -0.01 | 5.8 | 3.05 |
| Espírito Santo | -6.15 | -11.56 | 7.51 | 11.84 | 13.14 | 0.36 | 7.19 | 0.28 |
| Goiás | 6.91 | 31.48 | -11.76 | -75.34 | 16.32 | 265.78 | 16.88 | 331.82 |
| Maranhão | -5.41 | -35.51 | 17.42 | 315.41 | 60.94 | 134.28 | 50.71 | 137.83 |
| Mato Grosso | 2.55 | 83.49 | -5.93 | -177.89 | 48.17 | 158.62 | 52.3 | 198.61 |
| Mato Grosso do Sul | 7.95 | 109.55 | 33.73 | 548.78 | 3.25 | 71.49 | 2.72 | 61.55 |
| Minas Gerais | -19.38 | -186.44 | -23.37 | -222.62 | -5.3 | -202.81 | -3.76 | -169.98 |
| Pará | -0.54 | -76.5 | 24.13 | 1,437.83 | 5.7 | 100.49 | 11.61 | 304.93 |
| Paraíba | -25.94 | -28.43 | 14.32 | 26.69 | -63.48 | -62.86 | -54.36 | -63.36 |
| Paraná | -4.82 | -32.36 | -6.02 | -17.86 | -4.67 | -87.76 | -0.34 | -6.74 |
| Pernambuco | -25.65 | -78.25 | 15 | 28.07 | -14.08 | -71 | -16.23 | -89.62 |
| Piauí | -15.42 | -43.64 | 2.8 | 9.25 | -0.54 | -0.86 | 0.27 | 0.51 |
| Rio de Janeiro | 3.34 | 18.81 | 55.27 | 75.96 | 11.41 | 7.52 | 8.98 | 7.28 |
| Rio Grande do Norte | 5.49 | 23.56 | 15.85 | 63.28 | -40.95 | -51.44 | -38.49 | -58.88 |
| Rio Grande do Sul | 2.36 | 84.72 | -16.58 | -720.45 | 9.46 | 44.98 | 10.59 | 57.09 |
| Rondônia | 16.18 | 140.03 | 67.02 | 304.31 | 23.25 | 55.79 | 47.36 | 251.53 |
| Roraima | -1.72 | -19.56 | 19.72 | 320.31 | NA | 0 | NA | 0 |
| Santa Catarina | -0.63 | -1.95 | -10.65 | -33.9 | 96.83 | 96.97 | 89.1 | 113.28 |
| São Paulo | -1.2 | -5.17 | -8.37 | -35.25 | -1.92 | -83.3 | -1.76 | -83.17 |
| Sergipe | -27.84 | -17.33 | 38.6 | 21.69 | -2.69 | -0.63 | -0.95 | -0.24 |
| Tocantins | -6.59 | -85.06 | -31.65 | -298.27 | 59.08 | 431.03 | 59.11 | 452.75 |
| **Brazil** | **-1.48** | **-942.56** | **9.87** | **3,873.91** | **2.02** | **478.7** | **3.48** | **969.84** |

Data sources: UNEP´s Freshwater Ecosystems Explorer platform.

As references for the validation of data from wetlands, rivers and lakes for Brazil, carried out by ANA and forwarded to UNEP in 2020, data from the MapBiomas Project, IBGE and ANA were consulted. At the beginning of 2021, ANA, as a focal point for indicator 6.6.1 in Brazil, also made contributions to the review of the indicator methodology, a process coordinated by the UN´s Inter-agency and Expert Group on SDG Indicators (IAEG-SDGs).

Information available at https://mapbiomas.org/.

MapBiomas provides annual data on the extent of aquatic ecosystems (by biomes and other specific areas), in addition to other classes of land use and coverage, at different levels of classification, with the main input satellite imagery. In 2021, annual statistics on the variation in the extent of water bodies in the country were released, in a disaggregated manner and considering the 1985-2020 time series. IBGE, in turn, the Brazilian official statistical agency, is responsible for mapping natural resources in the national territory and maintains the Environmental Information Database (BDIA). On the other hand, ANA maintains and periodically updates a reference database of water bodies, which includes the typology of natural and artificial classification, which is relevant to monitor target 6.6, since the increase in water conservation in a country may be occurring at the same time that there is a loss recorded in the area of natural freshwater ecosystems.

Available at https:// bdiaweb.ibge.gov.br/#/home.

Available at https://metadados.snirh.gov.br/geonetwork/srv/por/catalog.search#/metadata/7d054e5a-8cc9-403c-9f1a-085fd933610c.

The spatial extent of natural and artificial water bodies and mangroves does not vary greatly between the different databases considered in the assessment. For wetlands, the most recent statistics (2018) from MapBiomas point to 26,240 km² of wetlands in the country, a value considerably lower than the area calculated by UNEP, of 214,183 km². MapBiomas uses the forest typology and the statistics of wetlands in the database correspond predominantly to the plains of the Pantanal biome, in addition to the wetland areas of the Pampa biome. The forest wetlands in the different Brazilian biomes, with Savannah and Forest formations such as the Cerrado and the Amazon, have riparian vegetation (gallery forests and igapó forests [black-water flooded forests], for example), palm swamps, among other classifications, and it is not possible to directly separate the classes of wetlands. Wetland mapping also does not include irrigated rice planting areas, probably included in UNEP´s estimates, based on the methodology presented. These areas were estimated in 2021 to correspond to 1.298 million hectares in Brazil, according to the 2nd edition of ANA´s Irrigation Atlas.

Available at https://atlasirrigacao.ana.gov.br.

For IBGE´s data, different statistics can be obtained. If only natural wetlands are considered, 78,028 km² is obtained. If wetlands altered by anthropogenic activities are included, they reach 91,973 km². Finally, if all the vegetation areas where there is influence of humidity, fluvial, alluvial, or lacustrine are considered, the figure reaches 267,443 km² in the Brazilian territory. The changes tracked in the freshwater area in the river basins reveal that over a fifth of the world's basins have recently experienced rapid increases in their surface water areas (indicative of flooding), growth of reservoirs and recently flooded lands, or rapid declines in the surface water area indicating the drying and depletion of lakes, reservoirs, swamps, floodplains and seasonal water bodies.

Globally, human activities are causing significant changes in freshwater ecosystems and hydrological regimes. The growing demand for water due to the constant increase in the world's population has redefined natural landscapes in agricultural and urban areas. Global changes in precipitation and temperature are worsening the problem for they impact the quantity and quality of freshwater. Rapid changes are being observed in the area of ecosystems. The extent of surface water has changed significantly in the last five years in one-fifth of the world's river basins. These impacted river basins are experiencing both rapid surface increases due to flooding and increasing in reservoirs, and rapid declines due to depletion or even the complete disappearance of lakes, reservoirs, wetlands, floodplains and seasonal water bodies.

Source: DHI GRAS/UNEP. Extracted from UNEP´s SDG 6.6.1 2021 Report.

**River basins with significant changes in the last 5 years in relation to the time series**


Given the massive loss of all types of wet ecosystems in recent centuries, coupled with the rapid changes observed in the last decade, countries need to act urgently. Efforts to protect and restore water-related ecosystems must be increased and accelerated.

## THE GLOBAL BOOM IN RESERVOIRS

The unprecedented number of dams under construction or planning can further impact freshwater ecosystems. Emergency recovery plans are therefore necessary to mitigate the harmful effects of new dams and reservoirs on these ecosystems. Possible immediate actions include the deactivation of dams to ensure minimum environmental disruptions to water flows, improvements in water quality and protection and the restoration of critical freshwater habitats.

Source: Extracted from UNEP´s SDG 6.6.1 2021 report.

### Heatmap of new dam locations since 2000


La Plata river basin has been pointed out as a hotspot for the emergence of new dams by UNEP/UN, as well as the basins of the Tigris and Euphrates rivers, in addition to the Mekong river basin, which is the most prominent in the world. Still as an aggravating factor, the region of the Paraguay River, a tributary of the Paraná River, has been suffering from a severe drought in the last two years. Some fluviometric monitoring stations located on the Paraguay River presented, in 2020, flows corresponding to the drought return period of 10 years. In Brazil, the Pantanal region, bathed by the Paraguay River, was the target of studies to survey the impact of hydroelectric plants, caused by concern, expressed in a resolution of the CNRH, with the expected installation of over a hundred new hydroelectric projects in the region. Therefore, in 2018 there was a temporary suspension of the analysis of new requests for a Water Availability Reserve Declaration (DRDH) or Water Use Permits for new hydroelectric projects in the basin, which lasted until May 2020, when studies on the social and environmental impact of the projects were completed. The Pantanal biome is considered one of the largest continuous wetlands on the planet, with lush beauty and rich fauna and flora. In its territorial space the biome, which is an alluvial plain, is influenced by rivers that drain the Upper Paraguay basin. As it is a complex of ecosystems that exhibits great diversity in aquatic environments, the Pantanal is home to a great diversity of fish species.

Return Period is an expression commonly used in hydrology and corresponds to the inverse of probability. Thus, if an event has a Return Period of 100 years, it means that there is a 1 in 100 chance that this event will happen in any given year.

Extracted from UNEP´s SDG 6.6.1 2021 Report.

### Location of La Plata river basin and the extension of the Pantanal wetland

# METHODOLOGICAL SHEET

## INDICATOR 6.6.1

### Concept

The indicator aims to track changes in water-related ecosystems over time, capturing data on different types of freshwater ecosystems. To measure the extent of the change, the indicator considers the spatial area, the water quality and the amount of water. The indicator uses satellite-based Earth observations to globally monitor different types of freshwater ecosystems.

The series of Earth observation data on the surface area is available for permanent water bodies, seasonal water bodies, reservoirs, wetlands and mangroves; in addition to generating data on the quality of water through the trophic state and turbidity of water bodies. Satellite images can be represented as numerical data, which in turn is aggregated into significant statistics of changes in the ecosystem attributed to administrative areas, such as national and sub-national territories (for example, regions and provinces) and basin and sub-basin boundaries.

River flow and aquifer level data have not yet been produced in useful spatial and temporal resolutions to be incorporated into the methodology of SDG 6.6.1. Currently, these data should continue to be provided based on the modeling or monitoring by the countries themselves.

### Methodology and data sources

The indicator is systematized on the "Freshwater Ecosystems Explorer" platform, available at https://www.sdg661.app/home. It was launched in March 2020 by UNEP and provides aquatic ecosystem extension data for all countries over the years. The data presented in this report were consulted in September 2021.

The ecosystem extension data from the platform were received for validation by Brazil in 2020. Flow and aquifer level monitoring data have not yet been requested by UNEP.

For the indicator, by national, subnational and basin level, the following are accounted for:

**Lakes and Rivers (surface)**

Annual and multiannual changes in the surface area of permanent and seasonal water bodies (1984-present)

Statistics of gain and loss of extension in percentage, and also in km² (2000-2019)

**Reservoirs (surface and water quality):**

Annual and multi-annual changes in reservoir surface area

Statistics of gain and loss of extension in percentage, and also in km² (2000-2019)

Monthly, annual and multi-annual measurements of the trophic state and turbidity of reservoirs and lakes (with a spatial resolution of 300m)

**Mangroves (surface):**

Annual and multi-annual changes in the surface area of mangroves (2000-2016)

**Wetlands (surface):**

Mangrove surface area (data from 2016 to 2018)

Changes in the surface of wetlands will be included as of 2021/2022

**Lakes (water quality):**

- Monthly, annual and multi-annual measurements of the trophic state and turbidity of reservoirs and lakes (with a spatial resolution of 300m)

Data sources:

"**Freshwater Ecosystems Explorer**" Platform

### Spatial unit for calculation

Rivers, Lakes, Reservoirs, Mangroves and Wetlands

### Spatial level

Federation Units and Brazil

### Step by step

Access the interactive map of the "Freshwater Ecosystems Explorer" platform and search for Brazil. Then, change the selection to Administrative Level 2, equivalent to the states.

# METHODOLOGICAL SHEET

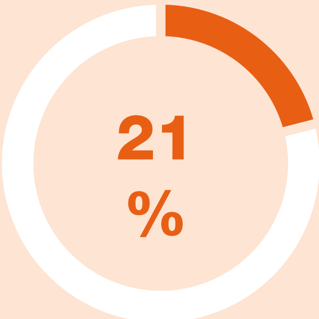
## INDICATOR 6.6.1

**Indicator 6.6.1 for Brazil (Data accessed on the Freshwater Ecosystems platform in September 2021)**

| Brazil | Change in the Extension (%) | Change in the Extension (km²) | Quantity of water bodies affected |
|---|---|---|---|
| **Lakes and rivers** | | | |
| Dynamics of permanent water bodies | -1.48 | -942.56 | |
| Dynamics of seasonal water bodies | 9.87 | 3,873.91 | |
| **Reservoirs** | | | |
| Minimum extension dynamics | 2.02 | 478.7 | |
| Maximum extension dynamics | 3.48 | 969.84 | |
| **Mangroves** | | | |
| Mangroves | -3.20 | 10,859.67 | |
| **Wetlands** | | | |
| Wetlands | | 214,183.41* | |
| **Water quality** | | | |
| Turbidity | 17.42 | | 23 out of 132 lakes affected |
| Trophic state | 0 | | 0 dos 132 lakes affected |

*Total wetlands mapped in the country.

**Hydrographic basins in Brazil that experienced high surface water extent changes in the last 5 years (2015 – 2020) in relation to the 2000-2020 period: 21%**



## Change in the Extent of Water-Related Ecosystems Over Time

**Indicator 6.6.1 for Brazil (Data accessed on the Freshwater Ecosystems platform in September 2021)**

| Federation Unit | Rivers and Lakes | | | | Reservoirs | | | |
|---|---|---|---|---|---|---|---|---|
| | Dynamic of permanent water bodies | | Dynamic of seasonal water bodies | | Dynamic of minimum extension | | Dynamic of maximum extension | |
| | Variation (%) | Gain/loss (km²) | Variation (%) | Gain/loss (km²) | Variation (%) | Gain/loss (km²) | Variation (%) | Gain/loss (km²) |
| Acre | -18.45 | -15.4 | 24.94 | 62.01 | NA | 0 | NA | 0 |
| Alagoas | -17.74 | -19.77 | 3.85 | 2.75 | -4.89 | -1.54 | -0.13 | -0.05 |
| Amapá | -12.41 | -50.84 | 17.25 | 117.03 | - | - | - | - |
| Amazonas | -1.49 | -491.88 | 15.65 | 2,147.11 | -5.06 | -107.3 | 0.41 | 9.89 |
| Bahia | -23.87 | -171.59 | -12.35 | -85.33 | -3.75 | -95.96 | -11.72 | -384.12 |
| Ceará | -21.44 | -133.08 | 22.83 | 174.84 | -54.02 | -127.39 | -39.96 | -112.77 |
| Distrito Federal | -1.73 | -0.08 | 75.61 | 2.88 | -0.01 | -0.01 | 5.8 | 3.05 |
| Espírito Santo | -6.15 | -11.56 | 7.51 | 11.84 | 13.14 | 0.36 | 7.19 | 0.28 |
| Goiás | 6.91 | 31.48 | -11.76 | -75.34 | 16.32 | 265.78 | 16.88 | 331.82 |
| Maranhão | -5.41 | -35.51 | 17.42 | 315.41 | 60.94 | 134.28 | 50.71 | 137.83 |
| Mato Grosso | 2.55 | 83.49 | -5.93 | -177.89 | 48.17 | 158.62 | 52.3 | 198.61 |
| Mato Grosso do Sul | 7.95 | 109.55 | 33.73 | 548.78 | 3.25 | 71.49 | 2.72 | 61.55 |
| Minas Gerais | -19.38 | -186.44 | -23.37 | -222.62 | -5.3 | -202.81 | -3.76 | -169.98 |
| Pará | -0.54 | -76.5 | 24.13 | 1,437.83 | 5.7 | 100.49 | 11.61 | 304.93 |
| Paraíba | -25.94 | -28.43 | 14.32 | 26.69 | -63.48 | -62.86 | -54.36 | -63.36 |
| Paraná | -4.82 | -32.36 | -6.02 | -17.86 | -4.67 | -87.76 | -0.34 | -6.74 |
| Pernambuco | -25.65 | -78.25 | 15 | 28.07 | -14.08 | -71 | -16.23 | -89.62 |
| Piauí | -15.42 | -43.64 | 2.8 | 9.25 | -0.54 | -0.86 | 0.27 | 0.51 |
| Rio de Janeiro | 3.34 | 18.81 | 55.27 | 75.96 | 11.41 | 7.52 | 8.98 | 7.28 |
| Rio Grande do Norte | 5.49 | 23.56 | 15.85 | 63.28 | -40.95 | -51.44 | -38.49 | -58.88 |
| Rio Grande do Sul | 2.36 | 84.72 | -16.58 | -720.45 | 9.46 | 44.98 | 10.59 | 57.09 |
| Rondônia | 16.18 | 140.03 | 67.02 | 304.31 | 23.25 | 55.79 | 47.36 | 251.53 |
| Roraima | -1.72 | -19.56 | 19.72 | 320.31 | NA | 0 | NA | 0 |
| Santa Catarina | -0.63 | -1.95 | -10.65 | -33.9 | 96.83 | 96.97 | 89.1 | 113.28 |
| São Paulo | -1.2 | -5.17 | -8.37 | -35.25 | -1.92 | -83.3 | -1.76 | -83.17 |
| Sergipe | -27.84 | -17.33 | 38.6 | 21.69 | -2.69 | -0.63 | -0.95 | -0.24 |
| Tocantins | -6.59 | -85.06 | -31.65 | -298.27 | 59.08 | 431.03 | 59.11 | 452.75 |
| **Brazil** | **-1.48** | **-942.56** | **9.87** | **3,873.91** | **2.02** | **478.7** | **3.48** | **969.84** |

## Target 6.a is monitored by the **Indicator 6.a.1 - Amount of official development assistance for water and sanitation as part of a government expenditure plan**

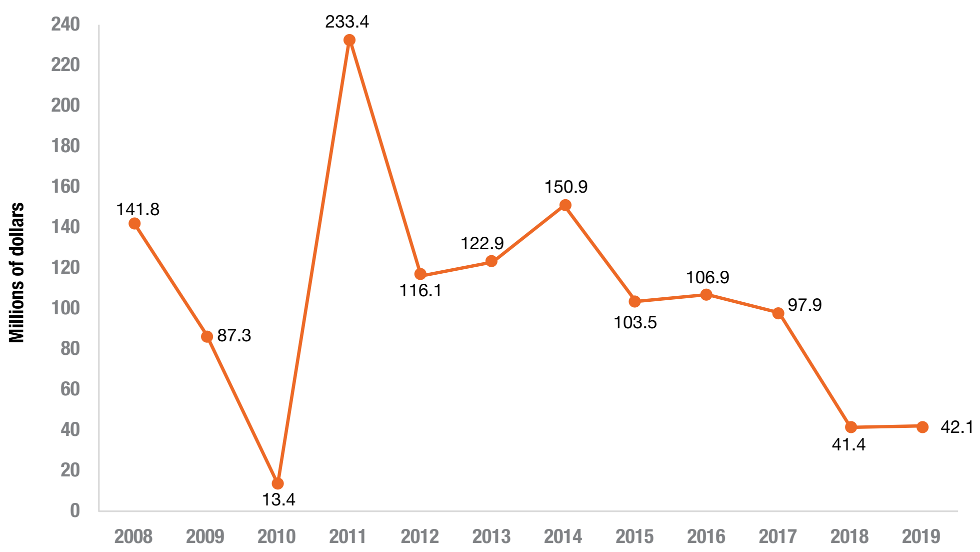
The indicator is defined by the amount and percentage of official development assistance (ODA) for water and sanitation included in a government investment plan and part of its budget, with the main goal of promoting the economic development and welfare of developing countries.

The ODA includes both grants and concessional loans with a grant element of at least 25 percent. A government-coordinated spending plan is defined as a financing/budget plan at the national or sub-national level, clearly assessing the available financial resources and financing strategies of future needs.

Currently, data is only available in the amount of ODA disbursed and authorized for the water and sanitation related sectors. In Brazil, there are no systematized databases that record how much of the funds received were effectively entered into government spending plans.

ODA flows comprise contributions from donor government agencies to developing countries at all levels, either bilaterally or through multilateral institutions. According to the UN´s methodology, the ODA for the water sector includes support for drinking water supply, sanitation and hygiene, as well as irrigation, flood protection and hydroelectric power generation and is a means to implement all aspects of SDG6.

**ODA received by Brazil (gross disbursements) for the water sector** – 2008-2019 (USD million)




Data sources: CRS/OECD.

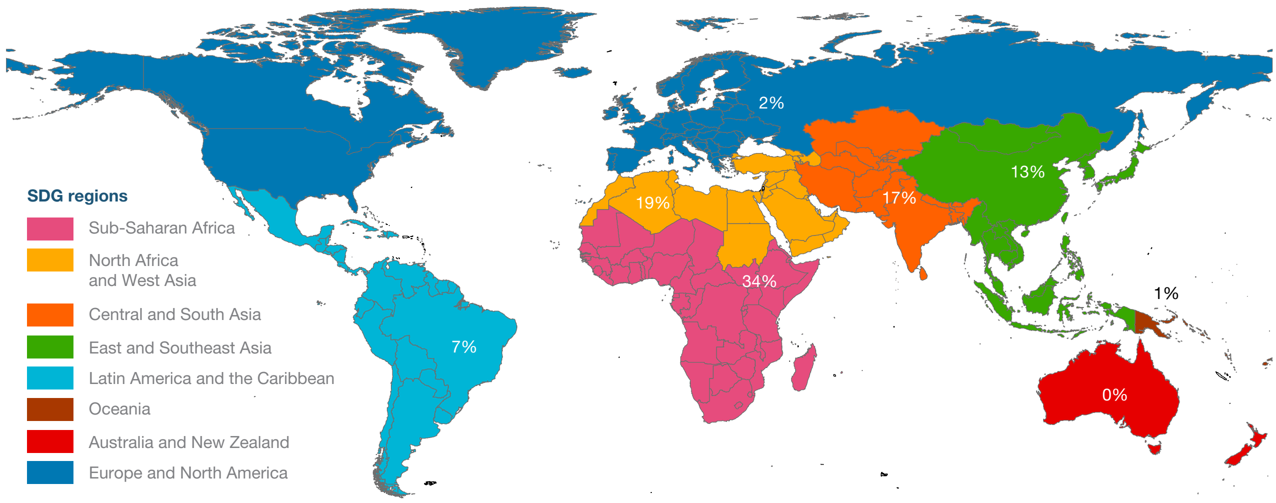
In Brazil, the amount received from ODA for the water sector has been decreasing significantly since 2011, while worldwide disbursements for this sector increased 3% in the period from 2015 to 2019 (USD 9.0 to USD 9.2 billion). Still, globally there is an increase in the gap between commitments and disbursements for this sector.

Increasing foreign aid commitments for the water sector is essential to support national investments related to SDG 6, to meet the growing demands and expand services for the most vulnerable populations

Currently, the monitoring of this indicator is based on the control of ODA resources destined to the water and sanitation sector for developing countries. However, the available data is insufficient for evaluating the results obtained by all countries and there is great difficulty in obtaining this data and in defining the variables involved in calculating the indicator.

Source: UN-Water´s SDG6 Summary Progress Update 2021 Report.

**Percentage and global ODA resources allocated to the water and sanitation sector for each SDG region** – 2000-2019



# METHODOLOGICAL SHEET

## INDICATOR 6.a.1

### Concept

This indicator assesses the proportion of water and sanitation-related Official Development Assistance (ODA) resources that are included in government-coordinated expenditure plans. Thus, indicating the level of alignment and cooperation between donor and recipient countries.

ODA means official development assistance and includes contributions from government agencies in the form of donations to developing countries, at all levels, either bilaterally or through multilateral institutions.

A government-coordinated expenditure plan is defined as a financial plan/budget at national or sub-national level, with a clear assessment of the available financial resources and strategies to finance future demands.

### Methodology and data sources

**ODA:**

To calculate the indicator, it is necessary to search for ODA data from all donor countries to Brazil on the Creditor Reporting System website provided by the OECD.

The search is made by gross "Disbursement" from "all donor countries" in millions of US dollars and constant prices (in 2016), for the following sectors: drinking water, sanitation and hygiene water supply, irrigation, flood protection and hydroelectric power generation.

**ODA incluído no orçamento do governo:**

Data on the amount of water and sanitation-related ODA included in government coordinated spending plans is not available and shall be compiled via data collection through the GLAAS TrackFin7 initiative (UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water).

### Time series available for 2021

2008 a 2019

### Spatial unit for calculation

Brazil

### Spatial level

Brazil

### Step by step

Access the Creditor Reporting System website provided by the OECD (available at https://stats.oecd. org/ Index.aspx?DataSetCode=CRS1).

Search using the filters:

- Official Donors, Total
- Sectors[1]: TOTAL water supply and sanitation (CRS 140), Hydroelectric power plants (CRS 23220), Agricultural water resources (CRS 31140)
- Official Development Assistance
- All Channels
- Gross Disbursements
- All Types of Aid
- Constant Prices

Add up the ODA of the mentioned sectors to obtain the Total ODA for the Water Sector

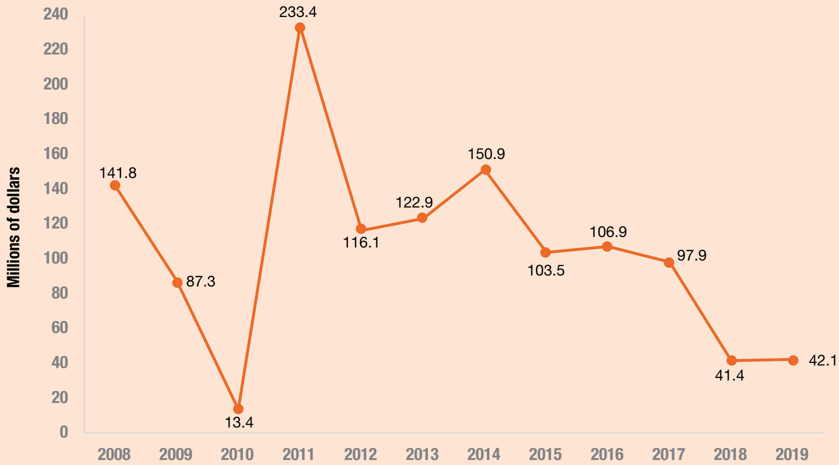
[1]The Flood Prevention and Control sector (CRS 41050) is no longer available on the OECD´s website. There is a new code (43060 Disaster risk reduction), but it is more comprehensive and was not considered for the calculation of the indicator, taking as reference the data presented by the UN in the platform https://sdg6data.org/indicator/6.a.1

# Amount of official development aid in the area of water and sanitation as part of a government expenditure plan

## Gross ODA Disbursement to Brazil, in millions of dollars (USD)

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|
| Water Sector Policy and Administrative (CRS 14010) | 1.1 | 0.6 | 0.9 | 0.9 | 0.5 | 0.4 | 0.7 | 0.4 | 0.1 | 0.3 |
| Water Resources Conservation (includes data collection) (CRS 14015) | 0.3 | 0.4 | 0.4 | 1.5 | 1.5 | 3.2 | 2.1 | 1.6 | 0.2 | 0.4 |
| Water Supply and Sanitation – large systems (CRS 14020) | 0.2 | 0.9 | 4.7 | 22.6 | 58.4 | 19.6 | 4.0 | 5.9 | 8.4 | 0.2 |
| Water Supply – large systems (CRS 014021) | 1.9 | 0.2 | 0.2 | 57.9 | 77.1 | 69.1 | 54.2 | 20.1 | 16.7 | 18.7 |
| Water and Sanitation Treatment – large systems (CRS 14022) | 1.2 | 183.1 | 5.4 | 35.4 | 9.4 | 9.2 | 38.0 | 64.8 | 13.0 | 20.1 |
| Basic Drinking Water Supply and Sanitation (CRS 14030) | 4.6 | 1.4 | 1.5 | 3.7 | 1.9 | 1.0 | 5.4 | 1.8 | 0.3 | 0.5 |
| Basic Drinking Water Supply (CRS 14031) | | 0.0 | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.1 | 0.0 | 0.2 |
| Basic Sanitation (CRS 14032) | 0.3 | | 0.5 | 0.0 | 0.4 | | | 0.0 | 0.0 | 0.0 |
| River Basins Development(CRS 14040) | 0.2 | 0.1 | 0.0 | 0.1 | 0.4 | 0.4 | 0.3 | 0.2 | 0.0 | 0.1 |
| Waste Management/Disposal (CRS 14050) | 1.3 | 0.5 | 0.7 | 0.6 | 1.0 | 0.5 | 2.2 | 3.1 | 2.5 | 1.4 |
| Education and Training in Water Supply and Sanitation (CRS 14081) | 0.0 | | 0.1 | | | | 0.0 | | | |
| **TOTAL – Water Supply and Sanitation (CRS 140)** | **11.0** | **187.2** | **14.4** | **122.7** | **150.6** | **103.5** | **106.8** | **97.9** | **41.3** | **42.0** |
| **Hydroelectric Power Plants (CRS 23220)** | **2.0** | **46.1** | **101.4** | | | | | | | |
| **Agricultural Water Resources (CRS 31140)** | **0.4** | **0.0** | **0.2** | **0.2** | **0.3** | | **0.1** | | **0.0** | **0.0** |
| **TOTAL – Water Sector** | **13.4** | **233.4** | **116.1** | **122.9** | **150.9** | **103.5** | **106.9** | **97.9** | **41.4** | **42.1** |

## Evolution of ODA received by Brazil (gross disbursements) for the water sector – 2008-2019 (USD million)



The active participation of institutions and communities in water resources management and sanitation management is essential to give legitimacy to public policies and initiatives aimed at the sustainable use of water. In the context of SDG 6, **Target 6.b** aims to assess the level of participation of local authorities in the management of water resources and sanitation. The objective of goal 6.b is: “To support and strengthen the participation of local communities in the improvement of water management and sanitation”.

## Target 6.b is monitored by Indicator **6.b.1: Participation of Local Communities in Water and Sanitation Management.**

In the indicator’s context, local participation policies and procedures are conceptualized as mechanisms by which individuals and communities can significantly contribute to decisions about the management of water and sanitation, including, for example: choose solutions that are adequate to a given social and economic context; acquire full understanding of the impacts of a decision on the local population; and have a degree of local responsibility in relation to the chosen solutions.

Indicator 6.b.1 records the level of stakeholder participation in water and sanitation management within a country:

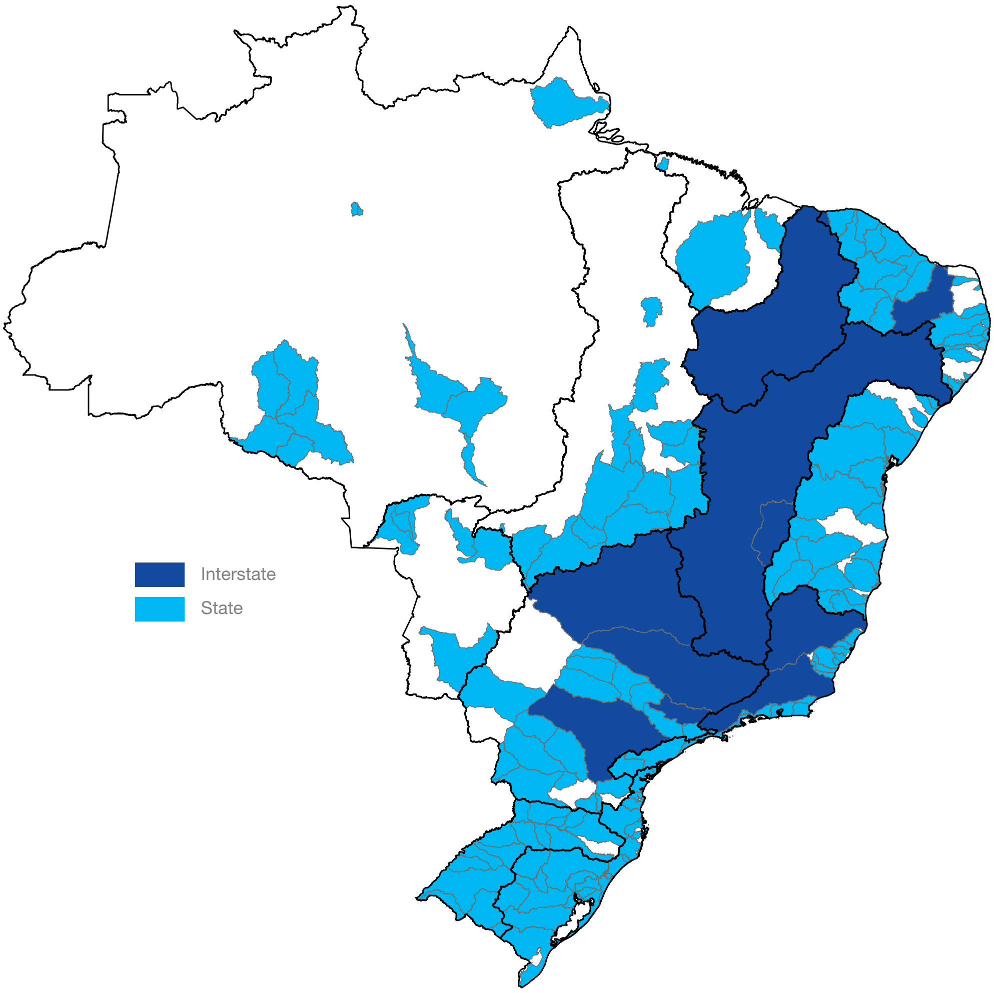
- Participation refers to a mechanism through which individuals and communities can contribute significantly to management decisions and directions.

- Local administrative units are institutional units whose authority extends to the smallest geographic areas delimited for administrative and political purposes within a country. In the case of Brazil, these areas correspond to the 5,570 municipalities. The local administrative units for planning and managing water resources may be different from those designated for drinking water and sanitation.

Indicator 6.b.1 monitors the participation of local communities in the management of water and sanitation within a country, analyzing the existence of procedures for participation in law or policy, as well as the actual level of participation. Participation is referred to as a mechanism by which individuals and communities can contribute significantly to management decisions. The data on the indicator can be broken down into six sub-sectors: drinking water (rural and urban), sanitation (rural and urban), promotion of hygiene and planning and managing water resources. The participation of users and communities helps ensure sustainable solutions to all aspects of SDG 6 and contributes to wider reductions in inequality within and between countries, including gender inequalities.

In Brazil, the river basin committee (CBH) is a forum for debates to make decisions on issues related to managing water resources in a specific river basin. CBHs are structured to promote the participatory and decentralized management of water resources, acting to promote the implementation of management instruments, the negotiation of conflicts over the use of water and the promotion of different uses of water in the basin. Therefore, they are known as "water parliaments" and their composition includes entities of the Government and civil society.

**River Basin Committees in Brazil in 2020**




Source: Brazilian Water Resources Report 2021 - Annual Report.

In the 1st edition of the SDG6 report, data was presented regarding the participation of municipalities in the management of water resources, at the river basin level and management of sanitation services, at the municipal level. Therefore, for the water resources management aspect, the municipalities located in the area of operation of the river basin committees, components of SINGREH, were considered, encompassing both interstate and state and unique committees, based on ANA´s data systematized in SNIRH and presented in the Brazilian Water Resources Report. In the case of sanitation management, the existence of municipal basic sanitation councils or similar councils that address the theme at the municipal level was considered, using the database of the Municipal Information Survey (MUNIC) made available by IBGE.

Information on collection cycles and data available at: https://www. who. int/teams/environment-climate-change-and-health/water-sanitation-and-health/monitoring-and-evidence/wash-systems-monitoring/un-water-global-analysis-and-assessment-of-sanitation-and-drinking-water

In the context of updating and collecting country data by the UN, the calculation of the indicator was incorporated into the UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS) survey. The most recently disclosed data correspond to the data collection of the 2018-2019 cycle.

Brazil reported compliance with 5 of the 6 criteria considered in the calculation of the indicator (subsectors with procedures for participation of communities defined by law or policies).

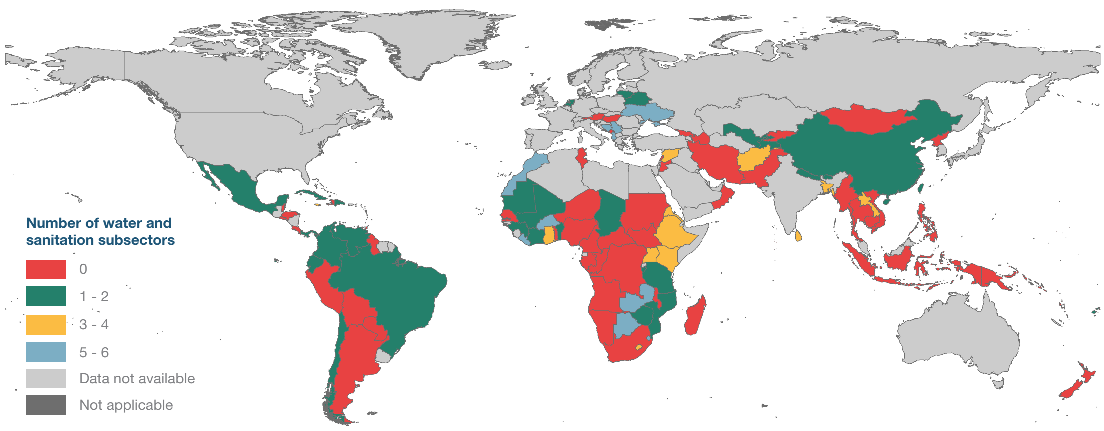
| Drinking Water | | Sanitation | | Hygiene Promotion | Water Resource Planning and Management |
|---|---|---|---|---|---|
| Urban | Rural | Urban | Rural | Domestic | Domestic |
| X | X | X | X | - | X |

Source: GLAAS 2018-2019.

Two-thirds of the 109 countries that responded to GLAAS have participation procedures that are defined in laws or policies in all sub-sectors of water and sanitation. Less than half of the reporting countries have laws or policies that specifically mention women’s participation in rural sanitation or water management. In all subsectors, only 14 out of 109 countries reported high levels of community and user participation for collaborative management and decision-making. For drinking water and rural health and water resource management, most countries reported average levels of user and community participation. This implies users and communities that are occasionally or regularly consulted, but not to the point of collaboration or representation in decision-making processes.

Source: UN-Water´s SDG6 Summary Progress Update 2021 Report

**Number of water and sanitation subsectors with procedures clearly defined in laws and policies for the participation of users and communities in the world** – 2012-2019



Community participation is crucial to ensure sustainable solutions to achieve the SDGs tailored to the contexts of local communities and is a key factor in ensuring that no one is left behind. Community participation is recognized as a key concept for sustainable water and sanitation activities in most countries. Approximately three quarters of the countries reported having participation procedures defined in the policy or law for rural management of drinking water and water resources. However, the implementation of procedures is hampered by the lack of resources. Approximately six out of ten countries reported that human and financial resources were less than 50% of those needed to support community participation. As a result, activities at the local level may not be implemented effectively. For example, 41% of countries reported that regular citizen participation forums took place in less than half of local administrative units for rural sanitation and drinking water services.

Although many countries have established procedures for participation in laws or policies, the implementation of these procedures is still left behind. To accelerate progress, more efforts are needed to establish regular forums and other opportunities for participation, as well as financial resources to support activities at the local level.

# METHODOLOGICAL SHEET

## INDICATOR 6.b.1

**Participation of Local Communities in Water and Sanitation Management**

### Concept

Indicator 6.b.1 tracks the participation of local communities in water and sanitation management in a country, through the existence of procedures in law or participation policy, as well as the actual level of participation.

Participation is considered the mechanism by which individuals and communities can significantly contribute to management decisions.

The indicator data can be broken down into six subsectors: drinking water (rural and urban), sanitation (rural and urban), hygiene promotion and planning and managing water resources.

The participation of users and communities helps to enable sustainable solutions for all aspects of SDG 6 and contributes to a broad reduction in inequity within countries and between countries, including gender inequity.

### Methodology and data sources

The UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS) survey is sent for countries to fill out. Since 2008, GLAAS has been monitoring the main elements of national drinking water, sanitation and hygiene (WASH) systems with focus on the governance, monitoring, human resources and finances. For more information on the survey, visit: https://www.who.int/teams/environment-climate-change-and-health/water-sanitation-and-health/monitoring-and-evidence/wash-systems-monitoring/un-water-global-analysis-and-assessment-of-sanitation-and-drinking-water

Data source:

**WHO:** GLASS survey

### Spatial unit for calculation

Brazil

### Spatial level

Brazil

### Step by step

**1.** Access the UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS) 2018/2019 initiative survey answered by Brazil and consult the data on which subsectors have procedures for the participation of communities defined by law or policies.

### **Indicator 6.b.1 for Brazil - subsectors with procedures for the participation of communities defined in laws or policies** - in the GLAAS survey (cycle 2018/2019)

| Drinking Water | | Sanitation | | Hygiene Promotion | Planning and Managing Water Resources |
|---|---|---|---|---|---|
| Urban | Rural | Urban | Rural | National | National |
| X | X | X | X | - | X |

# FINAL CONSIDERATIONS

The SDG 6 goals of the 2030 Agenda for Sustainable Development, agreed among the 193 member states of the United Nations in 2015, remain a major challenge to be overcome by all countries. In recent years, the need for access to clean water and sanitation services has become even more evident, with the recommendation to wash hands with water and soap to avoid Covid-19 contamination.

The governance of the 2030 Agenda to fulfill the targets agreed upon by Brazil has been coordinated by the Secretariat of the Presidency of the Republic. The process of coordinating and articulating all 17 SDGs and the integration and involvement of the various data-producing bodies and entities to monitor them, is headed by IBGE, as the country's official statistical body. All indicators that have already been calculated can be found on the SDG Brazil platform.

Available at: https://odsBrazil.gov.br

In the specific case of SDG 6, the analysis process of the different databases, methodological discussions with international custodian agencies and the calculation of its 11 indicators has been led by ANA, which also maintains an interinstitutional articulation for monitoring along with partner institutions and their focal points. The results of this broad and complex work have been disseminated and communicated by ANA, nationally and internationally, in the most simplified and accessible way possible, maintaining an interactive panel on SDG 6 and periodically publishing monitoring reports, including in other languages. This document corresponds to the 2nd edition of this report, which should be updated in the future, for the purpose of monitoring the achievement of the 8 targets of SDG 6 by 2030.

Available at: https://www.gov.br/ana/pt-br/centrais-de-conteudos/publicacoes/ods6

The collection and systematization of data, as well as the elaboration and monitoring of indicators, have been an enriching process at the national level. Through this work, ANA has been improving its databases and intensifying partnerships through communication and cooperation between bodies, which also generates positive repercussions in other works related to water resources and basic sanitation in the country.

SDG 6 is monitored in a specific manner for each indicator, through direct contact with the institutions responsible for the data used, aiming at the collection and discussion of the systematization work and calculation of the indicators. Much of the necessary data is the responsibility of ANA itself, which facilitates its collection. Other institutions involved in monitoring are, in addition to IBGE, the Ministry of Regional Development, the Ministry of Health, the Geological Survey of Brazil and the National Council of Water Resources, which comprises various sectors involved with water and its management.

The notification process of custodian agencies has been increasingly efficient, with technical support available both to clarify any questions related to the methodology and to reporting and communicating the data. In recent years, several online events have been promoted, providing opportunities to present and discuss methodologies and exchange valuable experiences between countries. Thus, a work platform was created that has a safe technical basis, based on procedures fully justifiable in light of the current availability of data in the country, ensuring that the main requirements determined by the UN for producing indicators were met and that the results obtained were consistent with the scenario in Brazil regarding the water and sanitation situation and management.

However, the process can be improved, with the definition of a general schedule of demands sent to the countries, related to SDG 6, containing the data collection stages, the list of information that will be requested and the scheduled events. As a result of this improvement, the organization and articulation of the institutions and focal points of the countries will be strengthened, considering that the teams that calculate and report the data are usually the same, as is the case with ANA.

All indicators of Brazil demanded by the UN, each with its specific form and frequency of collection, were duly updated and reported and were presented in this publication. The volume of information and the efforts used for its systematization resulted in very positive repercussions, as in the case of indicator 6.3.2, which addresses water quality. ANA seeks to disaggregate the indicators whenever possible, which also resulted in innovative work in the indicators 6.4.1, related to water use efficiency and 6.4.2, related to water stress. Joint action with the custodian agencies also contributed to improvements in the methodology for calculating certain indicators, such as indicators 6.4.2 and 6.6.1, related to changes in aquatic ecosystems.

There are still some data gaps observed for monitoring all aspects considered in SDG 6, as in the case of the component related to the availability of handwashing facilities with water and soap of indicator 6.2.1, since Brazil does not have specific surveys to collect this data, and an approximation is adopted, considering the existence of a bathroom for exclusive use at home. This also occurs for indicator 6.3.1, since Brazil does not have systematized data on the treatment of industrial wastewater, included in its calculation. In the case of indicator 6.3.2, it should be pointed out that groundwater quality monitoring is still not very representative, despite the advances verified. Regarding indicator 6.6.1, the challenge is in selecting the most appropriate databases and data sources, among those available, in addition to the tools suggested by the UN. Regarding indicator 6.a.1, it should be noted that Brazil does not have systematized data on the effective use of official assistance resources for the development received. Finally, in relation to indicator 6.b.1, the biggest questions concern the methodology and calculation method of the indicator, which are not yet clear.

Particularly for Brazil, with its continental size and great interregional differences, which are evident in a territory that covers more than 8.5 million $km^2$, there are even greater obstacles to be overcome to "ensure the availability and sustainable management of water and sanitation for all". However, the paths have been taken, as can be seen in the comparison of the country's performance with those of other countries with an equivalent socioeconomic context, presented throughout the publication.

In general, the results of the SDG 6 indicators for Brazil presented a positive evolution both in the historical period adopted to represent each of them and in relation to the period presented in the 1st edition of this report, with highlights on the advances in safely managed sanitation services and in the integrated management of water resources. There are also some indicators that have already shown good performance for a few years, such as access to drinking water.

Among the targets of SDG 6, target 6.1, referring to the universalization of access to drinking water, is close to being reached by 2030, considering the reach of the indicator over the analyzed period. Targets 6.3 (water quality improvement), 6.4 (efficiency and sustainability in water use), 6.5 (implementation of integrated water resources management), 6.6 (protection and restoration of water-related ecosystems), 6.a (expansion of international cooperation) and 6.b (strengthening the participation of local communities) have the potential to be achieved in Brazil, as the indicators have shown significant improvements.

Target 6.1, which aims to universalize the use of safely managed drinking water services, shows very high levels, including when analyzing the quality of water consumed by the Brazilian population, based on data from SISAGUA/MS, an improvement in relation to the 1st edition of this report. However, in order to achieve universal access, efforts and investments beyond those already practiced are still needed.

The monitoring of target 6.2, which aims at the universalization of safely managed sanitation services, showed that 47.8 million Brazilians began to have this access between 2009 and 2019. Still, 58.4 million people are not yet served by these services. Low sewage treatment has repercussions on population health and water quality and represents one of the biggest challenges in Brazil as to the achievement of the SDG 6 targets.

By monitoring target 6.3, it is possible to observe the great importance of monitoring the quality of water bodies, carried out by ANA in partnership with the Federation Units, comprising, to analyze indicator 6.3.2, 705 monitoring points in 460 reservoirs, 5,559 monitoring points in 2,300 rivers and 166 monitoring points in 28 aquifers, the latter included from this 2nd edition. Improvements in the water quality of surface water bodies were detected between 2017 and 2018, particularly in reservoirs. These environments, mainly in the Northeast Region of Brazil, are more susceptible to eutrophication and responded positively to the increase in the volumes due to rainy seasons closer to the historical average in these years.

Target 6.4, which aims to improve the efficiency of water use and the commitment of water availability in light of demands, obtains water stress results that are not very representative for Brazil as a whole, but very relevant when analyzing certain Hydrographic Regions, reflecting the great territorial diversity. There are Regions such as the Eastern Northeast Atlantic, inserted almost entirely in the Brazilian Semi-arid Region, with significant demand and low water availability, and the South Atlantic, with intense water withdrawal for the flood irrigation method. Along with water use and water availability, it is important to consider the continuous monitoring over time of the efficiency of economic sectors in Brazil. Thus, it is important to pay special attention to the use of water for irrigation, expanding the adoption of increasingly efficient methods, to reduce waste and for greater use of available water resources, contributing both to the reduction of water stress and to the increasing improvement of water use efficiency in the country. It is also worth noting that, in this 2nd edition, breakdown of the indicator by Federation Unit is new, which offers possibilities for monitoring efficiency at the state level.

Target 6.5 seeks to improve the integrated management of water resources through the achievement of three main objectives: economic efficiency, social equity and environmental sustainability. Thus, it provides the necessary means to achieve all other SDG 6 targets, playing a central role in the implementation of the 2030 Agenda. In this 2nd edition, we highlight the methodological advances with the participation of the CNRH councils in the calculation of indicator 6.5.1, to evaluate Brazil´s situation in relation to management and the evaluation of the operational transboundary arrangements in indicator 6.5.2. In Brazil, even though there have been many advances in recent years, there are several gaps that still need to be overcome, especially regarding financing mechanisms and effective application of financial resources in actions aimed at their implementation, as well as issues associated with gender. With regard to transboundary management, except for the Oiapoque basin, all others are covered by operational arrangements on water resources, which does not occur when dealing with aquifers. Treaties and Arrangements in basins of extreme relevance to Brazil and the world, such as the Amazon and Platina, and in particular technical cooperation actions between countries, are important instruments for Water Governance in the South American continent, in general, and for strengthening water resources management in each country, in particular.

In relation to target 6.6, a platform is available for monitoring water-related ecosystems with observations of the Earth through satellite imaging. Data made available to Brazil show that 21% of the river basins experienced high surface water extent changes in the last 5 years (2015 to 2020) in relation to the period from 2000 to 2020. We highlight losses in the extension of permanent rivers and lakes, and gains in the extension of seasonal rivers and lakes and in artificial reservoirs. An unprecedented number of dams under construction or planning in the world are noteworthy. La Plata river basin has been pointed out as a hotspot for the emergence of new reservoirs, as well as the basins of the Mekong, Tigris and Euphrates rivers. As an aggravating factor, the sub-basin of the Paraguay River has suffered from a severe drought in the last two years. Given the massive loss of all types of wet ecosystems in recent centuries, coupled with the rapid changes observed in the last decade, countries need to act urgently, expanding and accelerating efforts to protect and restore water-related ecosystems.

In this sense, it is of paramount importance to expand international cooperation investments in the areas of sanitation and water resources, to achieve all the targets of SDG 6. Target 6.a monitors official development assistance in these areas, comprising contributions from donor government agencies to developing countries at all levels, either bilaterally or through multilateral institutions. Meanwhile, the resources received by Brazil have been decreasing significantly since 2011, which may hinder the implementation of SDG 6.

In order to better monitor target 6.b, which evaluates the level of participation of local entities in a country in the water and sanitation resources management, ANA's approach to the GLAAS survey allowed the adoption of data to monitor the indicator. Of the six criteria evaluated, only the Hygiene Promotion does not have procedures for the participation of communities defined by law or policies at the national level. The participation of users and communities helps to ensure sustainable solutions to all aspects of SDG 6 and contributes to broader reductions in inequity within and between countries, including gender inequities. Therefore, it is necessary to increasingly expand this participation so that it is truly effective, whether in the river basin committees, or in the municipal basic sanitation councils and other similar councils, which meets the decentralized and participatory character of the National Water Resources Policy.

At the end of the construction and monitoring process of the indicators disclosed in this report, one of the challenges identified by ANA with the partner institutions corresponds to integrate the targets of SDG 6 into public policies in the different spheres of government, national, state and municipal, as well as the private sector, with support from civil society and integrate monitoring efforts. Another challenge is to more easily communicate results and opportunities to a wider audience and engage them on the theme. It is important for everyone to be aware of how the policies are being implemented and what the reality is of the country in the different indicators that monitor its 8 targets. In addition, the disaggregation and territorial groups presented facilitate the evaluation considering the regional diversity of the Brazilian territory, since a single geographical group is not representative of the various local specificities.

Throughout 2020 and 2021, Brazil adopted the tool to support decision-making on SDG 6 (SSP-SDG 6), developed by the UNU Institute of Water, Environment and Hygiene (UNU-INWEH). This tool assisted in the integration and involvement of the different institutions to monitor and evaluate progress in achieving the SDG 6 targets and in defining the most critical evidence-based components. It was identified, for Brazil, that the most relevant component for improvement is the inclusion of gender, as there is a need for efforts to reach and integrate the theme to the implementation of the 2030 Agenda. The policy and institutional component is also critical and requires attention in the country, given the need for progress and adequacy to meet the targets. One of the main challenges reported is the need for regular annual investments, as well as the improvement of some aspects of governance, which require the need for alignment and articulation between the institutions responsible for leadership, control and strategy for achieving SDG 6.

ANA's contribution to monitoring targets and calculating SDG 6 indicators materialized in this report and in its previous edition, is part of a set of Agency actions aimed at the 2030 Agenda. Among them, the 2021 Brazil Water Resources Report – Full Report, which constituted the Diagnosis and Prognosis of the new National Water Resources Plan (PNRH) and the Plan itself, with actions to be taken in the horizon until 2040. Based on the data and conclusions of these documents, initial recommendations were prepared to improve institutional, technical, legal and economic arrangements to implement and monitor SDG 6 targets in Brazil, since there is a total relationship between the SDG 6 targets and the PNRH Action Plan.

The information produced by ANA, along with its partners, is contained in the 2030 Agenda Platform maintained by IBGE, which has information from all 17 SDGs. IBGE is the representative of Mercosur in the Inter-agency and Expert Group on Sustainable Development Goal Indicators (IAEG-SDGs) and responsible for giving technical advice during the Brazilian governance process.

The experience and knowledge acquired by Brazil with the calculation and monitoring of SDG 6 indicators has also been recognized as a model for other countries, by the United Nations agencies themselves and, in this sense, will also be shared throughout 2022 with other Portuguese language countries through the existing partnership within the Community of Portuguese Language Countries (CPLP) and in exchange for experiences within the regional scope of Latin America and the Caribbean. The panel of indicators included in this report and the report itself are available in Portuguese, English and Spanish, expanding its regional and global scope.

http://bit.ly/36BjYx3

As presented, there have been advances over the last few years in achieving the SDG 6 targets by Brazil, but efforts are still required on several fronts. In the context of the implementation of national policies on water resources, basic sanitation and water security, ANA is a key piece for the central technical role it plays in the National Water Resources Management System (Singreh) and is responsible for establishing reference standards to regulate public basic sanitation services and for its strategic mission to ensure water security for the sustainable development of the country.

It is necessary to strive for compatibility in the regulation of the sanitation sector with advances in the implementation of the management and regulation instruments of water resources and, more broadly, as also established in Law No. 11,445 of 2007, “the policies and actions of the Federal Government for urban and regional development, housing, combating and eradicating poverty, environmental protection, health promotion, water resources and others of relevant social interest aimed at improving the quality of life should consider the necessary articulation, including with regard to financing and governance, with basic sanitation.”

Investments in water infrastructure, water supply and sanitation works are essential for targets 6.1, 6.2, 6.3 and 6.4. In this context, the water security path pointed out in the National Water Security Plan (PNSH), which addresses regional interventions, supplemented by the Water Atlas – Water Security of Urban Supply and the Sewage Atlas –River Basin Clean Up, indicates a coherent roadmap to subsidize the application of public resources. In total, BRL 287 billion are estimated in studies, projects and works to increase water supply and control pollution, analyzed in an integrated manner, considering the fulfillment of effective demands, the more rational use of water and the risks associated with climate change. Public investments must be increasingly added to private resources, in an environment where national reference standards for sanitation aim to ensure greater predictability and legal certainty.

- The national reference standards for sanitation are also essential to guide full access to drinking water and sanitation services provided for in targets 6.1 and 6.2, not just from the point of view of infrastructure, but mainly ensuring that it is, in fact, universal and fair.

- Implementation of the instruments of the national water resources policy, regulated on a regulatory basis by ANA, are fundamental to targets 6.3 and 6.4, which seek to improve water quality, substantially increase efficiency in its sectoral use and ensure sustainability of the water sources and should be a priority theme on the Agency's regulatory agenda.

- Target 6.5 of implementing integrated water resources management in Brazil, including through transboundary cooperation, should be guided by the new National Water Resources Plan, PNRH 2022-2040, organized in programs aimed at strengthening Singreh, the implementation of policy instruments, water quality and quantity management and interfaces with other sectoral policies. Success in implementing the Plan must ensure that the progress observed in this target and sub-indicators 6.a and 6.b is maintained.

- Actions related to target 6.6, to protect and restore ecosystems related to water, supplement, with green infrastructure and nature-based solutions, the previous items that focus on water resources management and the implementation of gray infrastructure. Due to its importance, Singreh must establish its specific field of action with greater certainty in the interface with environmental policy and management, so as not to be restricted to isolated programs and actions.

The work systematically initiated by ANA and materialized in this "SDG 6 in Brazil: ANA's vision of the indicators – 2nd Edition" report and in its previous version, it needs to count on the permanent partnership of other national data-producing entities for the 2030 Agenda, aiming at addressing the gaps already identified and the progressive improvement of the results of the SDG 6 indicators and their updating over time. Monitoring the targets allows awareness of the entire Brazilian society to be increased about the sanitation and water resources situation and management, assisting in the formulation of public policies and in the allocation and execution of financing, directing actions and monitoring progress in this area.

ANA's recent new responsibilities in sanitation, combined with the strengthening of its original role in managing the country's waters, are strategic for maintaining indicator monitoring and the development and guidance of actions to achieve the targets of SDG 6 by 2030.

ANA

NATIONAL WATER AND
SANITATION AGENCY - BRAZIL

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