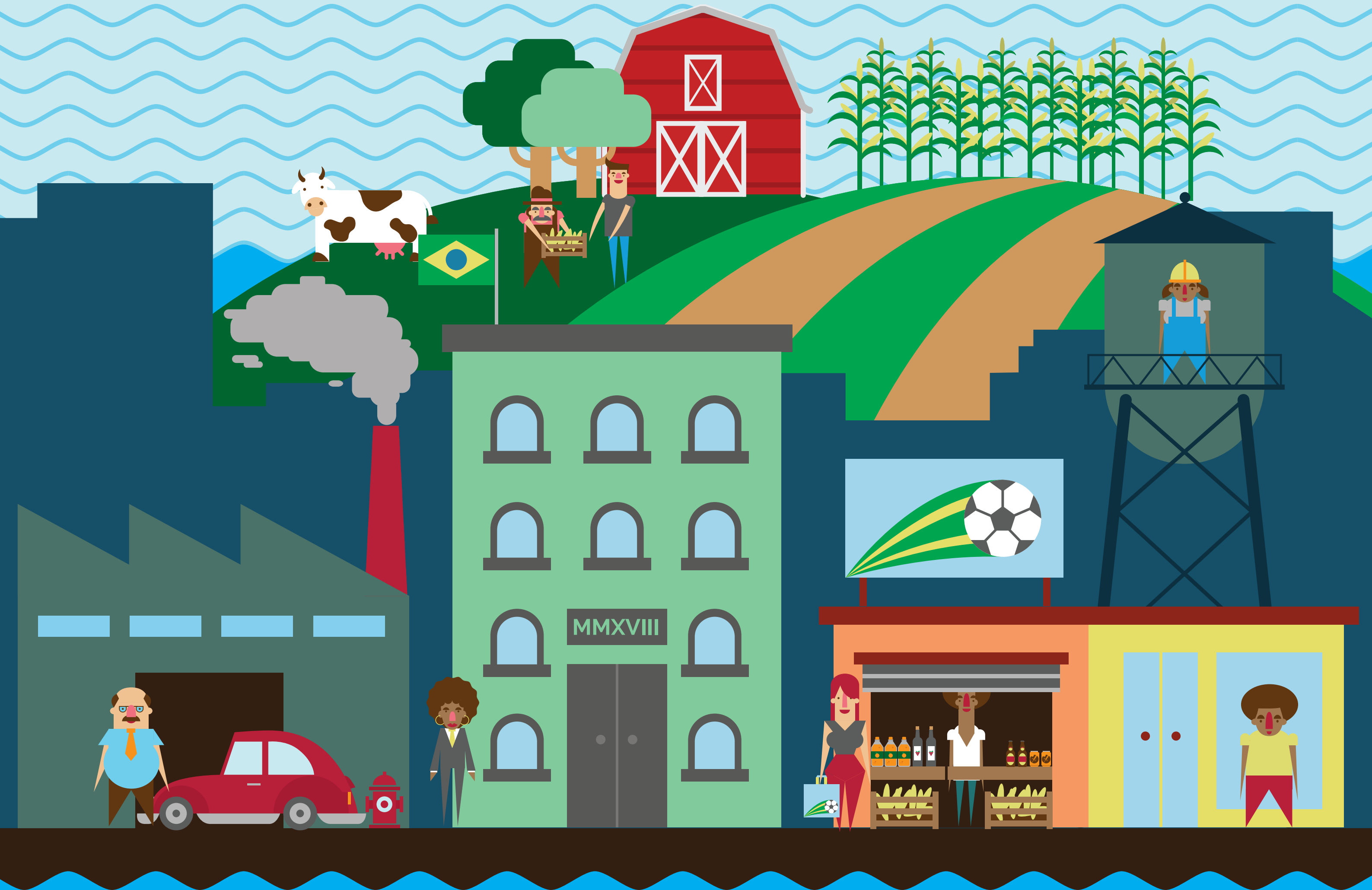
# ENVIRONMENTAL-ECONOMIC ACCOUNTING FOR WATER IN BRAZIL

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SECRETARIAT OF WATER RESOURCES AND ENVIRONMENTAL QUALITY

MINISTRY OF THE ENVIRONMENT

# ENVIRONMENTAL–ECONOMIC ACCOUNTING FOR WATER IN BRAZIL

## 2013–2015

BRASÍLIA–DF
ANA
2018

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# PRESENTATION

**IN A JOINT EFFORT,** the National Water Agency (ANA), the Brazilian Institute of Geography and Statistics (IBGE) and the Secretariat of Water Resources and Environmental Quality of the Ministry of the Environment (SRHQ/MMA) present the first results from the Environmental-Economic Accounts for Water (EEA-W) in Brazil. Such integration relies on the technical support and close collaboration of the Secretariat of Biodiversity (SBIO) of the Ministry of the Environment, and the German Cooperation for Sustainable Development through the *Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH*.

The Environmental-Economic Accounts for Water are considered in the context of production and dissemination of information related to the balance between water resources availability and water demands from the economic sectors at a national scale, according to the standardized methodology designed by the SEEA-Water (System of Environmental-Economic Accounting for Water) of the United Nations Statistics Division (UNSD).

The consolidation of different databases, direct and indirect estimates of sectoral water demands, and methods used to organize the information, allowed for calculating EEA-W time series (assets, supplies, uses, and hybrid accounts) for Brazil in the period between 2013 and 2015.

The results present strategic information that aim at supporting sectoral planning and management actions, economic and water resources actions, by diagnosing how the water is used by the Brazilian economic sector. This is done by organizing the information that shows evidence of the interactions between the economy and the environment, related to references in sustainable development and other public policies.

In that sense, the environmental-economic accounts are a key tool for an effective public management of natural resources. Particularly, EEA-W, which integrates physical indicators with monetary indicators, can influence actions and public policies when it comes to integrated management of physical and monetary aspects of that resource that is vital for life.

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# INTRODUCTION

**BRAZIL HOSTS A BROAD RESERVE OF** natural resources, which provides the country with comparative and competitive advantages in the economic context. The Amazon region, with its large biodiversity and acknowledged contribution to the global climate, the soil and the climate aptitude for the agribusiness in the Cerrado biome, surface and groundwater availability, and the strategic mineral reserves highlight Brazil as a global relevant actor in both environmental and economic issues, with notable share in the global market for mineral and agricultural commodities. With the continuous growth of global demand for goods and services, there is a clear pressure increase over the Brazilian environmental resources and subsequent risk of adverse economic and social impacts.

Water plays an undeniable role in that cycle of expansion and development. Water is the theme of national and international programs, agreements and agendas that establish norms to follow regarding its availability and quality as a natural resource. Brazil has advanced in water resources management, with important milestones since the 1930's, culminating with the development of the National Water Resources Policy[1] and the National Water Resources Management System in 1997, in a continuous process of implementation and enhancement.

**1.** Act # 9.433, as of 1997, which established the National Water Resources Policy in Brazil, is known as the 'Water Act'.

Great challenges are involved in the conservation of aquatic ecosystems, such as negative impacts caused by chaotic occupation and use of urban environments, non-conservation practices of land and water use in rural areas, low percentage of domestic wastewater collection and treatment, global climate changes, which cause more frequent and serious flood and drought events and affect water consumption. Economic activities, which have large dependence upon water under the proper conditions for their needs, are also affected by those impacts and ultimately have their decision-making processes highly influenced by this context.



Recent events in Brazil illustrate the relationship between water resources and the economy. The water crisis in 2014 and 2015 in the Southeastern region of the country directly interfered with the sanitation and electric power sectors. There was great impact on the financial health of large Brazilian corporations in the sanitation sector. In the last few years, consumers felt the negative consequences of increasing power generation costs due to the use of thermoelectric power plants, which had to be activated because the existing hydroelectric power plants were not able to meet the supply needs, as there was not enough rainfall and reservoir levels have dropped a lot. The drought in the Pianco-Piranhas-Acu river basin, in the Brazilian semiarid area, resulted in large economic losses[2] estimated from June 2012 to June 2017, affecting different sectors that use water. In 2015, a tailings dam rupture in Mariana (MG) strongly affected all the economic activities that depend on the waters of the Doce River, reducing individual and collective assets.

**2.** Economic loss estimates are presented in a study conducted by ANA, in partnership with the Getulio Vargas Foundation, available at: **goo.gl/8xy57V**.

All those facts illustrate the link between the economic, social and environmental systems, among many other examples experienced in Brazil. Therefore, it is mandatory for countries to gradually move from the development based on segmented sectoral policies to the adoption of an integrated and comprehensive management approach, to clearly show the relationship between the economic system and the hydrological system, in such a way as to formulate and implement public policies based on evidence of those interconnections.

In this publication, first the Environmental-Economic Accounts are defined, emphasizing their context and key applications. In the second chapter, the databases and the methodology used to organize EEA-W in Brazil are presented. In the following chapter, the results of the Accounts, encompassing assets, supplies and uses, and hybrid data (hydrology + economy), as well as the indicators derived from the Accounts can be found. Finally, final considerations on the application and improvement of EEA-W in Brazil are presented.

# NATIONAL ACCOUNTS AND ENVIRONMENTAL-ECONOMIC ACCOUNTING

**THE ACCOUNTING RATIONALE OF THE SYSTEM** of National Accounts (SNA) focuses in the reproduction of the economic circuit, providing the measurement of the corresponding aggregates, allowing for a global assessment of the economy, and showing the relationships among the economic agents, transactions, activities, products, assets and liabilities. In Brazil, SNA information relating to 2010, produced by IBGE Coordination of National Accounts (CONAC), bases its methodology on the international recommendation expressed in the System of National Accounts[3] manual (SNA, 2008).

SNA aggregates are summary indicators and key magnitudes for the purposes of macroeconomic analysis and comparisons over space and time. Supply and Use Tables (SUT), which are an integral part of SNA, show the composition and the flow of supply and demand of goods and services, as well as income and employment generation in each economic activity.

The aggregates related to the supply of goods and services represent the production gross value, imports at basic prices, margins, taxes and subsidies on products. The aggregates related to the demand of goods and services are the intermediate consumption of productive activities and the components of final demand at the purchaser's price (final consumption expenditure, gross capital formation and exports).

IBGE structural surveys are the key sources used[4] to produce the National Accounts aggregates. SNA organizes the country's economic activity information aiming at presenting stock and economic flow data in a standard format for planning and public policy formulation purposes.

Following this rationale, the System of Environmental Economic Accounting (SEEA)[5] emerges as a set of methodologies for the accounting of natural resources (such as water, forests and ecosystems) associated with economic activities. SEEA complements SNA using its accounting principles applied to environmental information and allows for a combined analysis of environmental data and economic information (both in physical and monetary terms) in a single structure.

The need to incorporate natural resources accounting (natural capital accounting) into the organization of a country economic activity information derives from the references established in the past years to achieve sustainable development. Those references determine the need to consider the relationships among the economic, social and environmental dimensions of the countries to ensure a low-carbon economic growth, truly sustainable. Thus, political decisions about economic growth, investment on social issues and environmental management are increasingly sensitive to natural resources values, their scarcity and deterioration.

**3.** The System of National Accounts was prepared under the supervision of the United Nations Organization (UN), the Statistical Office of the European Union (Eurostat), the International Monetary Fund (IMF), the Organization for Economic Cooperation and Development (OECD) and the World Bank. It is available at: **goo.gl/W1qoC8**.

**4.** For further details, please refer to 'Série Relatórios Metodológicos' (Methodological Reports Series), vol. 24 SNA, reference year 2010, available at: **goo.gl/8pGX7Y**.

**5.** The System of Environmental-Economic Accounting was standardized by the UNSD in 2012 for natural resources accounting (natural capital), and provides a broader view of the development progress than standard indicators such as the Gross Domestic Product (GDP). For further information and for SEEA manuals, please visit: **goo.gl/v8qaT7**.



Many countries took a step forward in the production of environmental-economic accounts in the last years, such as: Australia, Botswana, Colombia, Costa Rica, the Philippines, Guatemala, Netherlands, the United Kingdom, Rwanda and Sweden[6]. Brazil, in addition to elaborating the environmental-economic accounting for water, has been working in physical accounting of land use and land cover. In a near future, it expects to elaborate environmental-economic accounting for forests, energy, and ecosystem experimental accounting.

**6.** The Wealth Accounting and the Valuation of Ecosystem Services (WAVES) report shows experiences from many countries and is available at: **goo.gl/EBhh5c**.

## ENVIRONMENTAL-ECONOMIC ACCOUNTS AND SUSTAINABLE DEVELOPMENT REFERENCES

**THE UN CONFERENCE ON SUSTAINABLE DEVELOPMENT** held in Brazil in 2012, also known as 'Rio+20', sought to renew the political commitment of its Member States with the sustainable development. The document signed[7] by Brazil and other countries during the Rio+20 conference and consolidated in the new 2030 Agenda aims, among other things, at showing the need to integrate and acknowledge the interconnections among the economic, social and environmental dimensions of the development. The purpose is to foster sustainable, inclusive and equitable economic growth, reducing inequalities, raising basic life standards, promoting social development, integrated and sustainable management of natural resources, and ensuring conservation, regeneration and recovery of aquatic and terrestrial ecosystems in the face of new and emerging challenges.

The 2030 Agenda proposes 17 Sustainable Development Goals (SDG), which have become 169 targets based on the legacy of the Millennium Development Goals (MDGs). To implement the SDG, both internationally and in each country individually, there is an array of challenges, from the elaboration or enhancement of policies and management instruments, to the adjustment of procedures related to parameters, methodologies and indicators. The 2030 Agenda establishes that technical and scientific knowledge is critical to establish targets and to use indicators to properly check their progress[8].

Brazil, through Decree # 8,892/2016, created a National Commission for the Sustainable Development Goals, whose purpose is to internalize, disseminate and convey transparency to the 2030 Agenda implementation process. The commission will leverage studies, results from policies, and actions in the public and private sector concerning the SDG. For such, there must be a great effort from partners and initiatives of government bodies in different areas, in the view of the set of assignments ANA, IBGE and SRHQ/MMA directly have with SDG 6 – Water and Sanitation[9] – as well as others, considering the transversal nature of water in the economic, social and environmental agenda.

**7.** The document entitled *The Future We Want* can be accessed at: **goo.gl/v7gbFi**.

**8.** The United Nations Development Program (UNDP) monitors the SDG.

**9.** Information in the SEEA-Water model is structured to be linked to the SDG 6.

# ENVIRONMENTAL-ECONOMIC ACCOUNTING FOR WATER IN BRAZIL

**THE ENVIRONMENTAL-ECONOMIC ACCOUNTING STARTED BEING DEVELOPED** in Brazil in the 1990's. The first efforts were made under SNA-93 satellite accounts, leveraging the theoretical framework of UNSD Integrated System of Environmental Economic Accounting (SEEA) and the National Accounting Matrix with Environmental Accounts (NAMEA). Researchers and experts from different Brazilian public administration bodies and universities collaborated with that work. Several studies were conducted by the Ministry of the Environment, the National Power System Operator (ONS) and ANA, estimating water consumption flows and proposing technical coefficients of use.

Despite those studies, the Environmental-Economic Accounts for Water (EEA-W) in Brazil only started officially in 2012, under IBGE coordination, in partnership with ANA and the Secretariat of Water Resources and Urban Environment of the Ministry of the Environment (SRHU/MMA), currently called Secretariat of Water Resources and Environmental Quality (SRHQ). The history of EEA-W development in Brazil so far can be divided into three stages, each one with different specific goals. The first stage is the project proposition and institutional arrangements for its development; the second stage focused on training and interinstitutional technical exchange; and the third one was the construction of the first results[10], including hybrid tables.

The **first stage** started in September 2009, when IBGE organized the International Conference on Environmental Statistics and Environmental-Economic Accounting in Rio de Janeiro/RJ. During that conference, IBGE proposed that the Environmental Accounting in Brazil started with water. Such decision was mostly driven by the fact that production of information on water resources had evolved in the country. The database of the Brazilian Water Resources Report[11], which has been annually produced by ANA since 2009 and had been presented in that conference, was adopted as the main source of information[12] on water resources for EEA-W. Right after the event, IBGE proposed the creation of a Committee of Environmental-Economic Accounts for Water, initially involving the Ministry of the Environment (SRHU and ANA) and the Ministry of Planning, represented by IBGE. The proposition was reinforced by ANA during the International Conference on Water Accounting Methodologies, held in November 2011 in Brasilia/DF. The first stage was completed when this Committee was established, according to the Interministerial Ruling # 236, of May 2012, consisting of a Managing Group and an Executive Group with representatives of IBGE, ANA and SRHU/MMA.

The **second stage**, characterized by training and technical exchange among IBGE, ANA and SRHU/MMA, started in September 2012, with the first meeting held to discuss the participation of each institution in the development of the Accounts. In the following years, other events occurred: the National Conference on the Implementation of Environmental-Economic Accounting (2013), the International Conference on Environmental-Economic Accounting for Water (2014), the Training Workshop on Environmental-Economic Accounting for Water conducted by UNSD (2013), and the Environmental Kangare Training Course, focused on EEA-W, conducted by IBGE in 2014. In 2015, experts from IBGE, MMA and ANA participated in the Training Workshop on the Core Structure of the Environmental-Economic Accounting for Latin America and The Caribbean, in Santiago (Chile), organized by the Economic Commission for Latin America and the Caribbean (ECLAC). Still in 2015, the TEEB Regional-Local Project organized a workshop to discuss the proposition of a component in the Project aimed at supporting the process of elaborating environmental-economic accounting in Brazil. The proposition, submitted to the German government, was approved in 2016 to be implemented by May 2019. Upon the second stage completion, ECLAC provided ANA with technical support from November 8th - 10th, 2016, with two international expert guests invited for the discussion about how to fill out the first version of the Assets and Physical Supplies and Uses Tables in Brazil,, reference year 2013, which had been prepared by ANA and IBGE technical experts. The technical support report completed the stage, and was presented on May 26th, 2017.

The **third stage** started after the technical support event and involved a general review of the tables, identification of existing gaps, and elaboration of a time series, aiming at consolidating EEA-W results. The work was conducted in 2017 by ANA and IBGE technical teams, supported by short- and long-term consultancy from the 'TEEB Regional-Local[13]: Biodiversity Conservation by Integrating Ecosystem Services into Public Policies and Business Operation' project. There were technical contributions to the process, with joint efforts of SBIO/MMA and the German Cooperation to IBGE and other institutions that integrate the process to elaborate EEA-W in Brazil (ANA and SRHQ/MMA).

**10.** Resolution #181 (2016), from the National Council of Water Resources (CNRH), approved the Priorities, Actions and Goals of the Water Resources National Plan for 2016-2020. One of the actions planned was the conduction of a study on Environmental-Economic Accounts for Water.

**11.** Over the years, reports have supported different government actions, such as EEA-W, monitoring of the federal government Pluriannual Plan, and calculation of SDG 6. Publications are available at: **goo.gl/uLZ9Wj**.

**12.** The report is a reference to systematically monitor the situation of water resources in Brazil, through a set of statistics and indicators, and consists of a structured source of data and information available to the entire Brazilian society.

**13.** The project is an initiative of the Brazilian government, coordinated by the Ministry of the Environment (MMA), in partnership with the National Confederation of Industries (CNI) and IBGE, among others. The project is funded by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), through the International Climate Initiative (IKI), and implemented by the German Cooperation for Sustainable Development through GIZ. For more information: **goo.gl/CSUJru**.

## METHODOLOGY OF THE ENVIRONMENTAL-ECONOMIC ACCOUNTING FOR WATER

**THE STATISTICS DIVISION (UNSD) OF THE** United Nations Department of Economic and Social Affairs (UN DESA), in collaboration with the London Group on Environmental Accounting, coordinated the preparation of two documents that were published in 2013 to guide the development of water accounts: the International Recommendations for Water Statistics (IRWS) and the System of Environmental-Economic Accounting for Water (SEEA-W).

The UNSD recommends using the methodology System of Environmental-Economic Accounting for Water (SEEA-Water)[14] as a conceptual framework to organize hydrological databases and information related to the economy of the country in a consistent and concise way, describing interactions between the economy and the environment. The Environmental-Economic Accounts for Water (EEA-W), according to the SEEA-Water model, consists of a set of standardized tables that express availability, demands and flows established between the environment and economic activities, containing the minimum data set the UN encourages countries to compile, organize and publish. They show information about availability, use, consumption and return, and their corresponding economic activities, as well as the correlation between the sectors of the economy, including sanitation services (Gutiérrez-Martin et al., 2017).

SEEA-Water is a dual tool, involving economic and environmental aspects in the same framework to analyze and manage water resources, including the economic and physical dimensions, and considering that water is essentially dynamic in the environment and in the economy. It is a tool to organize hydrological and economic data, providing information that allows for consistent analyses, on one hand, of how water contributes to the economic development process, and the impact of economic activities on water resources, on the other hand.

As an auxiliary tool to the integrated management of water resources, SEEA-Water is an information system that supports the decision-making process. Standardization is critical so national and international organizations can manage the information in the same framework, allowing the comparison of results between countries and over time. Different indicators can be derived from EEA-W, which enables to assess water resources over time in a given country and to compare countries'[15] results.

SEEA-Water modules describe continental water resources as a function of their stocks and flows between the economy and natural processes. Surface hydrological resources are defined as assets, and consist of the water available in rivers, lakes, artificial reservoirs, snow, ice and glaciers. The main input of water into the system is precipitation and inflows from other territories. It is also considered that some hydrological processes, such as evapotranspiration and outflows to other territories in transboundary river basins, lead to a decrease in the stocks of water resources. Moreover, economic activities can act as a factor to increase or decrease water stocks through activities involving abstraction and returns.

**14.** For further information and for SEEA-Water manuals, please visit: **goo.gl/28Jvbb.**

**15.** SEEA-Water has been used by some countries, which published their experiences, namely: Australia, Botswana, Colombia, Costa Rica, Holland, Mexico, Namibia, Samoa, among others.



The **Asset Tables** compile information concerning water resource assets in the environment, allowing for an assessment of how pressures made by economic activities affect water stocks. Basically speaking, the water resource stocks include the account of surface water (rivers, artificial reservoirs, lakes, glaciers, snow, and ice), groundwater (aquifers), and soil water. Definitions of water abstraction consider the volume withdrawn from any source[16], either permanently or temporarily. Usually, the stocks considered by SEEA-Water are dynamic and can be altered in a given time scale.

The **Physical Supply and Use Tables** consider water interrelations in quantitative ways and with physical representativeness (units of volume over time - flow) in the economy, and between the environment and the economy. They assume abstractions from the environment to the economy, and water availability and water use in the economy and its final destination, either consumed or returned to the environment. Three key types of interactions are covered: **I)** water flows from the environment to the economy; **II)** water flows connected to economic activities; and **III)** water flows from the economy to the environment. For each type of interaction, accounting for volumes of water in the asset source and final destination is determined according to the mass balance.

Interactions between the environment and the economy involve, basically, water abstractions from the environment conducted by economic activities in a given territory for production and consumption activities. Finally, interactions of the economic sphere with the environment basically include return flows.

As a way to assess the results obtained in the time series, the temporal evolution was analyzed, emphasizing the key information presented in SEEA-Water Physical Supply and Use Tables (SUT). For analytic purposes, the information was aggregated in a format of economic activity classification called 'EEA-W Classification[17]', which corresponds to the hierarchical level at the Brazilian National Classification of Economic Activities **(CNAE) 2.0** section.

**SEEA-Water Hybrid Supply and Use Tables** basically consider the economic cycle associated with the cycle of water in society, describing availability and uses of water in different sectors in monetary terms to identify **I)** costs associated with economic activities that demand water in their production; **II)** income generated by the production associated with a given water demand; **III)** investment and maintenance costs for the infrastructure related to activities of water collection, treatment and supply; and IV) costs for the supply system users. Thus, the term 'hybrid' refers to a combination of different types of measurement units (volume and monetary units) for accounting, enabling the development of economic models that can assess the relationships between the policies associated with water resources and economic strategies.

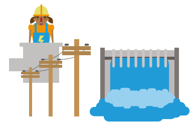
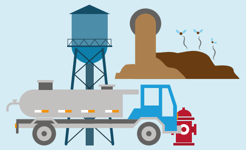
In addition to information standardized and organized according to SEEA-Water assumptions, it is possible to obtain derived **Indicators**. The indicators proposed

**16.** This definition includes soil water, and is equivalent to the concept of green water, as adopted in the scientific literature, whereas blue water refers to surface and groundwater, which is abstracted, stored and used.

**17.** The Brazilian National Classification of Economic Activities (CNAE) 2.0 directly matches the International Standard Industrial Classification of All Economic Activities (ISIC) Revision 4 at the top two hierarchical levels – sections and divisions – and adopts the same structure used by ISIC, including code definitions.

at SEEA-Water are sorted into three main categories: **I)** availability of water resources; **II)** water use for human activities; and **III)** water intensity and productivity associated with water. EEA-W is a tool that can improve water management in a country, since it provides basic information for calculating water-related indicators and a structured database for economic and hydrological information. The benefit of deriving indicators from such structure is that you can ensure its consistency and ability to analyze in further details the flows between the economy and the environment and the corresponding changes, as well as modeling of use scenarios and water resource demand.

**MATCHING EEA-W CLASSIFICATION WITH CNAE 2.0 SECTION**

| CNAE 2.0 SECTION | DESCRIPTION OF CNAE 2.0 | EEA-W CLASSIFICATION* |
|---|---|---|
| A | Agriculture, forestry production, fishing and aquaculture | Agriculture, forestry production, fishing and aquaculture  |
| B | Mining and quarrying | Extractive industries  |
| C | Manufacturing and construction | Manufacturing and construction industries  |
| D | Electricity and gas | Electricity and gas  |
| E | Water supply; sewerage, waste management and remediation activities | Water and sewage  |
| F | Construction | Manufacturing and construction industries  |



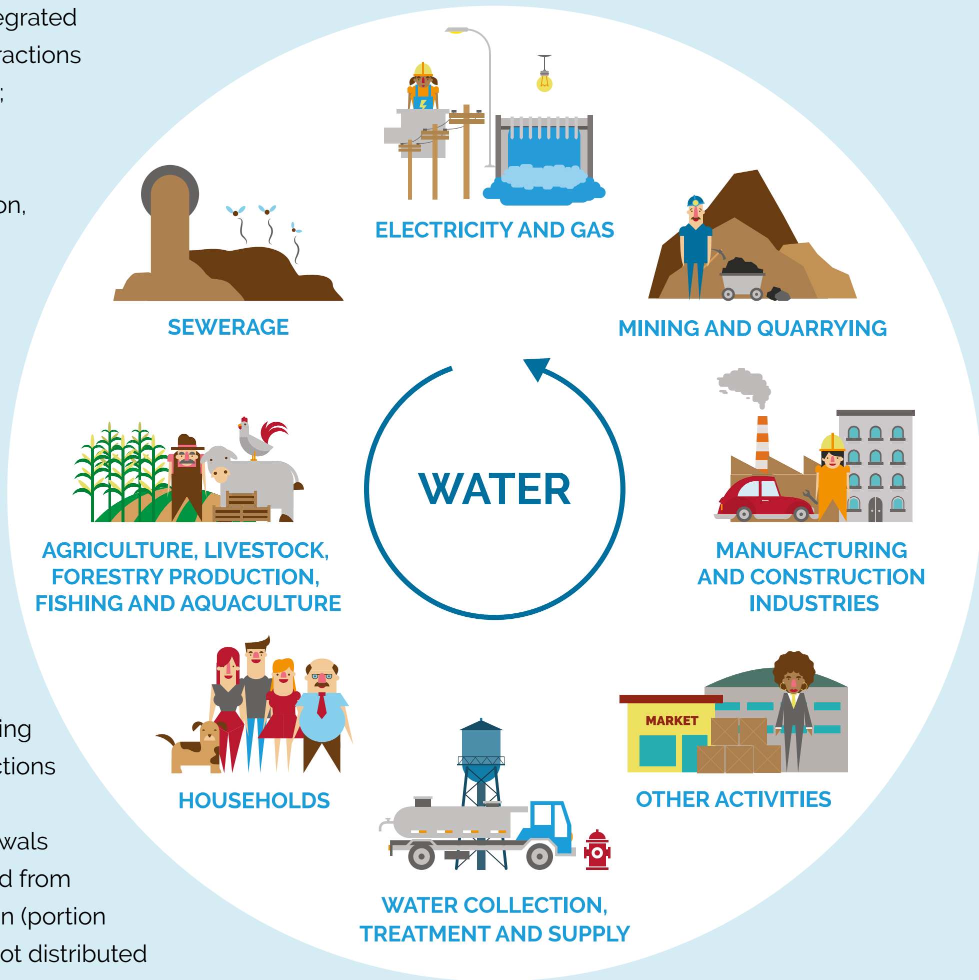
**MATCHING EEA-W CLASSIFICATION WITH CNAE 2.0 SECTION**

| CNAE 2.0 SECTION | DESCRIPTION OF CNAE 2.0 | EEA-W CLASSIFICATION* |
|---|---|---|
| G | Wholesale and retail trade; repair of motor vehicles and motorcycles | |
| H | Transport, storage and post office | |
| I | Accommodation and food service activities | |
| J | Information and communication | |
| K | Financial and insurance activities, and similar services | |
| L | Real estate activities | |
| M | Professional, scientific and technical activities |   Other activities |
| N | Administrative and support services activities | |
| O | Public administration, defense and social security | |
| P | Education | |
| Q | Human health and social work | |
| R | Arts, entertainment, sports and recreation | |
| S | Other service activities | |
| T | Activities of households as employers | |
| U | International and other extraterritorial organizations and bodies | |

*The 'Other Activities' classification in EEA-W also includes CNAE divisions of waste collection, processing and disposal, material recovery, decontamination and other waste management services.

## ACCOUNTING CYCLE

SEEA-Water assumes water is the primary source for activities involving production and consumption and as a return path for wastewater. Thus, the model can provide integrated information about the interactions between the economy (i.e.; agriculture, manufacturing industries, mining and quarrying, power generation, supply, and Households) and the environment.




Generally speaking, the use of water by economic activities is considered taking into account direct abstractions from the environment for activities involving withdrawals (volumes actually collected from water bodies), consumption (portion of water collected that is not distributed to other economic activities and does not return to the environment because it has been incorporated to other products or actually consumed by humans and/or animals) and return (volumes returned to the environment after productive activities) in consumptive uses, or use of water without necessarily removing it from the environment (non-consumptive uses).

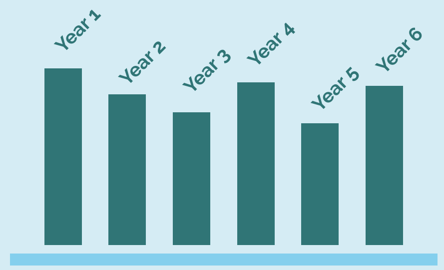



## WHERE SHOULD IT BE USED?

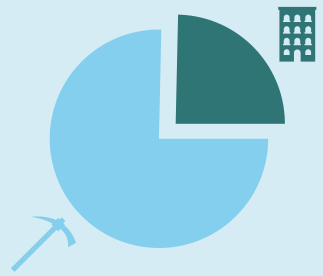
SEEA-Water results compiled in Physical Supply and Use Tables, Asset Tables, and Hybrid Supply and Use Tables can help in issues such as: I) effective allocation of water resources after quantifying availability and demands for different purposes; II) improvement of water efficiency both in regards to demand and availability; III) description and understanding of how water resources management can impact users; IV) leveraging investments in infrastructure; V) relationship between water availability and uses; VI) provision of a standardized information system capable of harmonizing different sources of data and information, which can also be used to calculate standard indicators; VII) empowering stakeholders in the decision-making process, since it is a model with clear and transparent concepts and definitions. In addition to that, it enables comparisons among economic sectors within a country, or among countries and regions in a given period, or their progress over time, following a predetermined method that complies with UN assumptions (2012).

Moreover, indicators derived from EEA-W allow for an assessment over time and diagnostics about the situation of water resources in the country for a specific period, and enable comparisons among countries on the availability of water resources, demands and uses of water for human activities, water intensity, and productivity associated with water.

COMPARISON WITH OTHER COUNTRIES




TIME ANALYSIS



COMPARISON AMONG ECONOMIC SECTORS

# RESULTS OF ACCOUNTS IN BRAZIL

**CONSIDERING THE EXTREME COMPLEXITY AND LARGE** volume of information involved, in order to present EEA-W results for Brazil it was necessary to harmonize the data, the information and studies from different sources[18]. In this sense, to fill out physical and hybrid tables of assets, supplies and uses of SEEA-Water model for Brazil[19], the main source used was information from rainfall and fluviometric monitoring in the country, field surveys and self-reporting records from water resources users, maintained and operated by ANA, studies and diagnoses on water resources in Brazil; the database of the National Information System on Sanitation (SNIS) of the Ministry of Cities (MCid); and SNA data from Brazil.

The configuration and productivity of the Brazilian economic sectors, associated with regional issues of water resource availability and water use demands, historically concentrate the highest water demands around the agricultural sector, human consumption and industrial sector. For comparison purposes, total water consumption in all different economic activities was estimated. SEEA-Water defines total consumption as water that is not distributed to other economic activities and does not return to the environment because it has been incorporated to other products or has been consumed by humans and/or animals.

Significant advances were observed in improvement and detailing of demand estimates from sectors of the economy in the last few years, and time serie[20] were built for water demands and uses for key economic sectors in the country, covering the period from 1931 up to date, including projections by 2030. Moreover, other studies[21] conducted by ANA form a database to support planning and management of water resources in Brazil. In addition to that, the National Information System on Sanitation (SNIS) made available information concerning conditions of water supply and sewage[22] system.

The first EAA-W results for Brazil are presented for the period between 2013 and 2015, and include the Asset, Physical and Hybrid Supply and Use Tables, as well as Indicators.

**18.** Information about how economic activities mostly use water and availability of water resources can be found in the Reports on the Situation of Water Resources in Brazil, available at: **goo.gl/zpgpTj**.

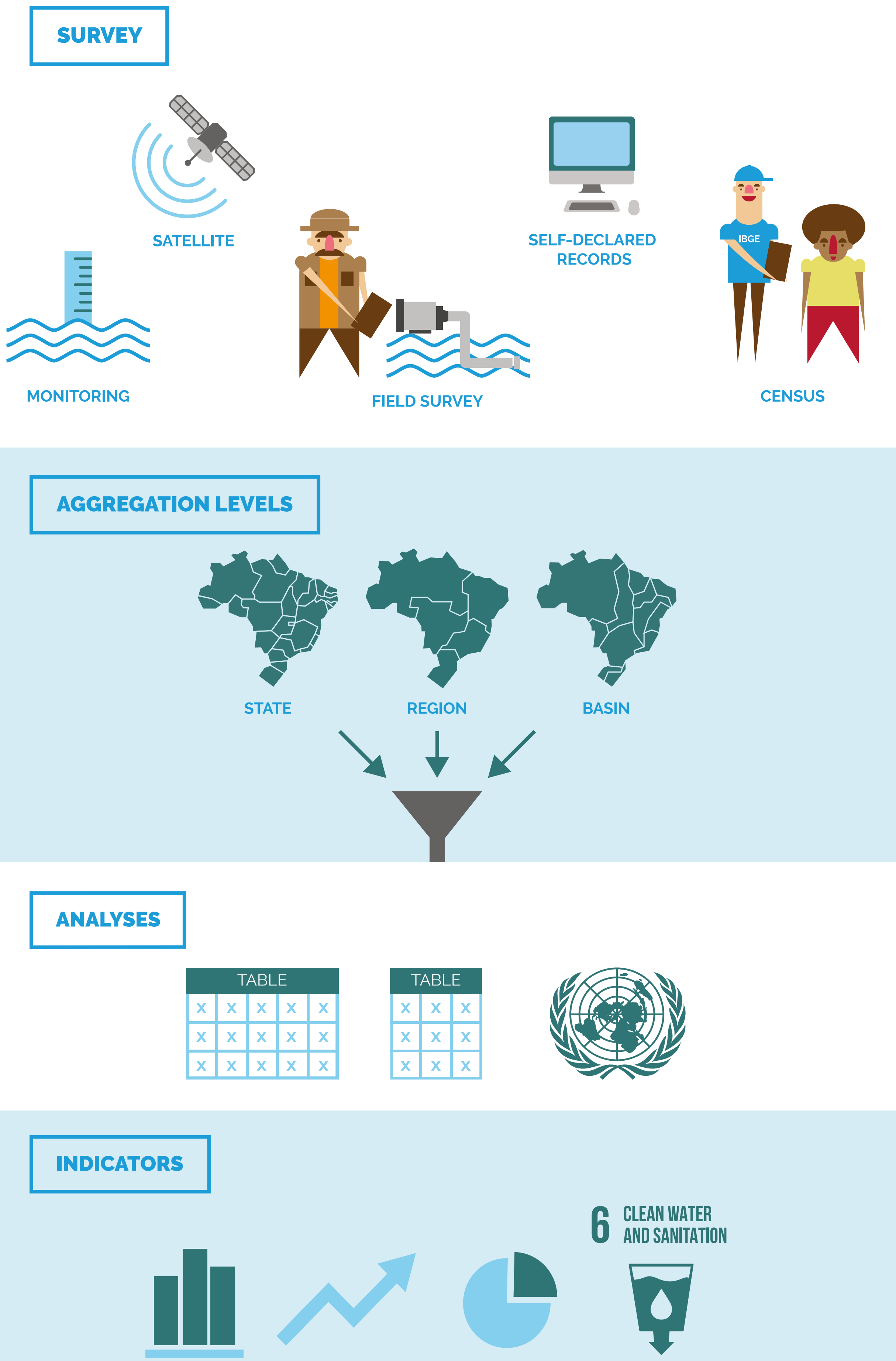
**19.** EEA-W complete tables are available at Brazil's National Accounts repository at: **goo.gl/e4aLDD**.

**20.** The study entitled 'Usos Consuntivos de Água no Brasil' (Consumptive Uses of Water in Brazil), conducted by ANA, estimated the main uses of water over time for all municipalities and watersheds throughout the country.

**21.** For example: 'Atlas Brasil – Abastecimento Urbano de Água' (Atlas Brazil – Urban Water Supply), available at **goo.gl/BmbnVn**, 'Atlas Esgotos – Despoluição de Bacias Hidrográficas' (Sewage Atlas – River Basin Cleanup), available at **goo.gl/H2TC8E** and 'Atlas Irrigação – Uso da Água na Agricultura Irrigada' (Irrigation Atlas – Use of Water in Irrigated Agriculture), available at **goo.gl/NSjdJt.**

**22.** SNIS has an annual time series presented by the Ministry of Cities at **goo.gl/r9gtga.**





## ASSET TABLES

**THE MAIN SOURCES OF SYSTEMATIZED DATA** for filling the information related to the SEEA-Water Asset Table correspond to the Brazilian Water Resources Reports, produced by ANA, data from the ANA's Reservoir Monitoring System (SAR)[23], produced by ANA, the country input and output flow balances consolidated using ANA's Hydrological Information System (Hidroweb)[24], and time series data concerning rainfall and evapotranspiration in the country produced by the National Institute of Meteorology (INMET). Besides, completing the Asset Table requires harmonization with the results obtained in SEEA-Water Supply and Use Table, therefore the sources of information used in the Physical Supply and Use Table have also been indirectly used in the Asset Tables.

Based on the results obtained in the time series of Water Assets in Brazil (2013-2015), it is possible to collectively assess information about abstractions/ withdrawals, water flows and water resource stocks (surface water, groundwater, and soil water) in the environment, and present an overview of the relationship between uses of water and the dynamics of hydrological resource stocks during the specific period. To assess the results, the time evolution of the series was analyzed, highlighting key additions, abstractions and balance of specific asset stocks.

As for **stock additions** per year, it is worth noting that the largest volumes are for soil water, defined by SEEA-Water as water suspended in the uppermost belt of soil, or in the zone of aeration near the ground surface, that can be discharged into the atmosphere by evapotranspiration. By definition, water inflows in the soil were considered as a part of rainfall that does not go directly to rivers and streams, lakes and artificial reservoirs. Consequently, stock additions of soil water show a direct correlation with the volume of rainfall in the current year and account for about 50% of total volumes added to water resource stocks in the country.

**23.** ANA monitors the volume of water in 677 Brazilian reservoirs, supported by the states and the organizations responsible for their operation. Data is available at **goo.gl/J3wYjb**.

**24.** Hydrological information is available on the Internet at **goo.gl/LysSDj**.

**TOTAL ADDITIONS TO ASSET STOCKS IN BRAZIL (in million hm³/YEAR)**

| Type of Water Resource | 2013 | | 2014 | | 2015 |
|---|---|---|---|---|---|
| Surface Water | 12,1 | ▲ | 13,2 | ▼ | 12,7 |
| Soil Water | 14,7 | ▼ | 14,5 | ▼ | 13,1 |
| **TOTAL** | **26,8** | ▲ | **27,7** | ▼ | **25,8** |

*1 hm³ corresponds to a million m³. One m³ corresponds to 1,000 liters.

Source: EEA-W-Brazil.



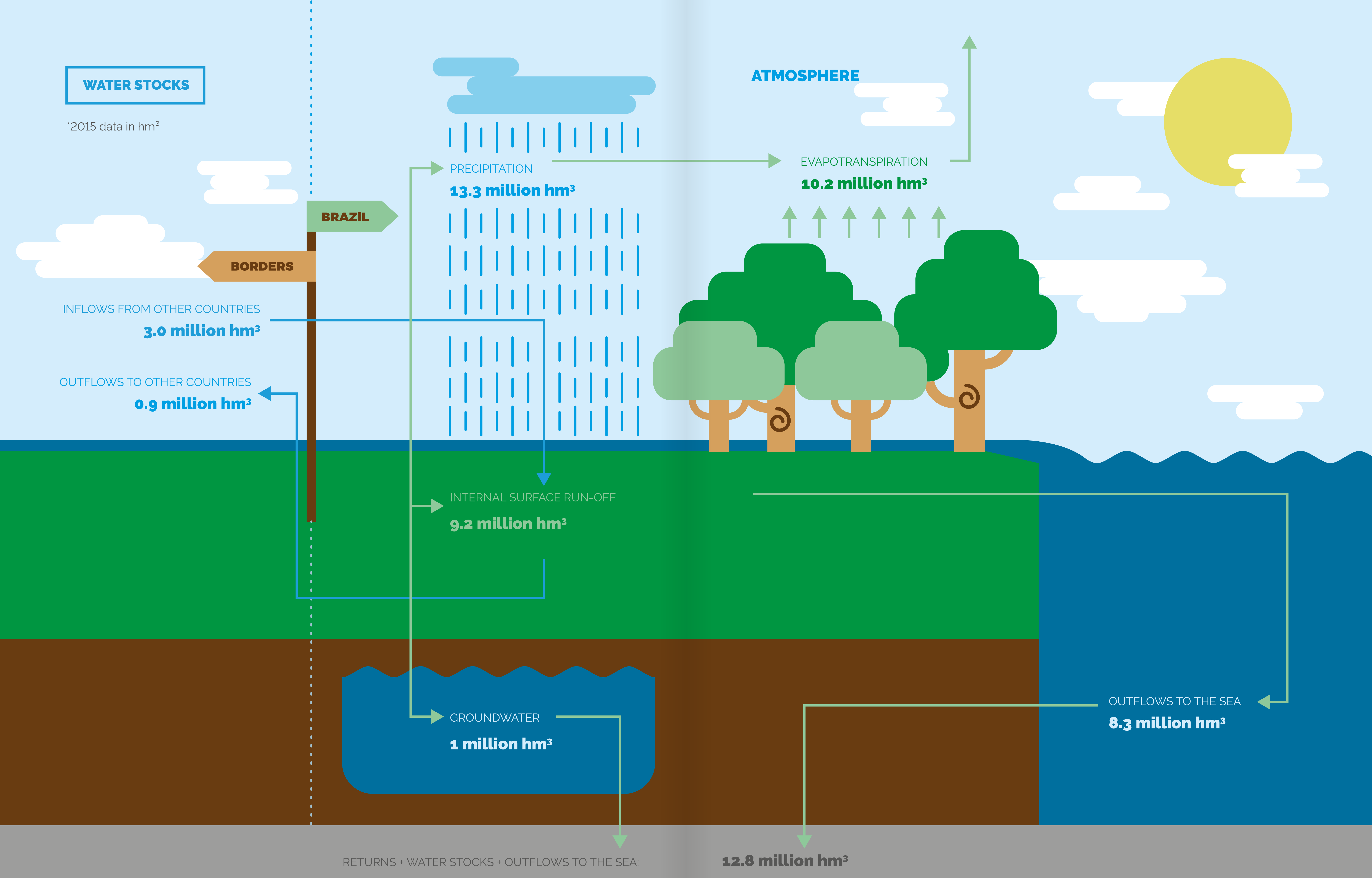
**Additions to the surface water stocks** are related to the rainfall that goes to rivers and streams, lakes and artificial reservoirs, as well as to return flows originated from interactions between the economy and the environment, in addition to inflows from upstream territories and other resources.

Return flows account for about 30% of total additions to surface stocks and are generally linked to flows used to generate energy in hydroelectric power plants that completely returns to surface water bodies. It is estimated that about 80% of the flows used by economic activities return to rivers and streams, and the remaining volume goes to lakes and artificial reservoirs. About 20% of the flows added to the country stocks come from upstream inflows from other countries (in 2013 and 2015, about 2.6 and 3.1 million hm³/year, respectively). Finally, about 50% of the inflow comes from other resources of the territory, including natural and artificial flows among the resources within the territory.

**TOTAL INITIAL STOCK AND ADDITIONS TO STOCK IN SURFACE ASSETS IN BRAZIL (in million hm³/YEAR)**

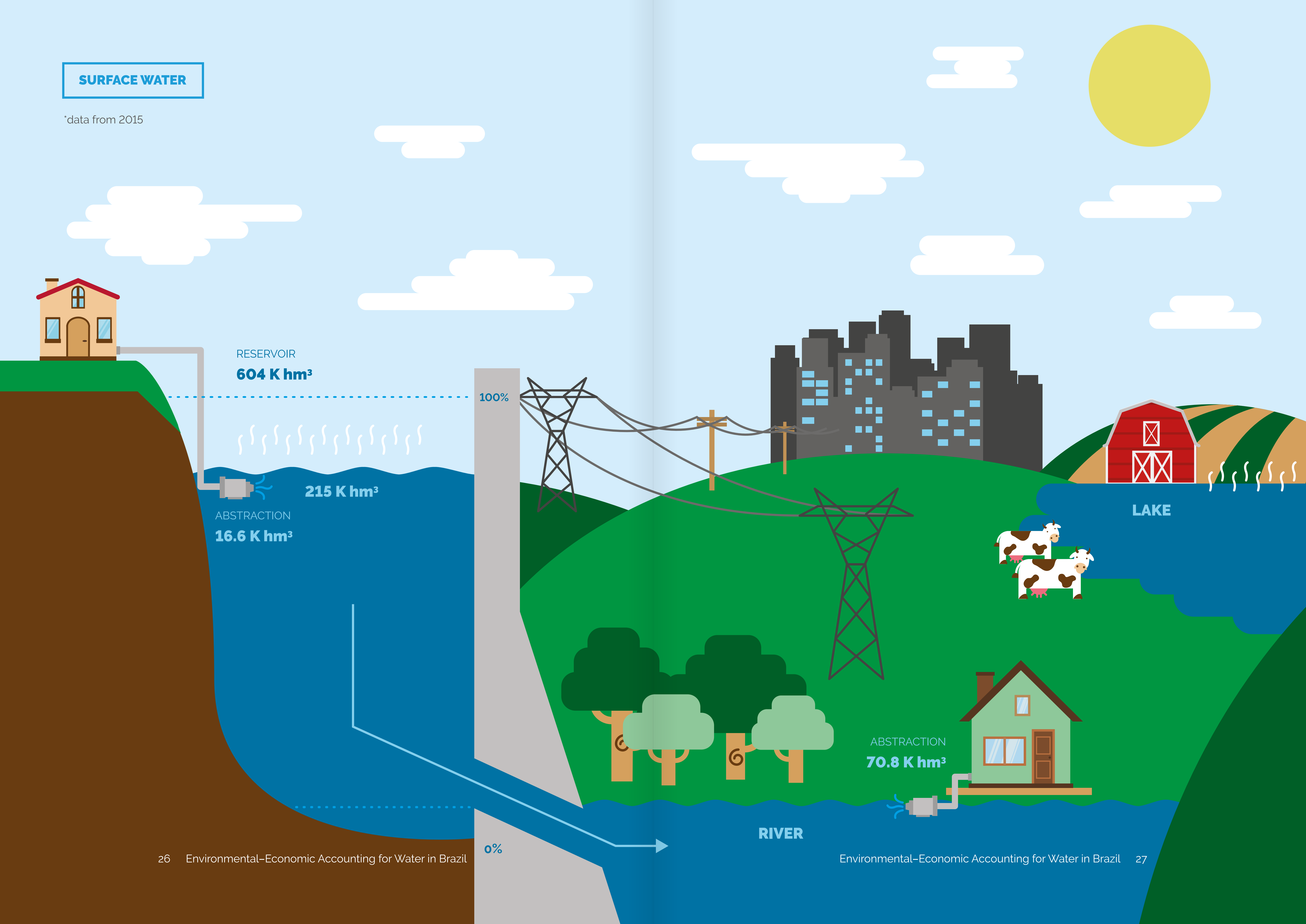
| | 2013 | | 2014 | | 2015 |
|---|---|---|---|---|---|
| Initial stock *(in artificial reservoirs)* | 0,21 | ■ | 0,21 | ■ | 0,22 |
| Returns | 2,9 | ▲ | 3,0 | ▲ | 3,1 |
| *Portion of rainfall that feeds rivers and streams, lakes and artificial reservoirs* | 0,27 | ▼ | 0,26 | ▼ | 0,24 |
| Inflows from other upstream countries | 2,6 | ▲ | 3,0 | ▲ | 3,1 |
| Inflows from other resources in the territory | 6,3 | ▲ | 7,0 | ▼ | 6,2 |
| **TOTAL** | **12,2** | ▲ | **13,3** | ▼ | **12,7** |

Source: EEA-W-Brazil.


WATER STOCKS
*2015 data in hm³
BRAZIL
BORDERS
INFLOWS FROM OTHER COUNTRIES
3.0 million hm³
OUTFLOWS TO OTHER COUNTRIES
0.9 million hm³
PRECIPITATION
13.3 million hm³
ATMOSPHERE
EVAPOTRANSPIRATION
10.2 million hm³
INTERNAL SURFACE RUN-OFF
9.2 million hm³
GROUNDWATER
1 million hm³
OUTFLOWS TO THE SEA
8.3 million hm³
RETURNS + WATER STOCKS + OUTFLOWS TO THE SEA:
12.8 million hm³

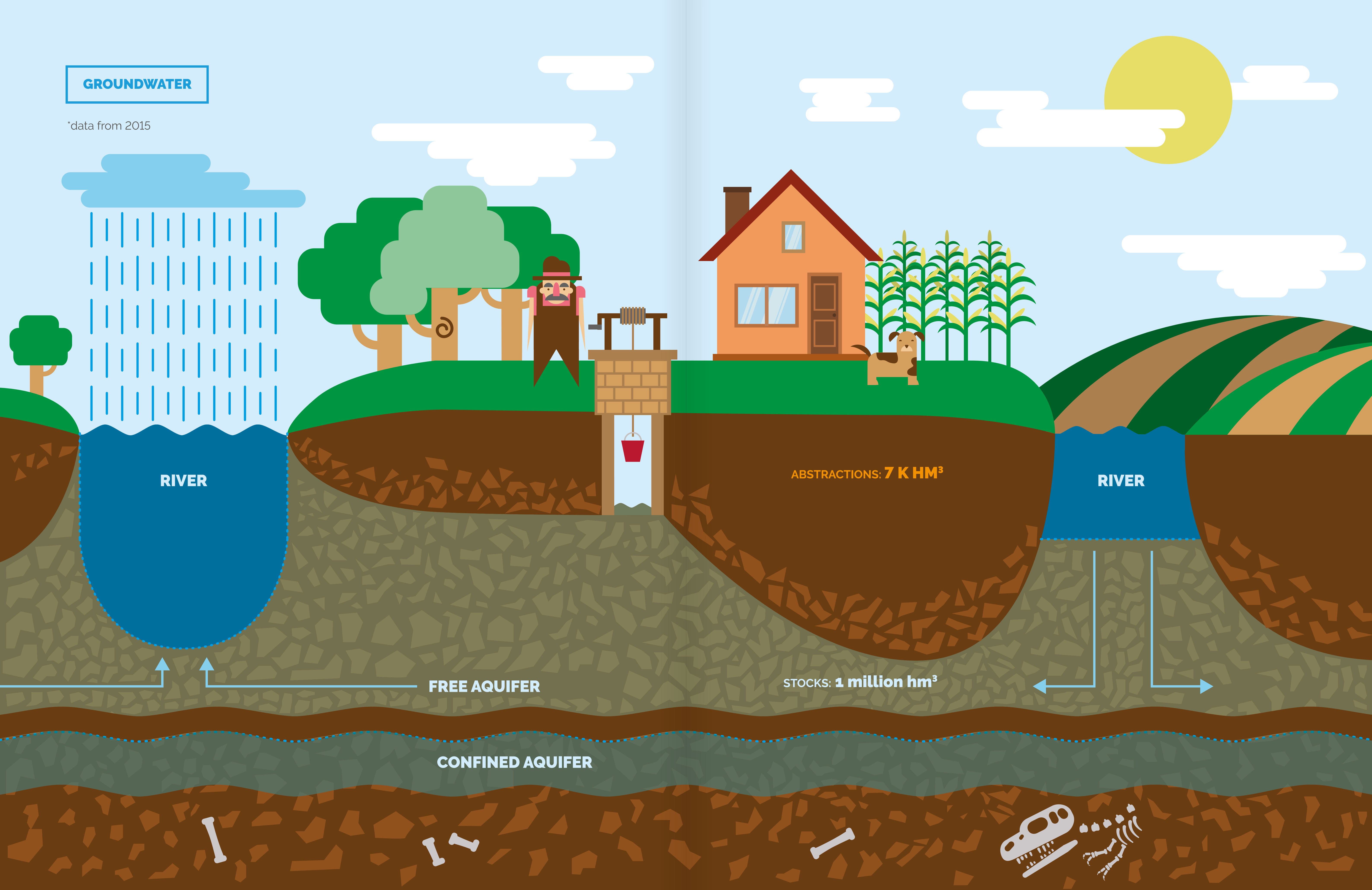
## SURFACE WATER

*data from 2015



## GROUNDWATER

*data from 2015



As for **subtractions of stocks**, the largest volumes are related to abstraction of soil water that outflows to other resources in the territory, such as groundwater, and losses through evaporation and evapotranspiration.

**TOTAL SUBTRACTIONS OF ASSET STOCKS IN BRAZIL (in million hm³/YEAR)**

| Type of Water Resource | 2013 | | 2014 | | 2015 |
|---|---|---|---|---|---|
| Surface Water | 12,0 | ▲ | 13,1 | ▼ | 12,6 |
| Groundwater | 0,007 | ■ | 0,007 | ■ | 0,007 |
| Soil Water | 14,7 | ▼ | 14,5 | ▼ | 13,1 |
| **TOTAL** | **26,7** | ▲ | **27,6** | ▼ | **25,7** |

Source: EEA-W-Brazil.

As for **subtractions of surface water**, they basically include abstractions made by the economy from surface water resources, as well as losses through evaporation and evapotranspiration, and outflows from the territory to downstream territories and to the sea. In 2014, abstractions accounted for at least 23% (3.0 million hm³) of the surface stock subtraction, and up to about 25% (3.1 million hm³) in 2015. The largest subtractions occur in flows that go directly to the sea, considering the drainage configuration of the country, in an exorheic pattern, accounting for about 70% of total subtractions in the country in the period between 2013 and 2015.

Concerning the balance between inflows and outflows calculated by SEEA-Water, in the period between 2013 and 2015 Brazil had positive balances in the use of water resources and in interactions between the economy and the environment. The country lowest total stock values were registered in 2015, due to a period of water scarcity in river basins located on the Southeastern region and in the Brazilian Semiarid area, among other regions[25]. In general, final balances of surface water dropped from 2013 to 2015.

25. Detailed information on recent hydrological crises in Brazil can be found in the 2017 Water Resources Report at **goo.gl/G7LSLJ**.



**TOTAL SUBTRACTIONS OF SURFACE ASSET STOCKS IN BRAZIL PER YEAR (in million hm³/YEAR)**

| | 2013 | | 2014 | | 2015 |
|---|---|---|---|---|---|
| Abstraction | 2,9 | ▲ | 3,0 | ▲ | 3,1 |
| Actual evaporation/ evapotranspiration of rivers and streams, lakes and artificial reservoirs | 0,16 | ■ | 0,16 | ■ | 0,16 |
| Outflows to other countries | 0,74 | ▼ | 0,72 | ▲ | 0,90 |
| Outflows to the sea | 8,1 | ▲ | 9,3 | ▼ | 8,4 |
| **TOTAL** | **12,0** | ▲ | **13,1** | ▼ | **12,6** |

Source: EEA-W-Brazil.

## PHYSICAL SUPPLY AND USE TABLES

**THE MAIN SOURCES OF SYSTEMATIZED DATA** related to the SEEA-Water Physical Supply and Use Table (SUT) were the water demand studies conducted by ANA (ANA, 2016; ANA/UNDP, 2017), the publication entitled 'Atlas Esgotos: Despoluição de Bacias Hidrográficas' (Sewage Atlas: River Basin Cleanup; ANA, 2017) and official flow databases (databases of water rights which are permits granted by Federal and State governments for water users), as well as information and indicators obtained from SNIS (MCid) and the National System of Information on Irrigation (SINIR), linked to the Ministry of National Integration (MI). Additionally, data on the operation of the reservoirs in the hydroelectric sector of the country was compiled, obtained from SAR (ANA), sustainability annual reports produced by Eletrobras Eletronuclear, and SNA data produced by CONAC (IBGE).

The Supply and Use Table (2013 – 2015) compilation, following the organization proposed by SEEA-Water, allows the assessment of the main economic sectors responsible for interactions of water resources in the environment with the economy, flows in the economy and return to the environment. It is possible to assess the flows established for water use in a country considering a snapshot of those sectors for a specific year and their evolution over time. As a way to assess the results obtained in the time series, the evolution over time was analyzed, emphasizing the key information presented in SEEA-Water Physical Supply and Use Tables (SUT).

26. It was not possible to estimate abstractions of water directly from the environment in the forestry production, fishing and aquaculture division, natural gas distribution and other CNAE activities.

In SEEA-Water, abstractions[26] are defined as the amount of water that is removed directly from the environment by sectors of the economy, encompassing abstraction to meet their own demand or to supply other sectors. Total abstraction values (summing up all economic activities and households) in the country are about 3.0 million hm3/year for the period considered. The largest flows were observed in 2015, and the lowest flows were observed in 2013.

The **electricity and gas** economic activity showed the largest water abstractions in the country in the 2013 – 2015 period, accounting for 97% of the flows captured by economic activities. The values are so high because include flows used for power generation in hydroelectric power plants, considered a non-consumptive use, and the flows used in thermoelectric power plants.

Concerning the other economic activities, it is worth mentioning significant volumes withdrawn for **agriculture, livestock, forestry production, fishing and aquaculture** and **water and sewage**, with abstractions in the time series period of about 31 million hm³/year and 48 million hm³/year, respectively. Irrigation and water supply correspond to the sectors that concentrate the highest water demands in the country (ANA, 2017).

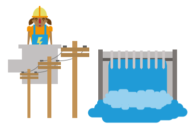
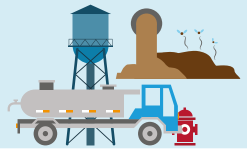
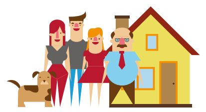
The use of water from other economic activities basically encompasses the interaction between certain volumes of water in the economy, including wastewater for sewerage, and use of treated water supplied by another economic activity.

The **water and sewage** economic activity accounts for the largest volumes of water from other economic activities, particularly when considering the volumes of sanitary sewage and urban run-off from **CNAE 37 Division – Sewage and Related Activities**. Moreover, there are significant volumes from **Households**, which refer to the volumes of treated water consumed in residential economies provided by other economic activities, i.e.; **CNAE 36 Division – Water Abstraction, Treatment and Distribution**.

Total use of water, as defined by SEEA-Water, is equivalent to the sum of total abstractions and use of water from other economic activities. For interactions within the economy, supply to other economic activities basically considers wastewater for sewer system, and supply of treated water to other economic activities. Interactions associated with the supply to other economic activities sum up flows of 17.78 million hm³/year (2015) to 18.41 million hm³/year (2014), having a significant share of **Water and Sewage** and **Households** economic activities to form the totals. Particularly for the **Water and Sewage** economic activity, there are flows intended for distribution to other economic activities by **CNAE 36 Division – Water Abstraction, Treatment and Distribution**, from CNAE 2.0, whereas the flows listed in the **Households** column and other sectors of the economy basically refer to the discharge of wastewater into the sewer system.



**TOTAL ABSTRACTIONS IN BRAZIL, ACCORDING TO THE EEA-W CLASSIFICATION (in K hm³/YEAR)**

| | | 2013 | | 2014 | | 2015 |
|---|---|---|---|---|---|---|
| Agriculture, forestry production, fishing and aquaculture |  | 30,52 | ▲ | 31,98 | ▲ | 32,5 |
| Mining and quarrying |  | 0,95 | ▲ | 0,99 | ▲ | 1,04 |
| Manufacturing and construction industries |  | 6,57 | ▼ | 6,45 | ▼ | 6,11 |
| Electricity and gas |  | 2.931,61 | ▲ | 2.943,77 | ▲ | 3.114,29 |
| Water and sewage |  | 48,68 | ▼ | 48,58 | ▼ | 47,09 |
| Other activities |  | 0 | ■ | 0 | ■ | 0 |
| **Total of Economic Activities** | | **3.018,33** | ▲ | **3.031,77** | ▲ | **3.201,03** |
| Households |  | 0,81 | ▼ | 0,72 | ▼ | 0,7 |
| **TOTAL** | | **3.019,14** | ▲ | **3.032,49** | ▲ | **3.201,73** |



Source: EEA-W-Brazil.

# FLOWS AND USES OF WATER IN BRAZIL

*2015 data in hm³

◀ WATER INFLOWS

▶ WATER OUTFLOWS

## WATER RESOURCES

**1** WATERS FROM OUTSIDE THE TERRITORY OF REFERENCE

▶ **900 K** (5)

**2** PRECIPITATION

▶ **1.33 million** (5)

**3** EVAPOTRANSPIRATION

▶ **10.2 million** (ATMOSPHERE)

**5** SURFACE WATER (RIVERS, LAKES, RESERVOIRS)

\+

GROUNDWATER (WATER TABLES, AQUIFERS)

\+

SOIL WATER

▶ **3.1 million** (A,B,C,D,E,F,G,H)

▶ **7.5 million** (4)

## USES IN THE ECONOMY

**A** AGRICULTURE, LIVESTOCK, FORESTRY PRODUCTION, FISHING AND AQUACULTURE

◀ **32.5 K** (5)

▶ **9.9 K** (5)

**B** MINING AND QUARRYING

◀ **1.0 K** (5)

▶ **0.75 K** (5)

**C** MANUFACTURING AND CONSTRUCTION INDUSTRIES

◀ **6.1 K** (5)

▶ **2.7 K** (5)

**D** ELECTRICITY AND GAS

◀ **3.1 million** (5)

◀ **3.1 K** (4)

▶ **3.1 million** (5)

**E** WATER COLLECTION, TREATMENT AND SUPPLY

◀ **17.1 K** (5)

▶ **4.0 K** (5)

▶ **10.8 K** (G)

▶ **2.0 K** (H)

**F** SEWERAGE

◀ **30.0 K** (5)

◀ **7.1 K** (G)

▶ **10 K** (4)

**G** HOUSEHOLDS

◀ **0.7 K** (5)

◀ **7.4 K** (E)

▶ **1.6 K** (5)

▶ **5.4 K** (F)

▶ **0.9 K** (4)

**H** OTHER ACTIVITIES

◀ **0.0** (5)

◀ **0.0** (E)

▶ **1.3 K** (5)

## WATER RESOURCES

**1** WATER FROM OUTSIDE THE TERRITORY OF REFERENCE

◀ **3.0 million** (5)

**4** SEA

◀ **6.2 million** (5)

◀ **10 K** (F)

◀ **3.1 K** (D)

**5** SURFACE WATER (RIVERS, LAKES, RESERVOIRS)

\+

GROUNDWATER (WATER TABLES, AQUIFERS)

\+

SOIL WATER

◀ **15.425 million** (2)

◀ **2.4 million** (1)

◀ **3.1 million** (A,B,C,D,E,F,G,H)

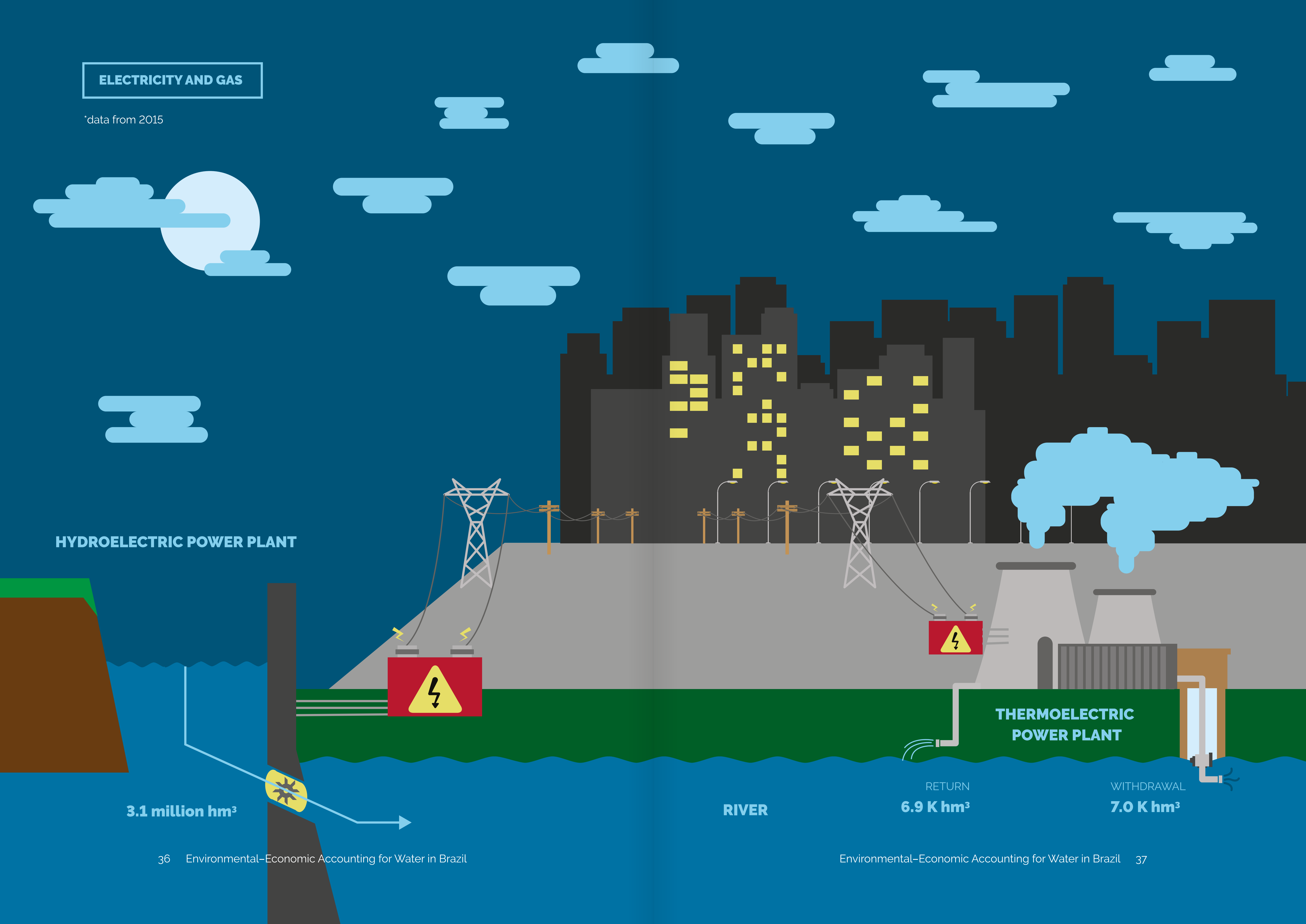
## EXAMPLE OF HOW TO READ IT

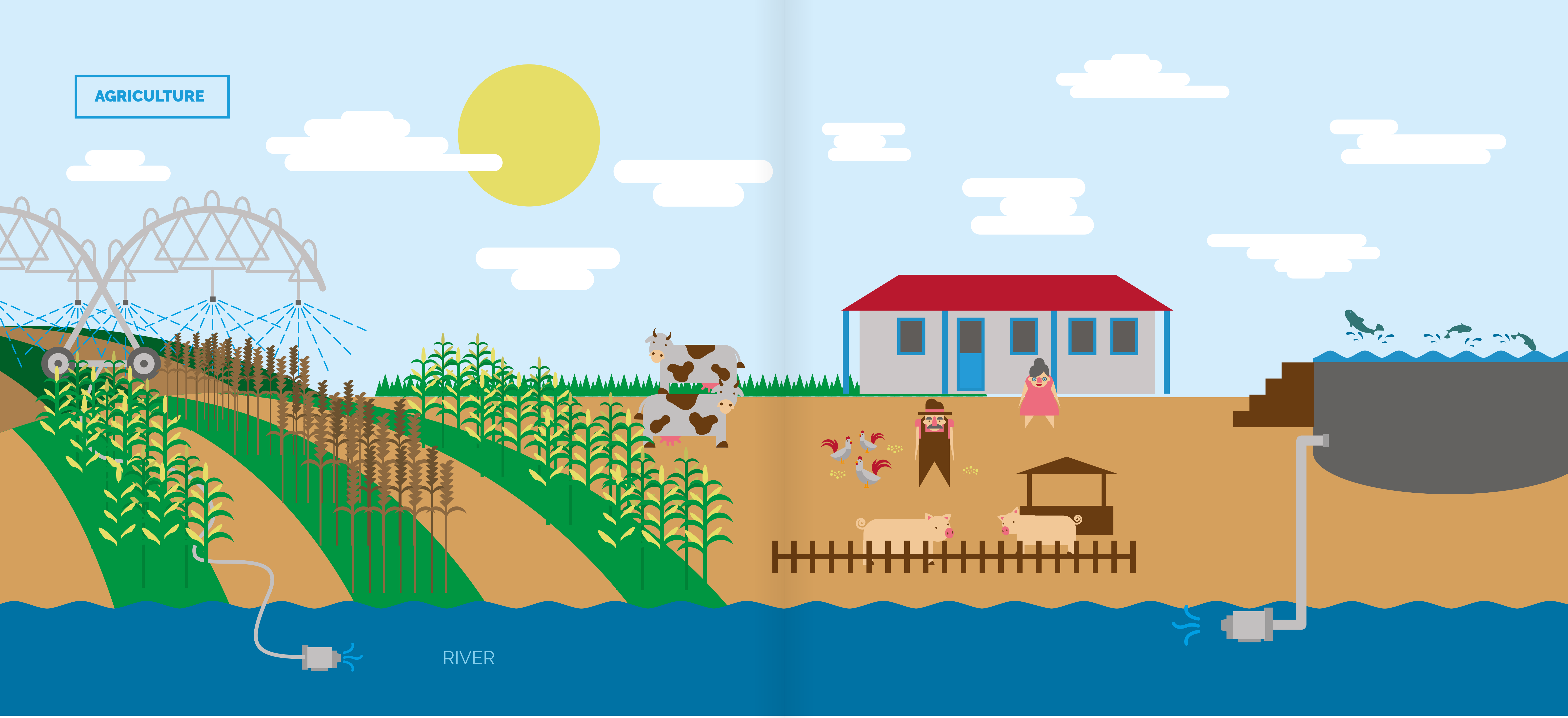
Water inflows (◀) represent the volume of water that entered for each component in the water resource system or in the economy in 2015. For instance, 3 million hm3 of water entered the internal water resources system (5) in Brazil coming from other countries (1).
The Manufacturing and Construction Industries activity (C) withdrew 6 k hm3 from the internal water resources system (5).

Water outflows (▶) represent the volume of water that left from each component of the water resources system or the economy in 2015. For instance, 10.8 k hm³ were used by Households (G) coming from the Water Collection, Treatment and Supply economic activity (E). The Sea (4) received 13.3 k hm³ from the economic activity Sewerage and Related Activities (F).

# ELECTRICITY AND GAS

*data from 2015






## AGRICULTURE

**ABSTRACTION (hm³/ano)**
From Surface Water: **26.8 K**
Groundwater: **0.5 K**
**WITHDRAWAL: 27.3 K**

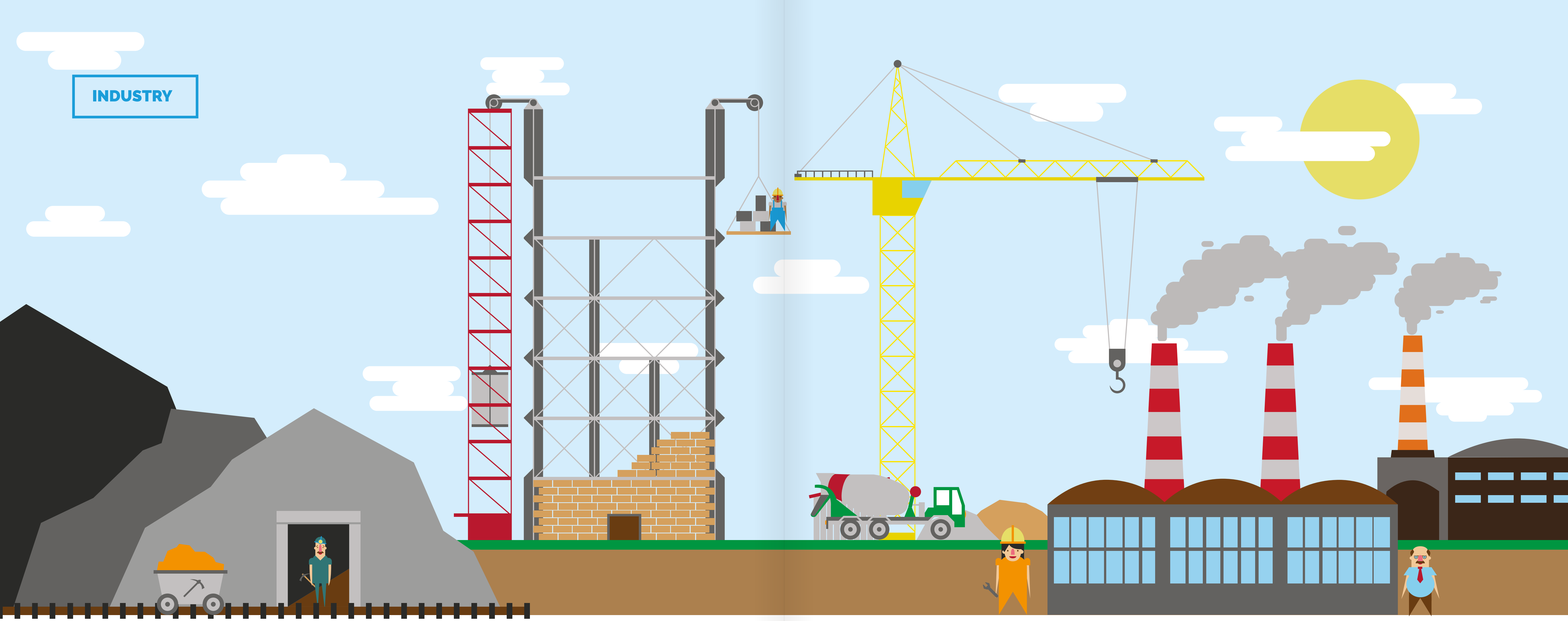
**RETURN (hm³/year)**
To internal water resources: **8.6 K**
**TOTAL RETURN: 8.6 K**

## LIVESTOCK

**ABSTRACTION (hm³/year)**
From Surface Water: **3.5 K**
Groundwater: **1.7 K**
**TOTAL WITHDRAWAL: 5.2 K**

**RETURN (hm³/year)**
To internal water resources: **1.3 K**
**TOTAL RETURN: 1.3 K**

# INDUSTRY



## MINING AND QUARRYING

**ABSTRACTION (hm³/year)**

From Surface Water: **1.0 K**

From Groundwater: **<0.1 K**

**TOTAL WITHDRAWAL: 1.0 K**

**RETURN (hm³/year)**

To internal water resources: **750.0**

**TOTAL RETURN: 760.0**

## MANUFACTURING AND CONSTRUCTION INDUSTRIES

**ABSTRACTION (hm³/ano)**

From Surface Water: **4.3 K**

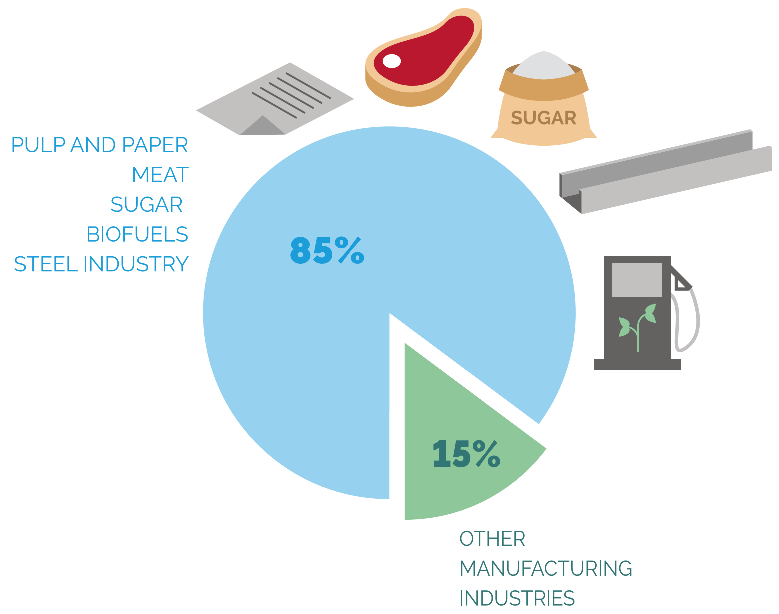
Groundwater: **1.7 K**

**WITHDRAWAL: 6.0 K**

**RETURN (hm³/year)**

To internal water resources: **2.7 K**

**TOTAL RETURN: 2.85 K**



**USE OF WATER FROM OTHER ECONOMIC ACTIVITIES IN BRAZIL, ACCORDING TO THE EEA-W CLASSIFICATION (in K hm³/YEAR)**

| | 2013 | | 2014 | | 2015 |
|---|---|---|---|---|---|
| Agriculture, forestry production, fishing and aquaculture | 1,06 | ▲ | 1,12 | ▲ | 1,14 |
| Mining and quarrying | 0,01 | ■ | 0,01 | ■ | 0,01 |
| Manufacturing and construction industries | 0,3 | ■ | 0,3 | ▼ | 0,28 |
| Electricity and gas | 0,01 | ■ | 0,01 | ■ | 0,01 |
| Water and sewage | 7,26 | ▲ | 7,41 | ▼ | 7,16 |
| Other activities | 2,12 | ▼ | 2,09 | ▼ | 2,05 |
| **Total of Economic Activities** | **10,74** | ▲ | **10,93** | ▼ | **10,63** |
| Households | 7,72 | ▲ | 7,74 | ▼ | 7,39 |
| **TOTAL** | **18,46** | ▲ | **18,67** | ▼ | **18,02** |

Source: EEA-W-Brazil.



**SUPPLY TO OTHER ECONOMIC ACTIVITIES IN BRAZIL, ACCORDING TO THE EEA-W CLASSIFICATION (in K hm³/YEAR)**

| | 2013 | | 2014 | | 2015 |
|---|---|---|---|---|---|
| Agriculture, forestry production, fishing and aquaculture | 0 | ■ | 0 | ■ | 0 |
| Mining and quarrying | 0 | ■ | 0 | ■ | 0 |
| Manufacturing and construction industries | 0,18 | ■ | 0,18 | ■ | 0,18 |
| Electricity and gas | 0 | ■ | 0 | ■ | 0 |
| Water and sewage | 11,2 | ▲ | 11,25 | ▼ | 10,86 |
| Other activities | 1,31 | ■ | 1,31 | ▼ | 1,3 |
| **Total of Economic Activities** | **12,7** | ▲ | **12,75** | ▼ | **12,34** |
| Households | 5,52 | ▲ | 5,66 | ▼ | 5,44 |
| **TOTAL** | **18,22** | ▲ | **18,41** | ▼ | **17,78** |

Source: EEA-W-Brazil.

Concerning resources for the environment, total return encompasses inflows of the economic sectors to inland water resources. Usually, the greatest returns are concentrated in the **Electricity and Gas** economic activity, since the flows used for power generation are completely returned to the environment by the hydroelectric power plants, whereas thermoelectric power plants have a significant low consumption (about 1.5% of the abstractions). For the **Water and Sewage** economic activity, total return to the environment includes flows of collected sewage and rainwater that is drained into underground galleries. Other significant return volumes can be observed in the **Agriculture, forestry production, fishing and aquaculture** economic activity, including return flows from irrigation and animal supply.

**TOTAL RETURN IN BRAZIL, ACCORDING TO EEA-W CLASSIFICATION (in K hm³/YEAR)**

| | 2013 | | 2014 | | 2015 |
|---|---|---|---|---|---|
| Agriculture, forestry production, fishing and aquaculture | 9,86 | ▼ | 9,2 | ▲ | 9,94 |
| Mining and quarrying | 0,69 | ▲ | 0,73 | ▲ | 0,76 |
| Manufacturing and construction industries | 2,89 | ▲ | 2,92 | ▼ | 2,77 |
| Electricity and gas | 2.931,53 | ▲ | 2.943,67 | ▲ | 3.114,20 |
| Water and sewage | 42,34 | ▲ | 42,4 | ▼ | 41,11 |
| Other activities | 0 | ■ | 0 | ■ | 0 |
| **Total of Economic Activities** | **2.987,31** | ▲ | **2.998,92** | ▲ | **3.168,77** |
| Households | 2,62 | ▲ | 2,69 | ▼ | 2,6 |
| **TOTAL** | **2.989,93** | ▲ | **3.001,60** | ▲ | **3.171,37** |

Source: EEA-W-Brazil.



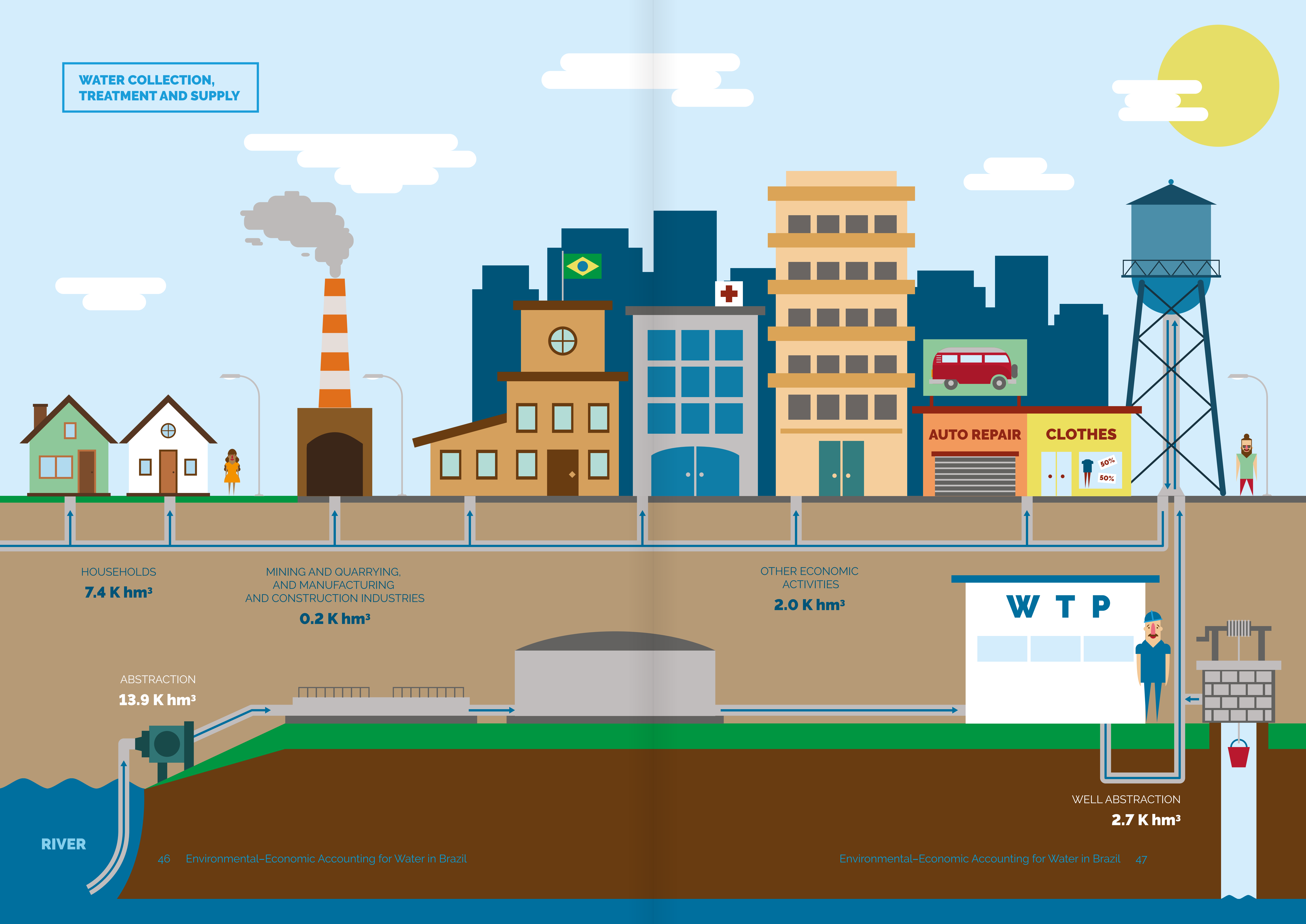
The total supply, as defined by SEEA-Water, is equivalent to the sum of the supply to other economic activities and total returns.

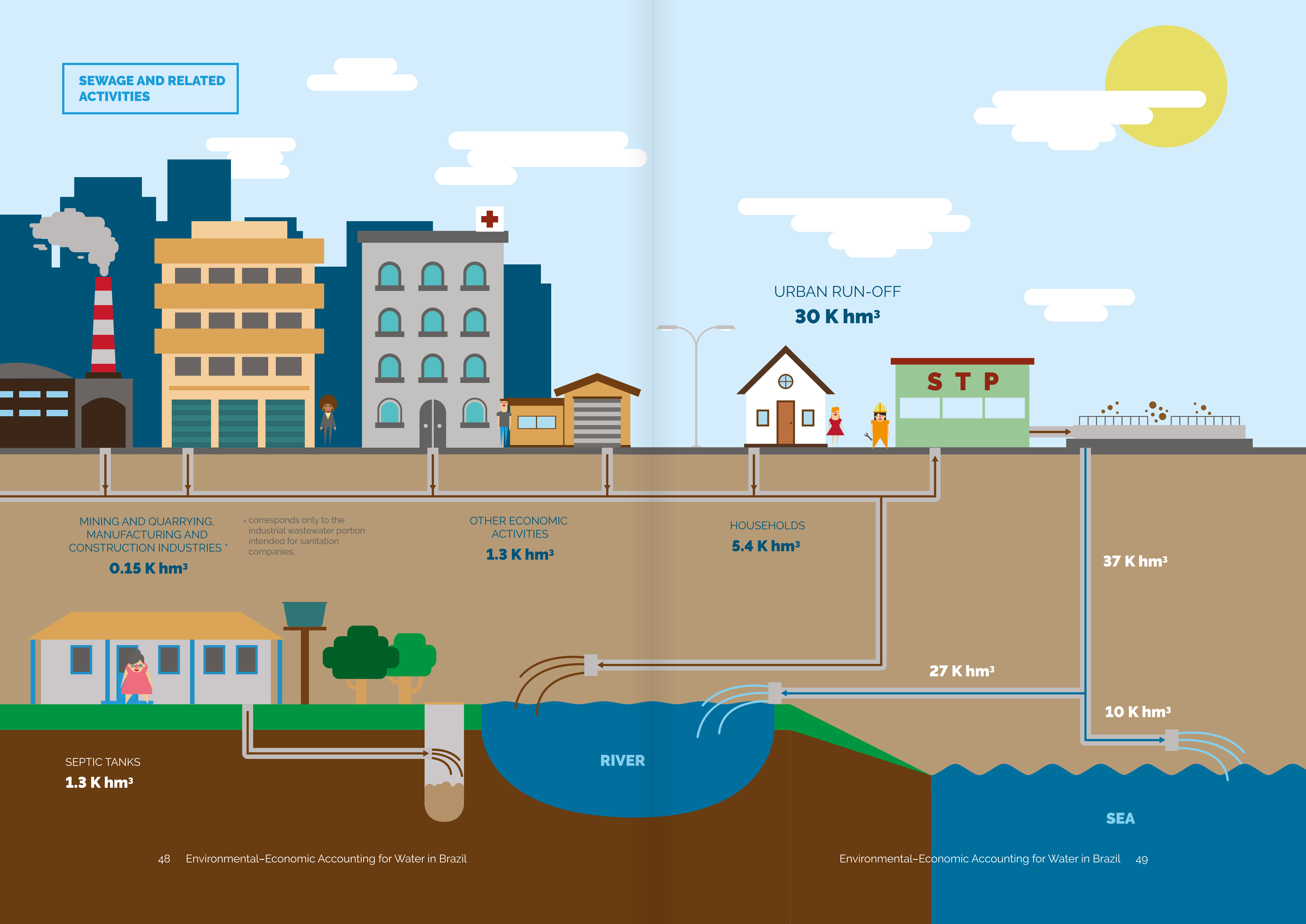
The highest consumption of water resources in the country is associated with irrigation and animal supply, into the **Agriculture, livestock, forestry production, fishing and aquaculture** economic activities, accounting for about 75% of the flows consumed. The **Water and Sewage** and **Transformation Industries and Construction** economic activities also have relevant consumption among of water uses in the country as organized by SEEA-Water, accounting for about 12%.

**TOTAL CONSUMPTION IN BRAZIL, ACCORDING TO EEA-W CLASSIFICATION (in K hm³/YEAR)**

| | 2013 | | 2014 | | 2015 |
|---|---|---|---|---|---|
| Agriculture, forestry production, fishing and aquaculture | 21,72 | ▲ | 23,9 | ▼ | 23,7 |
| Mining and quarrying | 0,26 | ▲ | 0,27 | ▲ | 0,28 |
| Manufacturing and construction industries | 3,8 | ▼ | 3,64 | ▼ | 3,45 |
| Electricity and gas | 0,09 | ▲ | 0,1 | ■ | 0,1 |
| Water and sewage | 2,4 | ▼ | 2,34 | ▼ | 2,27 |
| Other activities | 0,81 | ▼ | 0,78 | ▼ | 0,75 |
| **Total of Economic Activities** | **29,07** | ▲ | **31,03** | ▼ | **30,56** |
| Households | 0,38 | ▼ | 0,11 | ▼ | 0,05 |
| **TOTAL** | **29,45** | ▲ | **31,14** | ▼ | **30,6** |

Source:EEA-W-Brazil.


WATER COLLECTION, TREATMENT AND SUPPLY
AUTO REPAIR
CLOTHES
50%
50%
HOUSEHOLDS
7.4 K hm³
MINING AND QUARRYING, AND MANUFACTURING AND CONSTRUCTION INDUSTRIES
0.2 K hm³
OTHER ECONOMIC ACTIVITIES
2.0 K hm³
W T P
ABSTRACTION
13.9 K hm³
WELL ABSTRACTION
2.7 K hm³
RIVER

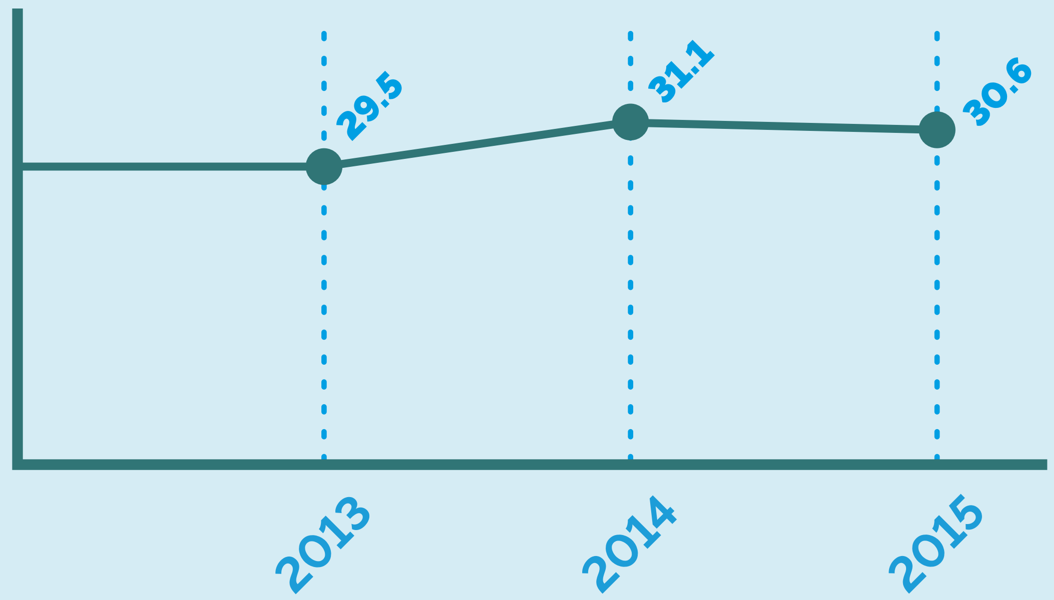

SEWAGE AND RELATED ACTIVITIES
URBAN RUN-OFF
30 K hm³
S T P
MINING AND QUARRYING, MANUFACTURING AND CONSTRUCTION INDUSTRIES *
0.15 K hm³
* corresponds only to the industrial wastewater portion intended for sanitation companies.
OTHER ECONOMIC ACTIVITIES
1.3 K hm³
HOUSEHOLDS
5.4 K hm³
37 K hm³
27 K hm³
10 K hm³
SEPTIC TANKS
1.3 K hm³
RIVER
SEA

## WATER ACCOUNTING OVER TIME

Structuring hydrological information on water demands in the country through the time series in the Supply and Use Tables allows for assessing the key economic sectors responsible for interactions of the water resources in the environment with the economy (flows withdrawn), flows within the economy, and return to the environment (return flows). Also, you can calculate the volume of water actually consumed by economic activities, in other words, the volume of water that does not return to the environment because it has been incorporated to products or consumed by humans and animals.

Generally, in the period analyzed (2013 – 2015), the total consumption observed is higher than 30 K hm³/year for 2013 - 2015, and the largest water consumption by the economic activities in the country were recorded in 2014 (31.1 K hm³/year). At large, agriculture is responsible for about 75% of the flows consumed in the country, particularly due to the water demands for irrigation activities in the country. For agriculture activities in the country, there is an increase in the volumes withdrawn from 2013 on, reaching their peak of 32.5 K hm³/year (2015), with total consumption of 23.7 K hm³/ year this year.

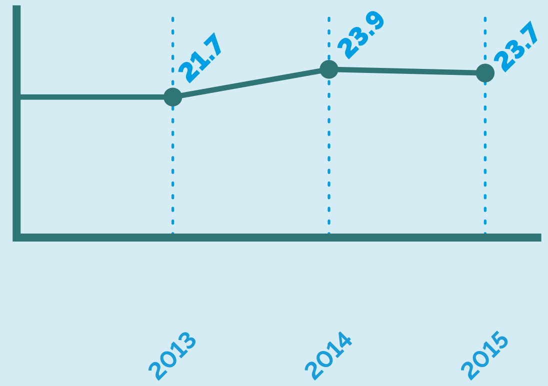
Moreover, manufacturing industries are also significant consumers of water in Brazil, with about 12% of total flows consumed by those economic sectors in the period. Although the sector has shown a decrease in withdrawals and consumption of water in the period, Brazilian industries present withdrawal flows of about 6.3 K hm³/year, and the maximum consumption was 3.7 K hm³/ year, registered in 2013.



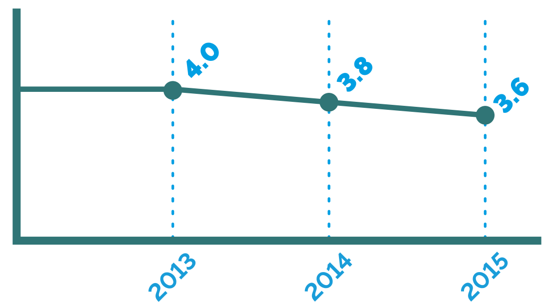

**TOTAL CONSUMPTION** (in K hm³)



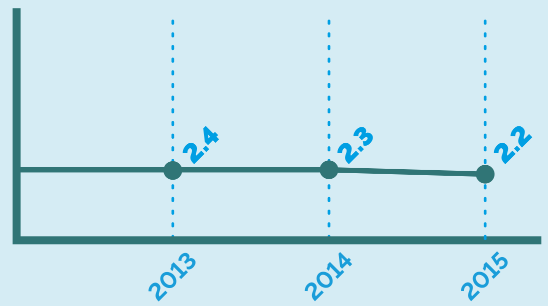
**AGRICULTURE, LIVESTOCK, FORESTRY PRODUCTION, FISHING AND AQUACULTURE**
(in K hm³)



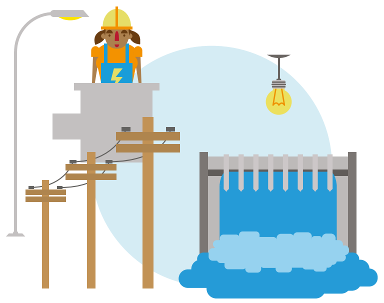

**MINING AND QUARRYING, MANUFACTURING AND CONSTRUCTION INDUSTRIES**
(in K hm³)

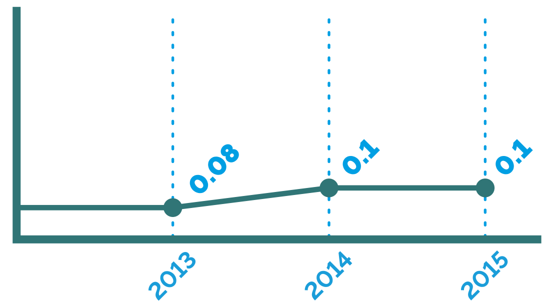



**WATER SUPPLY AND SEWAGE**
(in K hm³)




**ELECTRICITY AND GAS**
(in K hm³)





## HYBRID SUPPLY AND USE TABLES

**HYBRID SUPPLY AND USE TABLES (SUT)** for Brazil were developed based on **(I)** information from Physical SUT built according to SEEA-Water, and **(II)** information on production, intermediate consumption and final consumption included in SNA SUT, emphasizing data corresponding to **CNAE 36 – Water Abstraction, Treatment and Distribution** and **37 – Sewage and Related Activities divisions**.

Due to information complexity and scarcity, it was necessary to harmonize the data, information and studies from different sources to disaggregate data at the required level for SEEA-Water tables. SNA SUT results from 2013 to 2015 were adjusted according to EEA-W requirements. Consequently, there are slight differences between the values informed in this publication and the ones published by SNA, such as a change in the classification of water and sewage service activity, which was moved from **Public Administration** to **Water and Sewage**. Another example is an increase in intermediate consumption expenses associated with water and sewage in the **Agriculture, Llivestock, forestry production, fishing and aquaculture** activity, to include the values charged for water in public irrigation perimeters.

For better understanding the information presented, it is worth noting that the volume of water used by the economy can come from two typologies, namely, **I)** the volume collected *in natura*, classified as abstraction for own use or abstraction for distribution, and **II)** the volume used that comes from other economic activities, classified as use of water received from other economic units.

Moreover, the production values for Distribution Water[27] and Sewage Services[28] are centered in CNAE 36 and 37 divisions. Those values include the volumes of water (physical part) supplied to other economic activities, and, in addition to water supply for households and business purposes, they also include water supply for irrigation.

The values that appear under intermediate consumption and final consumption of water for distribution refer exclusively to the use of water from the **Water and Sewage** activity. The values of sewage service consumption refer to sewage collected through the **Domestic** system and economic activities listed under the Water and Sewage activity. It is worth saying that intermediate and final uses do not include the values paid by water abstracted directly from the environment, as water charges, as an instrument of the Brazilian Water Resources Policy management. In the SNA, they are classified as payment for the use of a natural resource. That is the reason why the information about those transactions[29] is not incorporated into the SUTs and, therefore, it does not appear as expenses of intermediary consumption in hybrid SUTs.

Among the results observed in the Hybrid Supply and Use Tables, it is worth emphasizing that the **Water and Sewage** economic activity accounted in average for 0.5% of the total Gross Value Added (GVA) in the Brazilian economy between

**27.** Associated with the production of CNAE 36 division, water abstraction, treatment and supply, corresponding to the exchange of water among economic units, and including water supplied for irrigation purposes.

**28.** Associated with the production of CNAE 37 division. It includes sewage systems, wastewater treatment, and septic tank emptying and cleaning services.

**29.** In the SNA, they are positioned in the Integrated Economic Accounts, along with other accounts, such as payments from royalties and income from land use, among others.



2013 and 2015. The production value of Water for Distribution and Sewage Services was BRL 42.5 billion in 2015, noting that Water for Distribution accounted for 67.2% of that production. On the demand side, meaning the expenses with water supply services, abstraction and sewage treatment (Water for Distribution and Sewage Services) paid by economic activities and **Households**, it is worth noting that Households were major users of Water for Distribution and Sewage Services, with 58.3% on average during the period, whereas activities accounted for 41.7% of the total produced.

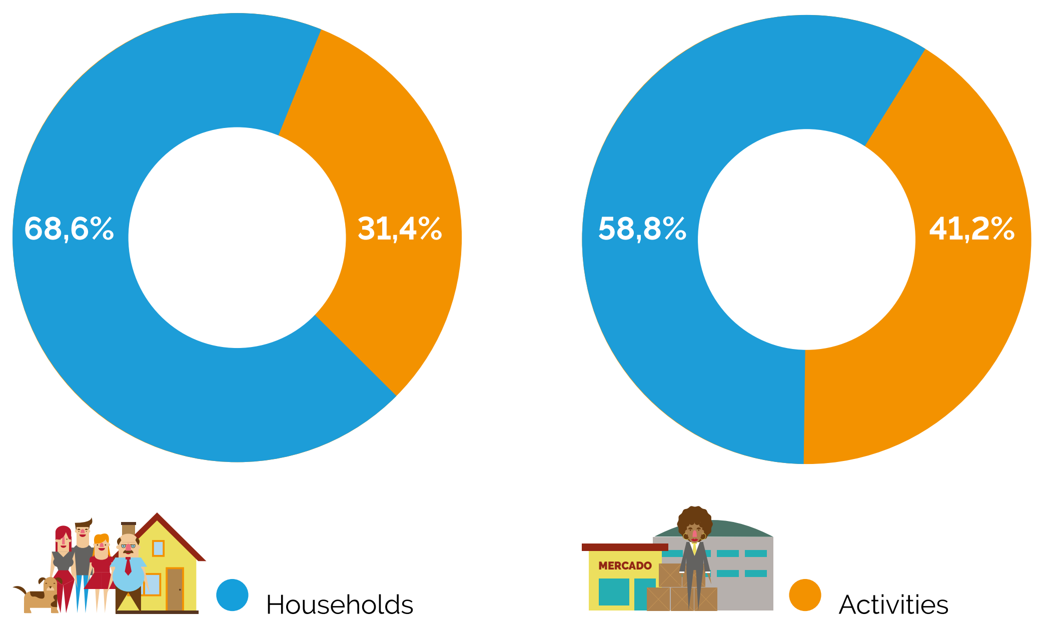
Expenditure can be compared with Water for Distribution with the distribution of water volume use received from other economic activities. Households have a larger share, both in volume and value, although the share in volume is larger (68.6% compared to 58.8%). Among the activities, the share accounts for 31.4% in volume and 41.2% in value.

It is also possible to compare intermediate consumption expenses incurred with Water for Distribution to volumes of water received from other economic activities to obtain the average cost per volume of water used (provided by the **Water and Sewage** activity). The results in 2015 show that the average cost for **Agriculture, livestock, forestry production, fishing and aquaculture** was BRL 0.11/m³; and, for other activities[30], BRL 5.29/m³. Similarly, for households the value was BRL 2.35/m3, associating final consumption expenditure of Water for Distribution with the volume of water received from other economic activities.

**30.** It includes extractive industries, manufacturing and construction industries, electricity and gas, and other activities.

**VOLUME DISTRIBUTION OF USE OF WATER RECEIVED FROM OTHER ECONOMIC ACTIVITIES**

**SHARE OF EXPENSES WITH WATER FOR DISTRIBUTION**



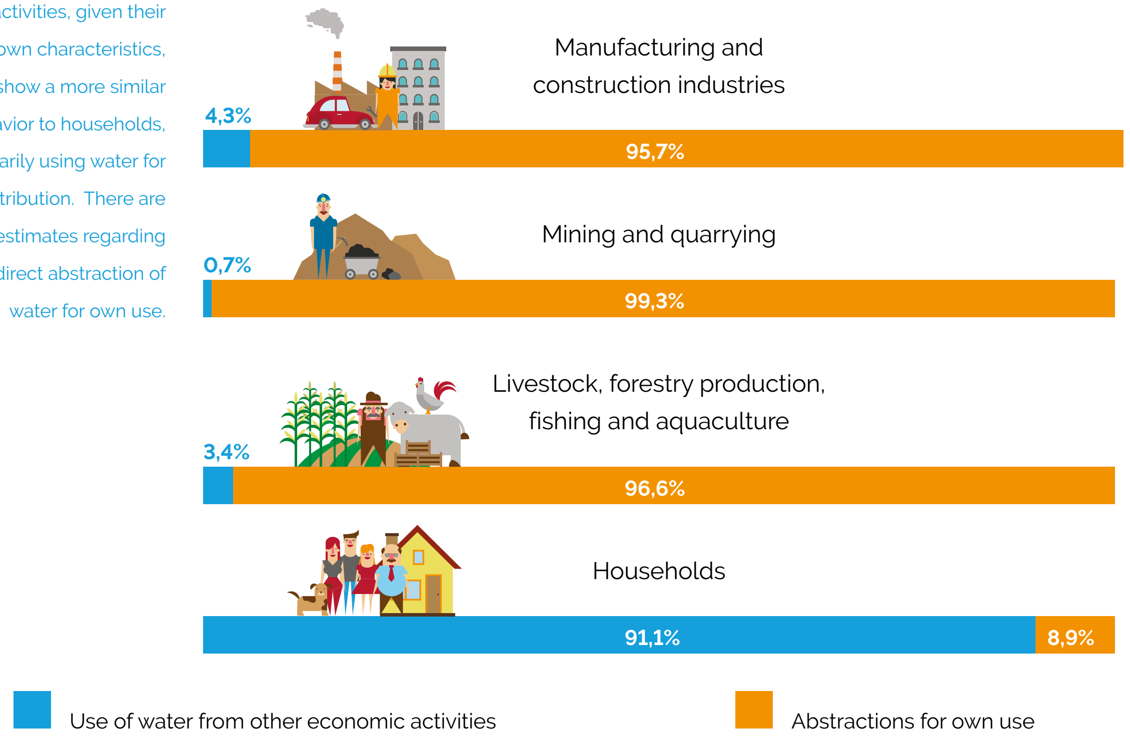
By analyzing water use in physical terms (which considers both use typologies), it is possible to see that the **Electricity and gas activity** accounted for 96.6% of water use on average between 2013 and 2015. This happens because the national electrical matrix is predominantly based on hydroelectric power plants, which means it is highly dependent on water resources. However, water used to generate power is considered non-consumptive use.

**Water and Sewage** activities accounted for 1.8% of total use of water. That result should also be carefully analyzed, because it combines flows of different natures, such as water abstracted for supply purposes, rainwater from urban run-offs, only drained through the sewer system, and wastewater discharged to sewer systems coming from **Households** and economic activities. In addition to that, even though you consider only the water abstracted for supply purposes, you should keep in mind that the distributed water is accounted for as use in other sectors.

Thus, disregarding the **Electricity and Gas** and **Water and Sewage** activities, on average, in the 2013 to 2015 period, the greatest total use of water in the economy occurred in **Agriculture, livestock, forestry production, fishing and aquaculture**, which accounted for 64.4%, followed by **Households**, with 16.4%, and **Manufacturing and Construction Industries**, with 13.1%.

By analyzing water use per source typology, it is possible to observe that there are large shares of water volume abstractions from other economic activities to the Households. As for economic activities, the opposite is observed.

**DISTRIBUTION OF WATER USE IN VOLUME BY SOURCE TYPOLOGY (2013-2015 AVERAGE)[31]**




**31.** The other activities, given their own characteristics, show a more similar behavior to households, primarily using water for distribution. There are no estimates regarding direct abstraction of water for own use.

Moreover, it is worth highlighting the results obtained from Hybrid SUT related to expenses with Water for Distribution compared to the total volume of water used (summing up abstractions for own use and water from other activities). In 2015, the **Agriculture, forestry production, fishing and aquaculture** activity had an average cost of BRL 0.004/m3. The **Mining and quarrying** activity had an average cost of BRL 0.040/m3, and the **Manufacturing and Construction Industries**, BRL 0.238/m3.

It is not included in the calculations above the value charged for using water that was abstracted for own use. The amount charged[32] for the use of water resources in river basins and Brazilian States with water charges implemented in Brazil[33] in 2015 (BRL$ 283.8 million) corresponds to an average cost per cubic meter of water withdrawn of BRL$ 0.004/m³, if the whole country is considered. This value corresponds to 2.27% of intermediate consumption expenditure with Water for Distribution.

Analyzing the **Water and Sewage** activity through time, it is possible to notice a decrease in water volume abstracted[34] for distribution in 2014 (-0.39%) and a steeper drop in 2015 (-3.46%). In 2014, its main users, **Households** and **Other Activities**, showed variations in the volume of water used, of 0.26% and -1.38%, respectively. In 2015, the variation in the volume of water used was -4.52% for **Households** and -2.09% for **Other Activities**. On the expenses side, a different pattern is observed. Final consumption of Water for Distribution for **Households** increased 5.86% in 2014, and 2.79% in 2015, and the intermediate consumption of the **Other Activities** group increased to 6.52% in 2014, and 3.66% in 2015.

**32.** For the analysis, the hydroelectric sector was removed, since its abstraction is predominantly non-consumptive, and the Financial Compensation for Using Water Resources (CFURH) was not taken into account. The values are based on the record of values charged and collected available at: **goo.gl/M84Eux**

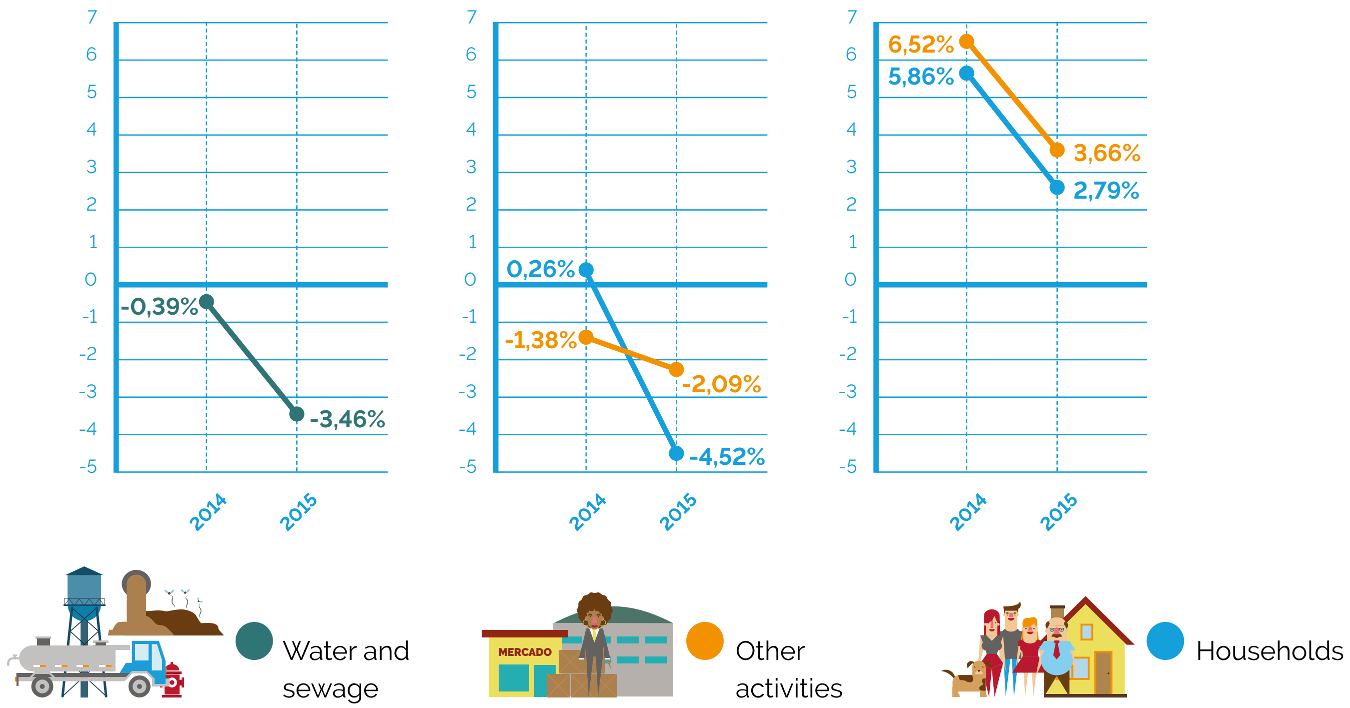
**33.** An overview of charges for the use of water resources in Brazil is presented in ANA's Water Resource Reports at **goo.gl/evXGrL**

**34.** The volumes considered for total abstractions were only the ones in CNAE 36, which refer to supply services. You can find further information in the Physical Supply and Use Tables.

**VARIATION OF ABSTRACTIONS FOR DISTRIBUTION**

**VARIATION OF VOLUME OF WATER SUPPLIED BY WATER AND SEWAGE ACTIVITY**

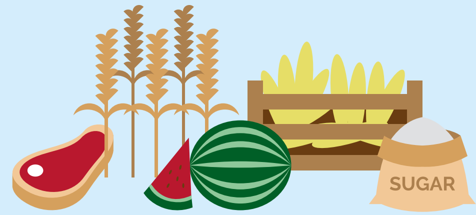
**VARIATION IN EXPENSES OF DISTRIBUTION**



## MONETARY ACCOUNTS

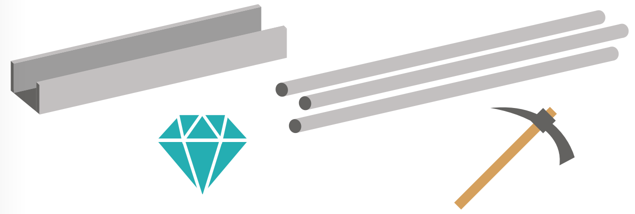
ECONOMIC ACTIVITY | WATER CONSUMPTION (%) | WATER CONSUMPTION (hm³/year) | VALUE ADDED (BRL million)

### AGRICULTURE, LIVESTOCK, FORESTRY PRODUCTION, FISHING AND AQUACULTURE




77.6%
23,704
258,842

### MINING AND QUARRYING

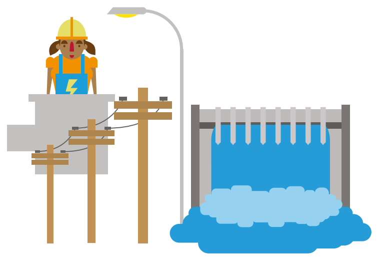


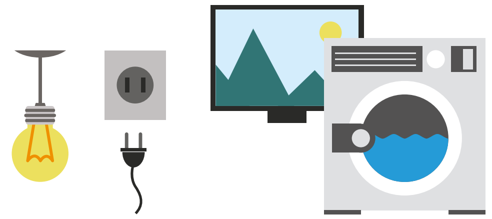
0.9%
282
110,775

### MANUFACTURING AND CONSTRUCTION INDUSTRIES

11.3%
3.450
926,831

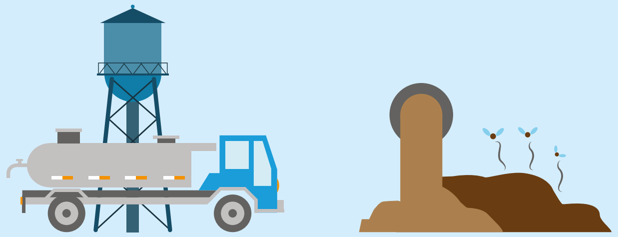
### ELECTRICITY AND GAS

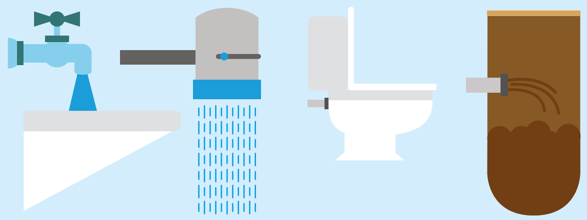




0.3%
101
85,468

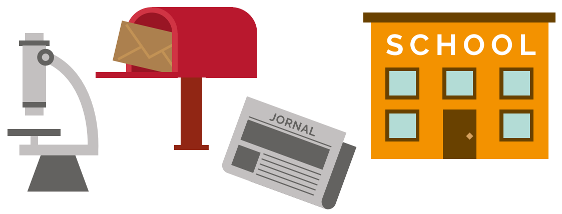
### WATER SUPPLY AND SEWAGE





7.4%
2.270
26,424

### OTHER ACTIVITIES


2.4%
748
3,747,261

## INDICATORS

**THE SYSTEM OF ENVIRONMENTAL-ECONOMIC ACCOUNTING (SEEA)** provides the foundation for developing relevant indicators to implement and assess public policies. The combination of indicators with foundation and coherent with the System of National Accounts (SNA) and SEEA offers a wide range of variable combinations related to the economy and the environment. Additionally, many water specific indicators can derive from EEA-W.

Indicators about the availability of water resources in the environment can be used to assess and monitor water resources in a territory and compare them to other territories, allowing the assessment of their natural characteristics. It is important to consider those indicators under the perspective of pressure caused by human activities, to link water demand information with water availability in the environment.

**TIME SERIES OF THE INDICATORS TO ASSESS AVAILABILITY AND PRESSURE ON WATER RESOURCES DERIVED FROM EEA-W**

| Indicator | Units | 2013 | | 2014 | | 2015 |
|---|---|---|---|---|---|---|
| Internal Renewable Water Resources (IRWR) | $hm^3$/year | 4.829.036 | ▼ | 4.615.364 | ▼ | 3.129.050 |
| External Renewable Water Resources (ERWR) | $hm^3$/year | 2.588.276 | ▲ | 2.953.856 | ▲ | 3.074.419 |
| Total Renewable Water Resources (TRWR) | $hm^3$/year | 7.417.312 | ▲ | 7.569.220 | ▼ | 6.203.469 |
| Dependency Ratio (DR) | % | 35% | ▲ | 39% | ▲ | 50% |
| Per Capita Total Renewable Water Resources | $m^3$/inhab./year | 36.896 | ▲ | 37.329 | ▼ | 30.342 |
| Volume withdrawn as a percentage of TRWR – Exploitation Index (EI) | % | 0,9% | ■ | 0,9% | ▲ | 1,1% |
| Consumption Index (CI) | % | 0,4% | ■ | 0,4% | ▲ | 0,5% |

**IRWR** indicates the amount of water that is internally available in the territory received through precipitation, whereas ERWR provides information on the amount of water that is generated outside the territory of reference. A decrease in the precipitation volumes in the country (IRWR) was observed in the period between 2013 – 2015.

**TRWR** represents the integral amount of water that is available in the territory in a given year, and is equivalent to the theoretical availability of water resources if there were no water consumption for economic activities. The **DR** indicator can be jointly analyzed with the results obtained from IRWR and ERWR, since, by definition, it expresses the dependency of a country on water resources generated outside its territory, varying between 0 and 100%. The closer it gets to 100%, the larger the amount of water received from neighboring countries compared with the total natural renewable resources inland in the territory. The DR value obtained varied between 35% (2013) and 50% (2015). In general, there is an increased external dependency on water resources in Brazil from 2013 on, due to a lower volume of rainfall in the country.

SEEA-Water highlights the importance of relating information on water resources in a certain territory to economic, demographic and social information, such as the population[35] and total land area. The total population in Brazil increased about 1% per year from 2013 on. Consequently, the values obtained for the *per capita* TRWR indicator behave similarly to the TRWR itself, decreasing about 15% per year from 2013 on, notably from 2014 to 2015 (from 37,329 $m^3$/inhab./year to 30.342 $m^3$/inhab./year).

There was an increase in the percentage of the volume of water abstractions from the environment in the country in the period analyzed, from 0.9% (2013) to 1.1% (2015). Generally speaking, this happens because of the increment in volumes abstracted to the **Agriculture, livestock, forestry production, fishing and aquaculture** economic activity, responsible for most of the abstractions in the country.

Although those indicators are of use for a diagnosis of water availability and pressures made on water resources, to address problems related to water and prioritize certain actions, it is necessary to have more detailed and regional information (distribution over time and space) on how the water is used in the economy of a country.

Indicators related to the assessment of intensity and productivity associated with water use in the economy and calculated for Brazil aim at identifying water use efficiency by sectors of the economy over time, according to EEA-W classification.

The volume of water abstracted considers the total volume abstracted in the country (except for the **Electricity & Gas** economic activity) and the population per year. On average, the flow per capita abstracted was 320 $m^3$/inhab./year. Particularly for flows abstracted for public utilities (**Division 36 – Water Abstraction, Treatment and Distribution**), the average flow per capita is 214 l/inhab./day, whereas the volumes actually received by houses connected to the supply networks (**Households**) vary between 105 l/inhab./day and 99 l/inhab./day. The share of the abstracted volume lost in distribution was 37% per year, showing the amount of flows effectively distributed by utilities which, due to apparent and physical losses in the process of distribution, did not reach the houses.

**35.** By comparing the TRWR indicator with the population, one may obtain information about the natural capacity of the territory to generate water resources according to the size of the population. In other words, it is possible to estimate if the natural availability of water resources is enough to meet the use demands of the population in a specific year.

**TIME SERIES OF THE INDICATORS SELECTED TO ASSESS WATER INTENSITY AND PRODUCTIVITY DERIVED FROM EEA-W**

| Indicators | Units | 2013 | | 2014 | | 2015 |
|---|---|---|---|---|---|---|
| Per capita total volume of water abstracted (Vt) | m³/inhab./year | 317 | ▲ | 325 | ▼ | 319 |
| Per capita volume abstracted for supply (Vas) | L/inhab./day | 220 | ▼ | 216 | ▼ | 206 |
| Per capita volume of water received by Households (Vh) | L/inhab./day | 105 | ■ | 105 | ▼ | 99 |
| Efficiency of Water Use in Agriculture (EwAg) | BRL/m³ | 11,06 | ▼ | 10,46 | ▲ | 10,92 |
| Efficiency of Water Use in Extractive Industries (EwEI) | BRL/m³ | 733,63 | ▼ | 684,42 | ▼ | 393,16 |
| Efficiency of Water Use in Manufacturing and Construction Industries (EwTI) | BRL/m³ | 223,14 | ▲ | 248,05 | ▲ | 268,66 |
| Efficiency of Water Use in Electricity & Gas and Other Utilities (EwEG) | BRL/m³ | 674,22 | ▼ | 550,51 | ▲ | 845,99 |
| Efficiency of Water Use in Water & Sewage Activity – (EwWS) | BRL/m³ | 10,98 | ▲ | 11,78 | ▲ | 11,64 |
| Efficiency of Water Use in Other Activities – (EwOt) | BRL/m³ | 3.932,66 | ▲ | 4.561,96 | ▲ | 5.012,18 |

The productivity of some economic sectors can be analyzed based on gross values aggregated by sector, taken from IBGE National Accounts, and on water consumption data by productive activity in the country in a given year. The concept of consumption adopted by EEA-W[36] takes into account the total water use value subtracted from the total supplied, by each economic activity.

The **EwAG**, **EwEI**, **EwTI**, **EwEG**, **EwWS** and **EwOt** indicators refer to the assessment of the water productivity in the economic sectors, relating monetary values from the sector gross value added (a result of productive activities) and the consumption of water resources in that sector for a given year. In theory, it is possible to assess the productivity of the economy in regards to water use by sector, allowing for comparisons over time and among sectors. Considering productivity and water consumption in agriculture, and in extractive and manufacturing industries, it is estimated that, comparatively, extractive industries feature the most profitable activities, when it comes to integrating wealth generation and water consumption. Average rates obtained for extractive industries (BRL/m³ 603.74) are numerically superior to the ones obtained for agriculture (BRL/m³ 10.81) and manufacturing industries (BRL/m³ 246.62). The high value indicator for extractive industries are explained by the high gross value added (GVA) and reduced use of water when compared to the other sectors.

For consumption in activities, the **Agriculture, livestock, forestry production and aquaculture** activity is the one with the largest consumption, with 23,704 hm3 in 2015, accounting for 77.6% of the total amount consumed by the activities. That result is also explained due to the fact that the sector features the lowest return rate (31%) compared to other activities. On the other hand, the water intensity is the highest of them all, indicating the consumption of 91.6 liters of water for each BRL 1.00 of value added generated.

The second activity with the largest share in consumption is the **Manufacturing and Construction Industries**, accounting for 11.3% (3,450 hm3) in total consumption and water intensity of 3.7 liters/BRL of value added. Despite of being the second activity with the largest share in consumption, it has low water intensity. Such fact suggests high value added in the activity per liter consumed.

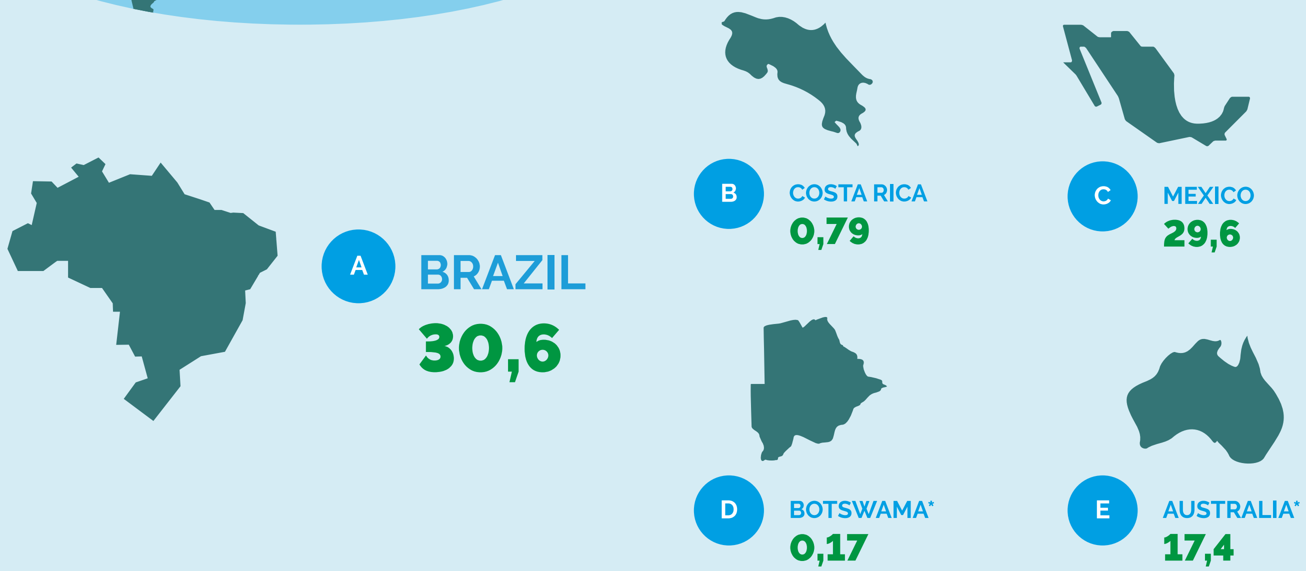
The **Electricity & Gas** activity shows the lowest share in consumption, because the return rate of hydropower is 100%. Considering hydroelectric power plants entirely rely on non-consumptive use, the hydrological intensity of the activity consists only of consumption of water by thermoelectric power plants, which represents the second lowest activity, with 1.2 liter/BRL of value added generated.

36. In its water use productivity indicator, SDG 6 calculation methodology considers the subtraction of abstractions for own use and total return to the environment. By following EEA-W methodology to calculate consumption, water consumption productivity indicators differ from SDG 6 indicators, in the sense that they incorporate the flow involved in economic activities.

## WATER ACCOUNTING WORLDWIDE

**WATER CONSUMPTION IN 2015 (IN K HM³)**

The data correspond to the water consumption of the economies as a whole (economic activities + households). Although countries follw the SEEA-Water Model, the results may reflect methodological differences used in the water consumption calculation, respecting the national particularities and the territorial and economic dimensions of the countries.

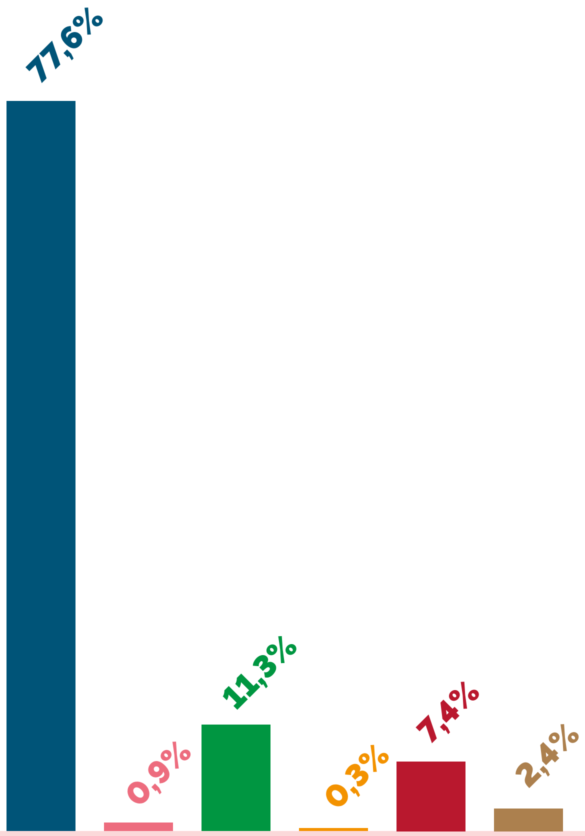




*data from 2014-2015

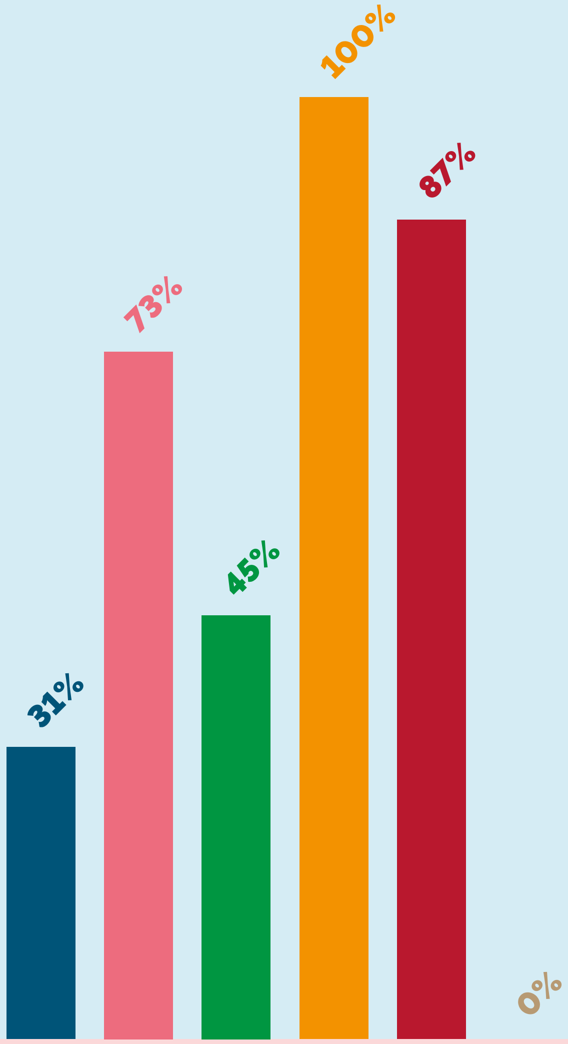
# INTENSITY IN WATER CONSUMPTION

## CONSUMPTION (hm³)

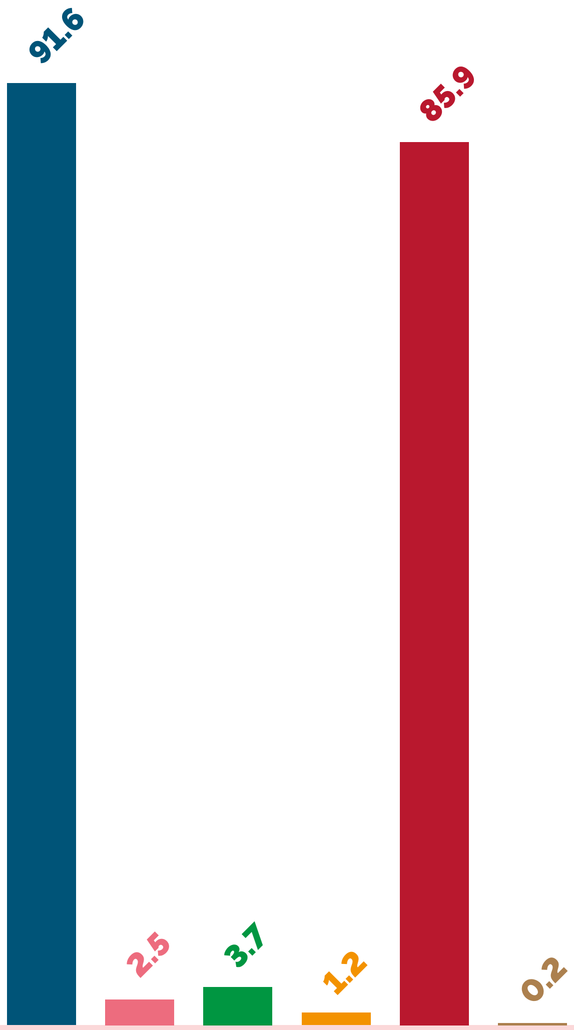

## SHARE OF THE ACTIVITY CONSUMPTION COMPARED TO TOTAL CONSUMPTION (%)




## RATIO BETWEEN RETURN AND WITHDRAWAL FOR THE ECONOMIC ACTIVITY (%)




## INTENSITY OF WATER CONSUMPTION (LITERS/BRL GVA)

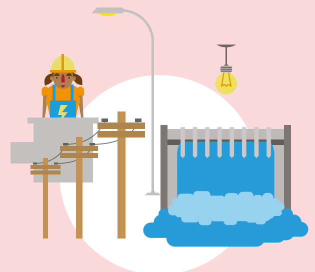



**KEY**

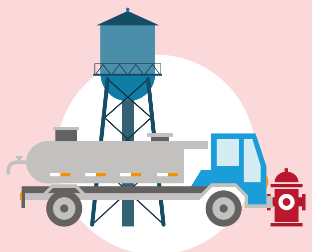
AGRICULTURE, LIVESTOCK, FORESTRY PRODUCTION, FISHING AND AQUACULTURE

MINING AND QUARRYING

MANUFACTURING AND CONSTRUCTION INDUSTRIES



ELECTRICITY AND GAS



WATER SUPPLY AND SEWAGE


OTHER ACTIVITIES

# FINAL REMARKS

**THE ENVIRONMENTAL-ECONOMIC ACCOUNTING FOR WATER IN** Brazil (EEA-W) developed for the period between 2013 and 2015 is the result of an effort to integrate data from different institutions, conducted by multidisciplinary teams. The challenges addressed to mobilize institutions and integrate technical data can be used as a reference to other initiatives in the context of environmental-economic accounting and for sustainable development.

The EEA-W was conducted by experts from ANA, IBGE and Secretariats of the Ministry of the Environment, and supported by consultants hired by the German Cooperation for Sustainable Development through GIZ. Gaining broader knowledge about water availability and demands in the country, associated with economic activities, provides relevant support to implement actions aiming at the sustainable management of water resources in Brazil.

In the medium- and long-term planning, EEA-W is applicable to water demand forecasting, risk management, analysis of the economic impacts caused by limited water supply, study of policy options / demand management, and planning of infrastructures aiming at water security.

Adopting the SEEA-Water methodology, proposed by the UN, to develop the EEA-W in Brazil allows for a regular and systematic assessment of key indicators that involve the integration of water physical and monetary data. Assessing indicators over time enables the country to monitor the results of implementing public policies targeted at managing water resources, in a robust way, with scientific background. The indicators produced are also essential for other national and international initiatives, such as the 17 Sustainable Development Goals (SDG), to which Brazil is committed. Particularly the implementation of SDG 6, Clean Water and Sanitation, can be boosted with the EEA-W elaboration.

Compiling time series of supplies, uses, assets and indicators derived from EEA-W positions Brazil in an incipient group of countries that organize water and economic information in an integrated manner. SEEA-Water standardized tables allow for exchanging information from different sources, collected for different purposes.

Although the time series presented consists of three years only, the data available, the methods compiled, the cooperation among institutions and the results obtained for Brazil indicate the possibility for enhancing the information, continuously updating EEA-W and systematically and regularly disseminating data, aiming at using it as an effective way to design and assess public policies, which is something decision-makers and the society as a whole can do.

The results obtained so far and the comparison with the development stage of EEA-W in other countries allow for indicating the next steps to consolidate and complement the existing gaps. As it consists of an initial set of data subject to improvements and expansions, it is expected that in the future, when Brazil's and other countries' accounts have been consolidated, it is possible to conduct comparative analyses with other countries and broadly exchange experiences in water management worldwide.

# REFERENCES


AUSTRALIAN BUREAU OF STATISTICS (Australia). **Water Account Australia**, Physical Water Supply and Use, by Water Type, Australia 2008 - 2015. Canberra: ABS, 2016. Available at: http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4610.02014-15?OpenDocument. Accessed in: jan. 2018.

BORREGO-MARÍN, M.M.; GUTIÉRREZ-MARTÍN, C.; BERBEL, J. Estimation of cost recovery ratio for water services based on the System of Environmental-Economic Accounting for Water. **Water Resources Management**, v. 30, n. 2, p. 767-783. Available at: https://link-springer-com.ez57.periodicos.capes.gov.br/article/10.1007/s11269-015-1189-2. Accessed in: jan. 2018

BRAZILIAN INSTITUTE OF GEOGRAPHY AND STATISTICS (Brazil). **Sistema de Contas Nacionais**: Brasil: 2015 (System of National Accounts). Rio de Janeiro: IBGE, 2017. Available at: https://www.ibge.gov.br/estatisticas-novoportal/economicas/contas-nacionais/9052-sistema-de-contas-nacionais-brasil.html?&t=publicacoes. Accessed in: jan. 2018.

BRAZILIAN INSTITUTE OF GEOGRAPHY AND STATISTICS (Brazil). **Sistema de Contas Nacionais**: Brasil: 2015. Notas Técnicas e Metodológicas nº 56 (2015 System of National Accounts: Technical and Methodological Notes). Rio de Janeiro: IBGE, 2017. Available at: https://biblioteca.ibge.gov.br/visualizacao/livros/liv101289_notas_tecnicas.pdf. Accessed in: Jan. 2018.

COMISIÓN NACIONAL DEL AGUA (México). **Estadísticas del Agua en México** (2011 - 2016) (Water Statistics in Mexico, 2011 - 2016). Cuidad de Mexico: CONAGUA, 2016. Available at: https://www.gob.mx/conagua/acciones-y-programas/publicaciones-estadisticas-y-geograficas-60692. Accessed in: Jan. 2018.

COSTA RICA CENTRAL BANK (Costa Rica). **Cuentas Agua - Documento de Trabajo** (Water Accounts - Working Document). San Jose: BCCR, 2017. Available at: http://www.bccr.fi.cr/cuentas_ambientales/documentos_agua/Cuenta_agua_2012_2015.pdf. Accessed in: jan. 2018.

DEPARTMENT OF ENVIRONMENTAL AFFAIRS (Botswana); CENTRE FOR APPLIED RESEARCH (Botswana). **Water accounts of Botswana** (1992 - 2003). Gaborone, 2006. Available at: https://unstats.un.org/unsd/envaccounting/ceea/archive/Water/Botswana_WaterAcc_2006.pdf. Accessed in: Jan. 2018.





ECONOMIC COMMISSION FOR LATIN AMERICA AND THE CARIBBEAN (ECLAC). **As contas econômicas ambientais da água**: Lições aprendidas para sua implementação no Brasil. (Environmental-Economic Accounting for Water: Lessons Learned for Implementing it in Brazil). Santiago: CEPAL, 2017. Available at: http://repositorio.cepal.org/bitstream/handle/11362/40990/1/S1601283_pt.pdf. Accessed in: Jan. 2018.

ELETROBRAS ELETRONUCLEAR. **Relatórios Anuais de Sustentabilidade** (2011 – 2016) (Annual Sustainability Reports, 2011 -2016). Rio de Janeiro: Eletrobras Eletronuclear. Available at: http://www.eletronuclear.gov.br/Aempresa/Governan%C3%A7a/RelatoacuterioseBalanccedilos/Relat%C3%B3riosdesustentabilidadesocioambiental.aspx. Accessed in: Jan. 2018.

GUTIÉRREZ-MARTÍN, C.; BORREGO-MARÍN, M.M.; BERBEL, J. The Economic Analysis of Water Use in the Water Framework Directive Based on the System of Environmental-Economic Accounting for Water: A Case Study of the Guadalquivir River Basin. **Water**, v. 9, n. 3, p. 180, 2017. Available at: http://www.mdpi.com/2073-4441/9/3/180. Accessed in: jan. 2018.

INTERNATIONAL MONETARY FUND (IMF). **IMF DataMapper**. Washington: IMF, 2017. Available at: www.imf.org/external/datamapper/datasets/weo. Accessed in: Jan. 2018.

NATIONAL INSTITUTE OF STATISTICS AND GEOGRAPHY (México). **Technical Note on the Water Accounts of Mexico**. Aguascalientes: INEGI, 2011. Available at: https://unstats.un.org/unsd/envaccounting/londongroup/meeting19/LG19_10_7.pdf. Accessed in: Jan. 2018.

NATIONAL WATER AGENCY (Brazil) **Atlas Brasil: Abastecimento Urbano de Água** (Atlas Brazil: Urban Water Supply). Brasilia: ANA, 2010. Available at: http://atlas.ana.gov.br/Atlas/forms/Home.aspx. Accessed in: Jan. 2018.

NATIONAL WATER AGENCY (Brazil). **Relatório de Conjuntura dos Recursos Hídricos no Brasil** (Brazilian Water Resources Report). Brasilia: ANA, 2013. Available at: http://www.snirh.gov.br/portal/snirh/centrais-de-conteudos/conjuntura-dos-recursos-hidricos/conj2013_rel.pdf. Accessed in: Jan. 2018.

NATIONAL WATER AGENCY (Brazil). **Encarte Especial sobre a Crise Hídrica - Conjuntura dos Recursos Hídricos no Brasil**, Informe 2014 (Special Supplement on the Water Crisis - Brazilian Water Resources Report 2014). Brasilia: ANA, 2015. Available at: http://www3.snirh.gov.br/portal/snirh/centrais-de-conteudos/conjuntura-dosrecursos-hidricos/crisehidrica2014.pdf. Accessed in: Jan. 2018.

NATIONAL WATER AGENCY (Brazil). **Estudos de estimativas de demandas e usos consuntivos de água** (Studies of Water Demand Estimates and Consumptive Uses). Brasilia: ANA, 2017.

NATIONAL WATER AGENCY (Brazil). **Atlas Esgotos - Despoluição de Bacias Hidrográficas** (Sewage Atlas - River Basin Cleanup). Brasilia: ANA, 2017. Available at: http://arquivos.ana.gov.br/imprensa/publicacoes/ATLASeESGOTOSDespoluicaodeBaciasHidrograficas-ResumoExecutivo_livro.pdf. Accessed in: Jan. 2018.

NATIONAL WATER AGENCY (Brazil). **Relatório de Conjuntura dos Recursos Hídricos no Brasil 2017** (Brazilian Water Resources Report). Brasilia: ANA, 2017. Available at: http://www.snirh.gov.br/portal/snirh/centrais-de-conteudos/conjuntura-dosrecursos-hidricos/conjuntura2017_digital.pdf. Accessed in: Jan. 2018.

NATIONAL WATER AGENCY (Brazil); UNITED NATIONS DEVELOPMENT PROGRAM (UNDP Brazil). **Água na Indústria: Uso e Coeficientes Técnicos** (Water in Industry: Use and Technical Coefficients). Brasilia: ANA, 2017. Available at: http://www.snirh.gov.br/portal/snirh/snirh-1/acesso-tematico/usos-da-agua/aguanaindustria_usoecoeficientestecnicos.pdf. Accessed in: Jan. 2018.

NATIONAL WATER AGENCY (Brazil); BRAZILIAN INSTITUTE OF GEOGRAPHY AND STATISTICS (Brazil); SECRETARIAT OF WATER RESOURCES AND ENVIRONMENTALQUALITY OF THE MINISTRY OF THE ENVIRONMENT (Brazil). **Relatório da Assistência Técnica à Elaboração das Contas Econômicas Ambientais da Água no Brasil** (Report on the Technical Assistance to Elaborate the Environmental-Economic Accounting for Water in Brazil). Brasilia: ANA, 2017.

NATIONAL WATER COMMISSION (México). **Atlas del Agua en México 2016** (Atlas of Water in Mexico 2016). Ciudad de Mexico: CONAGUA, 2016. Available at: http://201.116.60.25/publicaciones/AAM_2016.pdf. Accessed in: jan. 2018.

SAMOA BUREAU OF STATISTICS (Samoa). **Water Accounts for Samoa 2014 - 2015**. Samoa: SBS, 2016. Available at: http://www.sbs.gov.ws/index.php/newdocument-library?view=download&fileId=2099. Accessed in: jan. 2018.

STATISTICS NETHERLANDS (Netherlands). E**nvironmental Accounts of the Netherlands (2011-2014)**. Haia: CBS, 2014. Available in: https://www.cbs.nl/en-gb/publication/2014/46/environmental-accounts-of-the-netherlands. Accessed in: jan. 2018.

UNITED NATIONS (UN). **World Water Development Report**. Geneva: UN, 2006. Available at: http://www.unwater.org/publication_categories/world-water-development-report/. Accessed in: Jan. 2018.

UNITED NATIONS (UN). **System of National Accounts 2008**. New York: UN, 2009. Available at: http://unstats.un.org/unsd/nationalaccount/sna2008.asp. Accessed in: Jan. 2018.

UNITED NATIONS (UN) (2011). **Monitoring Framework for Water**. New York: UNSD, 2011. Available at: https://unstats.un.org/unsd/envaccounting/WWAP_UNSD_WaterMF.pdf. Accessed in: Jan. 2018.

UNITED NATIONS (UN). **System of Environmental Economic Accounting for Water**. New York: UN, 2012. Available at: https://unstats.un.org/unsd/envaccounting/seeaw/seeawaterwebversion.pdf. Accessed in: Jan. 2018.

UNITED NATIONS (UN). **Metadata on Suggested indicators for Global Monitoring of the Sustainable Development Goal 6 on Water and Sanitation**. New York: UN, 2016. Available at: http://www.unwater.org/publications/monitoring-water-sanitation-2030-agenda-sustainable-development-executive-briefing-2/ Accessed in: Jan. 2018.

VARDON, M., BASS, S., AHLROTH, S.; RUIJS, A. (Eds.) **Forum on Natural Capital Accounting for Better Policy Decisions:** Taking Stock and Moving Forward. Washington: World Bank WAVES, 2017. Available at: https://www.wavespartnership.org/sites/waves/files/kc/WAVES%20report%20final%20version%20%20%281%29.pdf. Accessed in: jan. 2018.

WEALTH ACCOUNTING AND THE VALUATION OF ECOSYSTEM SERVICES (Botswana); CAR; MMEWR. **Water Accounting Report 2014/15**: final report. Gaborone, 2016. Available at: http://www.water.gov.bw/images/Reports/DWA_Website/Botswana%20Water%20Accounting%20Report%202014_15.pdf. Accessed in: jan. 2018.

# GLOSSARY OF TERMS

**ABSTRACTION:** The amount of water that is removed from any water body, either surface or underground, permanently or temporarily, in a given period of time, for final consumption and production activities. Total water abstraction can be broken down according to the type of source and the type of use.

**ABSTRACTION FOR DISTRIBUTION:** Water abstracted for the purpose of its distribution.

**ABSTRACTION FOR OWN USE:** Water abstracted for own use. However, once water is used, it can be delivered to another user for reuse or for treatment.

**APPARENT WATER LOSSES IN THE DISTRIBUTION PROCESS:** Water that, in spite of being consumed, is not billed by the sanitation company, which occurs mainly due to errors in water meters and frauds. Also known as business losses.

**AQUIFER:** A geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable rocks to store and allow for water circulation. It may yield significant quantities of water to wells and springs. Aquifers have a great capacity to store water, but the water moves slowly.

**ARTIFICIAL RESERVOIRS:** Man-made lakes formed of the construction of a dam in a watercourse. They are used for storage and regulation of river flows, with the goal to supply water for different uses, irrigation, power generation, reducing risks of floods, among others.

**ASSET:** Please refer to *stock*.

**WATER CHARGE:** Charging for the use of water is an instrument to manage water resources which was established by the National Water Resources Policy, according to Brazilian Law # 9,433/97. The billing does not consist of a tax or a fee charged by water distributors in the city, but rather a payment for the use of a public asset, made by public or private users. It enables forming a financial fund for construction works, programs and interventions to enhance the basin environmental conditions. Charging is applied according to the amount of water abstracted and used, and according to the quality of the wastewater discharged into the water body, among other criteria, at the Basin Committee's discretion.

**CONFINED AQUIFER:** Aquifer confined between impermeable or semi-permeable formations, in which the water is subject to a pressure that is greater than the atmospheric pressure.

**CONSUMPTION INDEX (CI):** The ratio between total water consumed by economic units and total renewable water resources (TRWR).

**CONSUMPTIVE USE:** Use in which part of the water withdrawn is consumed during processes involved in its use, not returning to the water body.

**COOLING WATER:** Water which is used to absorb and remove heat. It is used, for instance, in thermoelectric power plants and in nuclear power plants.

**DEPENDENCY RATIO (DR):** The ratio between external renewable water resources (ERWR) and total renewable water resources (TRWR), indicating the proportion of water resources generated externally to the territory of reference.

**DOWNSTREAM:** Altimetric attribute of one point in relation to another one that is above (upstream), in the same watercourse. It indicates the direction of the river mouth in a watercourse or its final point, down the river.

**ECONOMIC UNIT:** A set of production units characterized by the goods they produce, classified according to their main production.

**EFFICIENCY OF WATER IN AGRICULTURE (EWAG):** The ratio between the gross value added by agricultural activities and water consumption in the sector in a given year, expressed in BRL/$m^3$. It is different from the SDG 6 efficiency indicator, which considers only irrigated agriculture.

**EFFICIENCY OF WATER IN ELECTRICITY AND GAS ACTIVITIES (EWEG):** The ratio between the gross value added by electricity and gas activities and water consumption in the sector in a given year, expressed in BRL/$m^3$.

**EFFICIENCY OF WATER IN EXTRACTIVE INDUSTRIES (EWEI):** The ratio between the gross value added by extractive industries and water consumption in the sector in a given year, expressed in BRL/$m^3$.

**EFFICIENCY OF WATER IN OTHER ACTIVITIES (EWOT):** The ratio between the gross value added by other economic units and water consumption in the sector in a given year, expressed in BRL/$m^3$.

**EFFICIENCY OF WATER IN TRANSFORMATION INDUSTRIES AND CONSTRUCTION (EWTI):** The ratio between the gross value added by transformation industries and construction and water consumption in the sector in a given year, expressed in BRL/$m^3$.

**EFFICIENCY OF WATER IN WATER AND SEWAGE ACTIVITY (EWWS):** The ratio between the gross value added by water and sewage activities and water consumption in the sector in a given year, expressed in BRL/$m^3$.

**EVAPORATION:** A physical process by which a liquid, due to temperature rise and/or pressure decrease, turns into vapor.

**EVAPOTRANSPIRATION:** The quantity of water transferred from the soil and water bodies to the atmosphere by evaporation and transpiration of plants and other living organisms.

**EXORHEIC:** Water flows that drain to seas and oceans.

**EXTERNAL RENEWABLE WATER RESOURCES (ERWR):** Portion of renewable water resources in a country that is shared with neighboring countries or where they come from.

**FINANCIAL COMPENSATION FOR USING WATER RESOURCES (CFURH):** Holders of concession or authorization to explore hydraulic potential greater than 30 MW in Brazil pay 0.75% of the value of the power produced, according to Brazilian Laws # 7,990/89 and # 9,427/96. The values collected are intended for implementing the National Water Resources Policy and the National Water Resources Management System.

**FINAL CONSUMPTION EXPENDITURE OF HOUSEHOLDS:** The expenditure incurred by households on goods and services.

**FINAL CONSUMPTION EXPENDITURE OF THE GOVERNMENT:** The expenditure incurred by the three levels of government (federal, state and local) on individual and collective goods and services made available for free, either totally or partially. The value used is the cost of production.

**FLOW:** Volume of water that flows through a section of a river, channel or pipe by unit of time.



**FLUVIOMETRY:** A technique to measure levels of water, speeds and water body flows. Fluviometry allows for quantifying the river regimes, characterizing their basic measurements, as well as their different parameters and representative curves.

**FREE AQUIFER:** Aquifer in which the water surface is subject to atmospheric pressure.

**WATER RIGHT:** A management instrument established by the National Water Resources Policy, according to Brazilian Law # 9,433/97, through which public authorities allow users to use a certain volume of surface or groundwater for a given period, according to the terms and conditions expressed in a specific administrative procedure. The purpose of the water right is to ensure quantitative and qualitative control of water uses an actual right to access water.
gross domestic product Total of goods and services produced by resident producer units intended for final uses. Thus, it is equivalent to the sum of the values added by different economic activities plus taxes, minus any subsidies, over products. The gross domestic product is also equivalent to the sum of final uses of goods and services valued at the market price, and is also equivalent to the sum of primary incomes.

**GROSS FIXED CAPITAL FORMATION:** Additions to the stock of fixed assets intended for use of productive units, made each year, with the goal of increasing the productive capacity.

**GROSS VALUE ADDED (GVA):** Value the activity adds to goods and services consumed in their productive process. It is the contribution to the gross domestic product made by different economic activities, obtained by subtracting the gross value of the production from the intermediate consumption of those activities.

**GROUNDWATER:** Water laying underground, which collects in porous layers of geological formations known as aquifers.

**HOUSEHOLD:** A family aggregate is a group of people who dwell under the same roof, grouping some or all their income and wealth, and who collectively consume certain types of goods and services, particularly housing and food.

**HYBRID SUPPLY AND USE:** A table that describes water flows in physical and monetary units within the economy and between the environment and the economy, in a given period.

**INFLOW:** Water that flows into a river, stream, lake, reservoir, basin, aquifer, etc. It includes inflows from other territories/countries and inflows from other resources within the territory.

**INTEGRATED ECONOMIC ACCOUNTS (CEI):** The Integrated Economic Accounts are at the core of the System of National Accounts, which consists of a sequence of interrelated flow accounts, broken down by institutional sector, including financial companies, non-financial companies, public administration and Households. They also show the relationships between the national economy and the rest of the world.

**INTENSITY OF WATER:** Ratio between the volume of water consumed by a certain economic activity and the gross value added produced by that activity, in a given year. It represents the flow consumed in liters per real of gross value added generated, expressed in liters/BRL.

**INTERMEDIATE CONSUMPTION:** The value of the goods and services consumed as inputs by a process of production, excluding fixed assets; the goods or services may be either transformed or used up by the production process.

**INTERNAL RENEWABLE WATER RESOURCES (IRWR):** Annual average of flows in rivers and replenishment in aquifers generated by precipitation internal to the territory, minus evapotranspiration.

**INTERNATIONAL STANDARD INDUSTRIAL CLASSIFICATION OF ALL ECONOMIC ACTIVITIES (ISIC):** It is the international classification used as reference for productive activities. Its main purpose is to provide a set of activity categories that can be used for collection and statistics reports, according to the activities.

**IRRIGATION WATER:** Water artificially applied to land for agricultural purposes, with the goal to meet the plant needs for water.

**LAKE:** A generic term for a body of standing water, surrounded by land, of natural origin, usually occupying a depression in the Earth's surface.

**NATIONAL CLASSIFICATION OF ECONOMIC ACTIVITIES (CNAE):** It is the Brazilian official classification adopted by the National Statistics System and the federal bodies who manage administrative records.

**NATURAL CAPITAL:** A set of natural resources considered as production means, such as water, power, forests, ecosystems, whether renewable or non-renewable.

**NON-CONSUMPTIVE USE:** Use in which the water, after being withdrawn and used, is returned at the same quantity and with the same quality, or also uses in which water serves only as a vehicle for another activity, meaning the water is not consumed while used.



**OTHER ACTIVITIES:** It refers to the economic activities listed under CNAE 2.0, sections G to U, as well as divisions 38 (Waste Collection, Processing and Disposal; Material Recovery) and 39 (Decontamination and Other Waste Management Services).

**OUTFLOW:** Flow of water out of a river, stream, lake, reservoir, basin, aquifer, etc. It includes outflows to other territories/countries, to the sea and to other resources within the territory.

**PER CAPITA TOTAL RENEWABLE WATER RESOURCES:** Ratio between the total renewable water resources (TRWR) and the population of the territory of reference in a given year.

**PER CAPITA VOLUME ABSTRACTED FOR SUPPLY (*VAS*):** Ratio between the volume abstracted by CNAE division and the population in a given year, per day.

**PER CAPITA TOTAL VOLUME OF WATER ABSTRACTED (VT):** Ratio between the volume abstracted by economic units (except for water withdrawn for Hydropower, Sewage and related activities) and the population in a given year.

**PER CAPITA VOLUME RECEIVED BY HOUSEHOLDS (VH):** Ratio between the volume of water received by Households connected to the public supply network and the population in a given year, per day.

**PHYSICAL SUPPLY AND USE:** A table that describes water flows in physical units within the economy and between the environment and the economy, in a given period.

**PHYSICAL WATER LOSSES IN THE DISTRIBUTION PROCESS:** The volume of water lost during transport through leakages and evaporation between a point of abstraction and a point of use, and between points of use and reuse. Water lost due to leakages is recorded as a return flow as it percolates to an aquifer and is available for further abstraction; water lost due to evaporation is recorded as water consumption. When computed as the difference between the supply and use of an economic unit, it may also include illegal tapping. Also known as real losses.

**PLUVIOMETRY:** Measurement of the amount of rainfall on a territory in a given period of time.

**PRECIPITATION:** The volume of water from the atmosphere that gravitationally reaches the Earth's surface, such as rain (pluviometric precipitation), snow and hail.

**PROPELLED FLOW:** Volume of water passing through the turbines of a hydroelectric power plant, used for power generation purposes.

**PUBLIC IRRIGATION PERIMETERS:** Public irrigation projects whose infrastructure is designed, implemented in a certain area and directly or indirectly operated by public authorities. They can be intended for agriculture in a predominantly social interest project – family lot – or combined (social and business interest).

**RATE OF ABSTRACTION (RA):** Ratio between the total volume withdrawn by economic units (except for water withdrawn for Hydropower, Sewage and related activities) and total renewable water resources (TRWR) per year.

**REUSE:** Use of wastewater or sewage from a process as raw material for the same process or another process or activity.

**RIVERS AND STREAMS:** Water bodies flowing continuously or periodically in a channel.

**RUN-OFF:** The part of precipitation on a given surface that appears as running water.

**SATELLITE ACCOUNTS:** The satellite accounts are an extension of the System of National Accounts. They allow for analyzing the profile and the evolution of a sector compared to the overall economy, as measured by the National Accounts.

**SEPTIC TANK:** An underground cavity, usually located next to houses or buildings, designed to receive, keep and decompose wastewater.

**SOIL WATER:** Water suspended in the uppermost belt of soil, or in the zone of aeration near the ground surface that can be discharged into the atmosphere as vapor through the evapotranspiration effect.

**STOCK:** Volume of water available and/or stored on the surface (in rivers, streams, lakes, artificial reservoirs, snow, ice, glaciers), in aquifers (groundwater) or on the soil.

**STOCK VARIATION:** Difference between the stock values of finished goods, semi-finished goods, goods in the process of being manufactured and raw materials for productive sectors in the beginning and in the end of the year, assessed at current average prices in the time period.

**SUPPLY OF TREATED WATER:** Water that is supplied by an economic unit to another and to Households.

**SUPPLY OF WASTEWATER TO THE SEWER SYSTEM:** Wastewater that is supplied by economic units and Households to the sewer system.



**SUPPLY TO OTHER ECONOMIC UNITS:** The sum of treated water that is distributed with wastewater to the sewer system.

**SURFACE RUN-OFF:** Please refer to *run-off*.

**SURFACE WATER:** Water which flows over the ground surface, forming rivers and streams, or is stored in artificial reservoirs, lakes and glaciers.

**SYSTEM OF NATIONAL ACCOUNTS (SNA):** A set of internationally accepted norms and recommendations related to the elaboration of economic activity indicators, according to accounting conventions, based on economic principles. The recommendations represent a set of accounting concepts, definitions, classifications and rules to calculate indicators, such as the Gross Domestic Product, the most frequently used economic result indicator. The Brazilian System of National Accounts provides information about generation, distribution and use of income in Brazil. There is also data about acquisition of non-financial assets, equity and the relationships between the domestic economy and the rest of the world.

**TECHNICAL COEFFICIENT:** Numeric values that express a physical relationship between the quantity of raw materials used to produce a specific quantity of a product.

**TOTAL OF WATER SUPPLIED:** The sum of water supplied to other economic units with total return.

**TOTAL RENEWABLE WATER RESOURCES (TRWR):** The sum of internal (IRwR) and external (ERwR) renewable water resources in the territory. It corresponds to the maximum value of water available for a country in a reference period.

**TOTAL RETURN:** Water that is returned into the environment by an economic unit and/or Households after use. Returns can be classified according to the receiving media (surface water, groundwater, soil water and sea water).

**TOTAL SUPPLIED:** The sum of water supply to other economic units plus total return.

**TOTAL USE OF WATER:** The sum of total abstractions and use of water from other economic units.

**TOTAL WITHDRAWAL:** The sum of abstractions for own use and abstractions for distribution.

**TRANSBOUNDARY WATER:** Surface or ground waters which cross or are located on boundaries between two or more Countries.

**UPSTREAM:** A point or area along the watercourse that is altimetrically above another point. Towards the source or up the river.

**URBAN RUN-OFF:** A set of structures (i.e.; sewers, pipes, channels and reservoirs) whose goal is to minimize risks of inundation and flood due to rainfall in urban areas.

**USE OF TREATED WATER SUPPLIED BY ANOTHER ECONOMIC UNIT:** It is the treated water supplied by CNAE 36 Division – Water Abstraction, Treatment and Distribution for economic units and Households.

**USE OF WASTEWATER FOR SEWER SYSTEM:** Wastewater that is supplied by economic units and Households to the sewer system.

**USE OF WATER RECEIVED FROM OTHER ECONOMIC UNITS:** It is the sum of use of wastewater for sewer systems plus use of treated water supplied by another economic unit.

**WASTEWATER:** Water altered in its natural conditions, with potential to cause pollution or contamination. However, wastewater from one user can be a potential supply of water to a user elsewhere. It includes discharges of cooling water. It is also known as sewage.

**WATER BODY:** A general term used for any river, lake, stream, artificial reservoir or aquifer, in terms of inland waters. It also applies to seas and oceans.

**WATER CONSUMPTION:** That part of water abstracted for use which is not distributed to other economic units and/or does not return to the environment (to water resources, sea and ocean) because during use it has been incorporated into products, or consumed by households or livestock. It is calculated as the difference between total use and total supply; thus, it may include losses occurring in distribution and apparent losses due to illegal tapping as well as malfunctioning metering.

**WATER CYCLE:** A cyclic sequence of phases water goes through when circulating in the atmosphere, on the surface of the continents and islands, seas and oceans, and underground. The hydrological cycle involves evaporation, transpiration, condensation, precipitation, infiltration, percolation, surface run-off, underground run-off, circulation of ocean currents and all possible manners water is present in our planet. A global phenomenon of closed-loop circulation and continuous transfer of water between Earth's surface and the atmosphere, mainly driven by solar power associated with gravity and Earth's rotation.



**WATER DEMAND:** Amount of water needed to supply existing needs in a given watershed, based on time and quantity elements, and related to a specific spot on the watershed.

**WATER EFFICIENCY:** An indicator that calculates the ratio between the gross value added of a certain economic activity and the volume of water consumed by that activity in a given year. It represents how many Brazilian reals of gross value added are produced by cubic meter of water consumed in a given year, expressed in BRL/m3.

**WATER FOR DISTRIBUTION:** Water abstracted and treated to be distributed to different economic units and Households.

**WATER RESOURCE AVAILABILITY:** It is an estimate of the amount of water accessible to the most different uses in a given period. For management purposes, is also considered as a certain level of guarantee.

**WATERSHED OR BASIN:** An area with a common exit for its surface drainage, topographically delimited by its corresponding water dividers with other basins. Surface run-off of a water body and its tributaries converges to its interior, is captured by its corresponding drainage network and is discharged by one or more exits in the lower portion of the area.

**WATER TABLE:** The surface in a saturated zone of an unconfined aquifer. The saturated zone can be considered a single reservoir or a system of natural reservoirs whose capacity and total volume of pores or interstices are filled with water. Below the water table, the surface water fills the porous and permeable spaces of the rocks.

**WITHDRAWAL OF WATER:** Please refer to *abstraction*, *abstraction for own use*, and *abstraction for distribution*.

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Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

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