

# Results of the Initiative Water Unites Us – Suizagua Brasil 2018–2021

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**São Paulo, Brazil**

an initiative of:



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## **The Water Unites Us – Suizagua Brasil Initiative**

Results of the Water Unites Us – Suizagua Brasil Initiative: 2018-2021

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Votorantim Cimentos

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ACV Brasil

Brazilian Network of the UN Global Compact

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## Project information

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### **Corporate members**

Companhia Brasileira de Alumínio, Klabin, Votorantim Cimentos

### **Partners**

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### **Declaration of Responsibility**

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## List of acronyms and abbreviations

<b>ABNT</b>	Brazilian Association for Technical Standards
<b>CBA</b>	Companhia Brasileira de Alumínio
<b>FGVces</b>	Fundação Getulio Vargas Center for Sustainability Studies
<b>ISO</b>	International Organization for Standardization
<b>LCA</b>	Life-Cycle Assessment
<b>LCIA</b>	Life-Cycle Impact Assessment
<b>SDC</b>	The Swiss Agency for Development and Cooperation
<b>VC</b>	Votorantim Cimentos
<b>WF</b>	Water Footprint
<b>WUU</b>	Water Unites Us

# 1. Introduction

Changes in rainfall patterns, caused mainly by climate change, impact those dependent on water in different regions and demand new technical approaches to solve the problems arising from these impacts. In Brazil, especially after the 2014 water crisis, companies have been working to reduce the risks and costs associated with these impacts, as well as to understand the future consequences for businesses.

In addition to responding to the water crisis, companies are now more attentive. They are preparing to avoid future impacts, becoming more resilient, anticipating the risks associated with a lack of water and making more efficient use of this resource. In order to do this, they need to obtain technical and operational competence, adapt to changes and strengthen water management knowledge. It is important to remember that this strategy becomes more effective when it permeates the entire value chain, since most corporate water risks are related to other actors in their chain: suppliers, partners, clients, consumers, etc.

Therefore, from a business perspective, it is not sufficient to look only at one's own operations and control them directly; one must go beyond and look at the impacts throughout the value chain and product portfolios

In this context, the water footprint (WF) technique has been shown to be an important tool to measure and manage a variety of impacts related to water throughout the life cycle of a product, analyzing its entire value chain. The WF therefore leads to a reduction in the impacts related to water and is beneficial not only to the company, but also to the various actors linked to it, and to the different river basins that



supply the company. As a result, more integrated and complete management of this resource can be carried out, increasing the possibilities for impact and risk reduction, strengthening innovation and reaching beyond the walls of the organization.



Given this, the Swiss Agency for Development and Cooperation (SDC), through the Global Water Program, developed the Water Unites Us Initiative to strengthen corporate water management in Latin America. The Water Unites Us initiative began in 2010 and has been working with the private sector to develop a water governance agenda, using the water footprint technique as a tool to promote the efficient use of this input.

In November 2018, Brazil joined the initiative (already active in Colombia, Mexico, Peru and Chile), which acts as a network for more efficient management of water in Latin America.

In Brazil, the Water Unites Us – SuizÁgua Brasil (WUU) initiative is the result of a partnership between SDC and the Center for Sustainability Studies (FGVces) of the School of Business Administration of the Fundação Getúlio Vargas (FGV-EAESP), which is responsible for carrying out the initiative locally. During its first cycle of activities (2018–2021), the three participating companies – CBA, Klabin and Votorantim Cimentos – developed impact studies and action plans to reduce their water footprints.

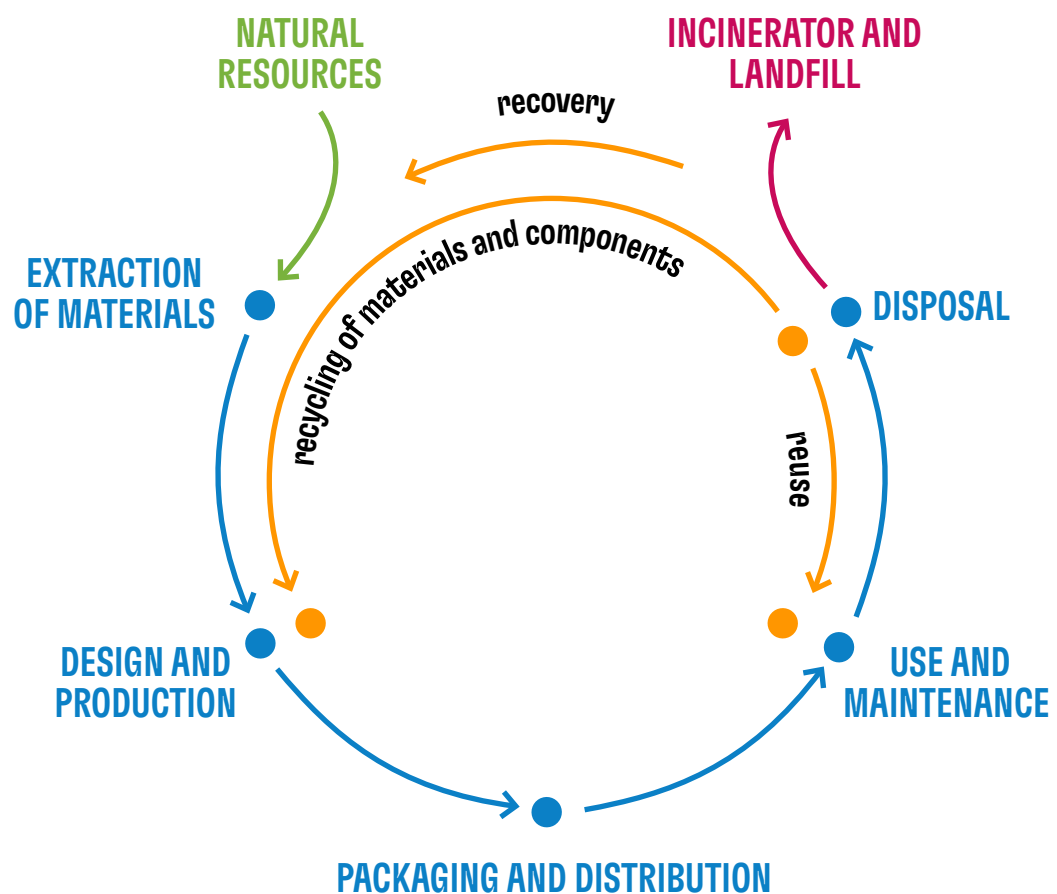
In the following pages we summarize the results and findings of the Water Unites Us – SuizÁgua Brasil initiative and discuss the importance of water management at the participating companies. Additionally, we discuss the contributions and challenges of the project and propose recommendations for advancing this agenda in Brazil.

Enjoy!

## 2. Understanding the Water Footprint

The water footprint is a technique used to measure the water used throughout the lifecycle of a product and its associated environmental impacts, that is, from the extraction of natural resources to their disposal in the environment, including the steps of obtaining the raw material, pre-processing, production, distribution, use and end of life.

Representation of the life cycle of a product



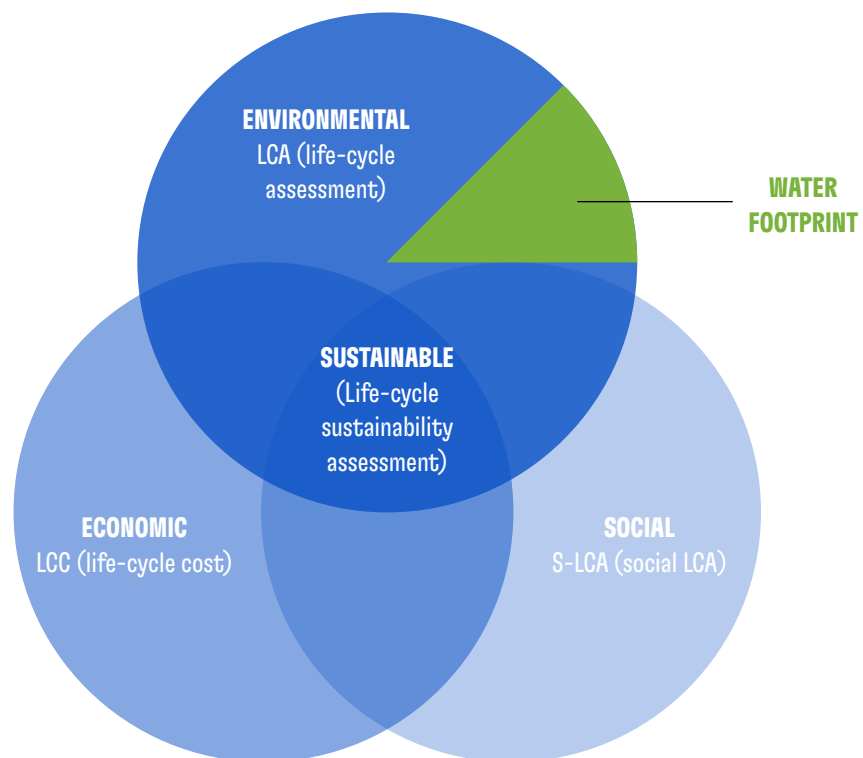
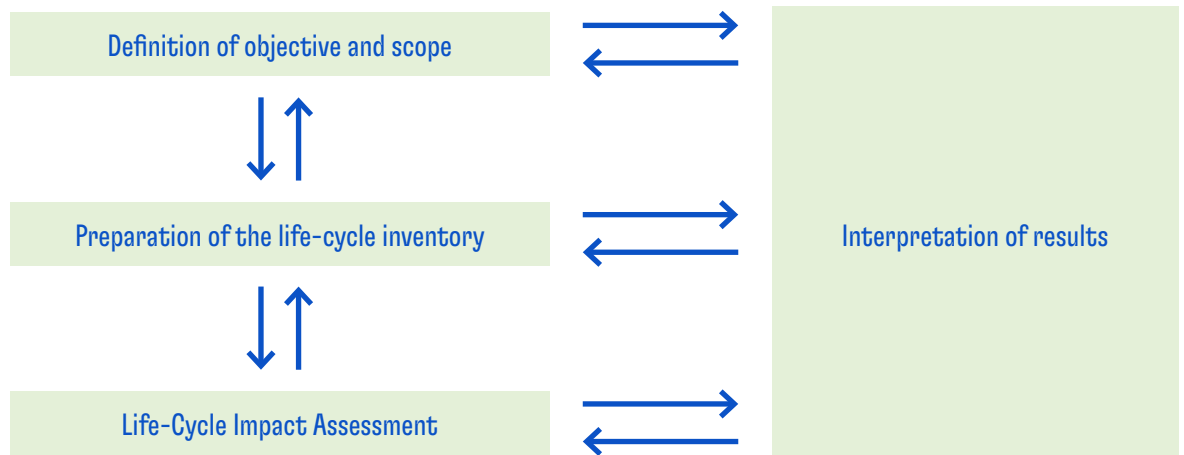
SOURCE: adapted from UNEP/SETAC (2007)

It is a robust, internationally recognized technique based on science. The principles, requirements and guidelines for carrying out a water footprint study are described in the ISO 14046 standard and are fully aligned with the ISO 14040 and 14044 Life-Cycle Assessment standards. The water footprint can therefore be defined as a specific subset of indicators related to potential environmental impacts associated with the quantity and quality of water.

As with the Life-Cycle Assessment, the Water Footprint is a valuable tool for identifying and prioritizing actions that significantly reduce impacts and improve water management in production processes. Its greatest benefit lies in the possibility of quantifying the environmental performance of a product and identifying the main processes and stages linked to this performance after evaluating its entire life cycle. Its results can be used in several ways: as support for decision making; in product development and improvement; in strategic planning; in the formulation of public policies; in environmental labeling, in marketing and much more.

As can be seen in Figure 1, an LCA and/or water footprint study is carried out in four main phases: (a) definition of objective and scope; (b) preparation of the life-cycle inventory (LCI); (c) assessment of life-cycle impacts (LCIA) and (d) interpretation of results (ABNT, 2014a, 2014b).

## Phases of a Life-Cycle Assessment Study



SOURCE: ABNT (2014a)

### 3. Introduction to the Water Unites Us Initiative in Brazil

Water Unites Us is an initiative led by the Swiss Agency for Development and Cooperation (SDC), with FGVces responsible for local implementation. It is a Latin American network whose main objective is to develop and strengthen water resources management in companies in the countries in which it operates by employing the water footprint technique.

The objectives of the Brazilian initiative are to:

- Promote the use of the water footprint technique in a corporate context;
- Develop and strengthen the community of practice employing the water footprint technique in the region;
- Promote the efficient use of water resources throughout the value chain;
- Encourage the sharing of experiences between Brazilian companies and other organizations participating in the Water Unites Us network.

From November 2018 through June 2021 the Brazilian initiative worked with the companies CBA, Klabin and Votorantim Cimentos, and their partners, to carry out the various project activities, including: training, conduction of the water footprint study, preparation and implementation of reduction plans and communication. Figure 2 illustrates the main components of the Project.

Figure 2. Components of the Water Unites Us – SuizAgua Brasil Project



SOURCE: the authors

The project was launched in Brazil at an event held on February 11, 2019 and the water footprint study began in the same year, with activities designed to train the team and conduct the study. In order to ensure that all the companies had the technical knowledge needed to participate in the activities, FGVces held two training sessions on the water footprint<sup>1</sup> for 35 professionals from the three companies, totaling 32 hours of technical training.

After the training, a multidisciplinary team composed of professionals from different areas worked on the various activities of the study over a period of 15 months, which included: selection of the product to be studied, definition of objectives and scope, preparation of the process map, gathering of process data (inputs and outputs), collection of primary data, preparation of the life-cycle inventory, software modeling, interpretation of results and, finally, preparation of water footprint reduction plans.

Specialists from FGVces provided support and guidance for all activities and closely monitored the entire process through more than 30 technical meetings and two face-to-face meetings. Additionally, other

<sup>1</sup> <http://www.elaguanosune.org/noticias/noticias-destacadas/entrenamiento-tecnico-en-huella-de-agua-para-aliados-empresariales-en-brasil/>

training sessions were held with strategic partners of the project: training on how to use the software SimaPro, in partnership with the consulting company ACV Brasil, and Training on the Water Footprint technique and Sustainable Development Objectives, in partnership with the Brazilian Network of the UN Global Compact.

As it is a highly complex topic, the study required specific knowledge of different areas: sustainability, the environment, production, business management, etc. Thus, in order to facilitate and foster communication between the many actors involved in water management, we held webinars and workshops on the topic with the objective of disseminating knowledge on advances and share experiences regarding calculation of the water footprint of the products developed by Water Unites Us partner companies. The interactions between companies, consulting firms, NGOs and academia, as well as the events, provided opportunities for important discussions designed to advance the water management agenda in Brazil.

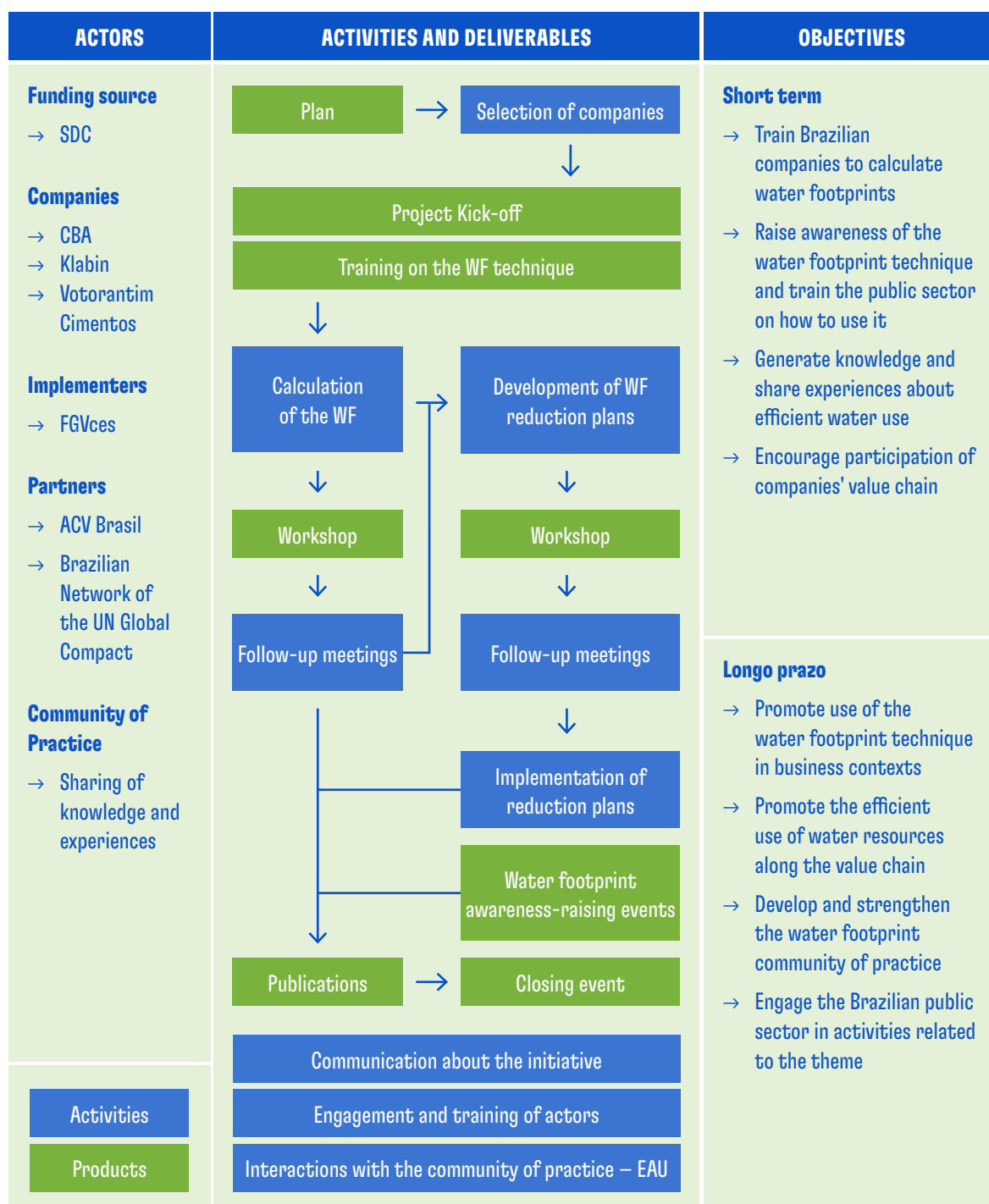


## Timeline of the Water Unites Us - SuizAgua Brasil Project



Figure 3 summarizes the main aspects covered by the Water Unites Us Project, mapping the actors involved, the objectives, the main activities carried out during its execution and the deliverables.

Figure 3. Logic framework of the Water Unites Us – SuizAgua Brasil Project



SOURCE: the authors

## 4. Working with the Partner Companies

As mentioned earlier, from November 2018 to June 2021, FGVces worked in conjunction with the companies CBA, Klabin and Votarantim Cimentos to conduct the various project activities for the Water Unites Us – SuizAgua Brasil initiative, which included: selection of the product to be studied, definition of objectives and scope, preparation of the process map, gathering of process data (inputs and outputs), collection of primary data, preparation of the life-cycle inventory, software modeling, interpretation of results and, finally, preparation of water footprint reduction plans.

Below is a brief description of the companies selected to participate in the Water Unites Us Initiative, their relationships with water, and their main motivation for participating in the Project. The main methodological aspects of the water footprint study, the principal results achieved and the reduction plans adopted by the companies are also presented.

### 4.1. Selection of the Companies

Between December 2018 and March 2019, the FGVces team together with SDC carried out the selection process of companies to participate in the Water Unites Us Initiative in Brazil.

After some interactions, the companies CBA, Klabin and Votorantim Cimentos joined the Brazilian initiative.

**CBA – Companhia Brasileira de Alumínio**



Companhia Brasileira de Alumínio (CBA) has a broad portfolio of primary and secondary aluminum products, and is responsible for all stages of manufacturing, from mining and processing bauxite to finishing the final products.

The production process for the aluminum produced by CBA starts in the states of Minas Gerais and Goiás, in the bauxite mining process. The bauxite is transported by truck to the railway yards, then taken by train to the factory in Alumínio, SP, where industrial production occurs.

At the factory, bauxite is transformed into aluminum oxide and then into liquid aluminum which, in turn, is used to manufacture primary products, such as ingots, billets, rebars, caster rolls and plates using a casting process. CBA also develops customized solutions and services for strategic markets and customers, based on secondary products such as natural, anodized and painted sheets, plates and profiles. Production is increased by recycling aluminum scrap.

Water is a basic input when manufacturing aluminum. At CBA, it is used principally during initial treatment of bauxite, in the refinery, in gas treatment structures and in cooling processes in the primary and secondary product units. The aluminum factory's water needs are met by obtaining water from surface and underground bodies of water located near the factory. After use, the effluent is sent to an exclusive storage lake with a capacity of 75,000 cubic meters and then forwarded to the Industrial Water Treatment Station (ETAI), thus circulating in a closed system.

CBA's goal is to reduce water intake by 22% (in comparison with 2017) by 2025. CBA has the ASI (*Aluminium Stewardship Initiative*) seal, which certifies companies that adopt best social and environmental practices when producing aluminum worldwide and include management of water and effluents in their processes

CBA's participation in the Water Unites Us project is aligned with the company's strategic goals. The main objective is to apply the lens of the "water" theme throughout the supply chain, in addition to implementing improvements in internal management.

**Klabin S.A.**



Klabin S.A. is a publicly held corporation founded in 1899 with 18 factories in Brazil and one in Argentina.

It is the largest producer and exporter of paper for packaging in Brazil and the leading producer of cardboard, corrugated cardboard packaging and industrial bags in Brazil. Klabin is the only company in Brazil to offer the market the best short-fiber cellulose, long-fiber cellulose and fluff solutions.

Commitment to sustainable development is a premise for Klabin's business. In line with overall consumption trends, the company offers the market safe, light, efficient, recyclable packaging solutions from renewable, flexible sources.

Participating in the Water Unites Us project is an important reinforcement of Klabin's commitment to sustainable development, as the company is always seeking best practices for environmental management and the water footprint technique creates in-depth knowledge of the environmental impacts related to water management in the production chain, helping develop methods for improvement and appropriate distribution of resources.



**Votorantim Cimentos**



Votorantim Cimentos has offices in 11 countries on four continents: Argentina, Brazil, Bolivia and Uruguay in South America; Canada and the United States in North America; Spain and Luxembourg in Europe; Turkey in Eurasia; and Morocco and Tunisia in Africa. At the end of 2019, it had 11,953 employees and 256 factories, with an installed production capacity of 52.8 million metric tons of cement. Last year, the company produced 30.1 million metric tons of cement and its net revenue was R\$ 13 billion.

In terms of production capacity, Votorantim Cimentos is the sixth largest cement company in the world (excluding China) and the largest in Brazil, according to public reports. As part of its corporate strategy, the company seeks to maintain a significant market share in all markets in which it operates, focusing on operational excellence and competitiveness, the result of more than 80 years of experience in Brazil.

Votorantim Cimentos emphasizes the importance of water resources management in its environmental policy and includes GRI standards data in its annual integrated report. Participation in the Water Unites Us project is very much in line with the Votorantim Cimentos Environmental Policy and with its external commitments to improve the management of water resources in its operations.

## 4.2. **Principal methodological choices in the study**

The principal objective of the study is to analyze the water footprints of the products selected by the participating companies. Its scope includes all significant activities related to the product life cycle, from extraction of natural resources to when the finished product leaves the factory. Thus, the study is characterized as “cradle to gate” and does not include the use and end-of-life product stages.

Based on the results of the Water Unites Us SuizAgua Brasil Initiative, the participating companies intend to i) implement actions in their companies and with their suppliers to reduce their water footprints and ii) support the decision-making process of managers by providing more information from an environmental standpoint on the water performance of products, inputs and processes.

The main methodological aspects of the study can be seen in Table 1.

Table 1. Summary of the main methodological aspects of the study

COMPANY	CBA	KLABIN	VOTORANTIM CIMENTOS
PRODUCT STUDIED	Thin aluminum sheets	Short-fiber cellulose	Concrete
SCOPE	Cradle to gate		
REFERENCE QUANTITY	A metric ton	A metric ton	A cubic meter
GEOGRAPHICAL COVERAGE	Alumínio, São Paulo State, Brazil	Campos Gerais, Paraná State, Brazil	São Paulo, São Paulo State, Brazil
TIMEFRAME	2018		
TECHNOLOGICAL COVERAGE	Aluminum Oxide – Bayer Process Electrolytic aluminum – Soderberg Process	Elemental chlorine-free bleached cellulose process	CONV C30 B1 SL10±2 Specification
SOURCE OF DATA	Primary data was taken from the companies' internal control software, such as SAP, from environmental monitoring reports and from readings of measurement instruments. Secondary data was obtained from the ecoinvent database, v.3.5 (WERNET et al., 2016).		
ENVIRONMENTAL IMPACT CATEGORIES ANALYZED	Aquatic acidification, terrestrial acidification, water scarcity, freshwater eutrophication, marine eutrophication, freshwater toxicity, human toxicity		

SOURCE: the authors

During preparation of the life-cycle inventory and evaluation of the water footprint, all relevant inputs into and outputs from the system were quantified. In this way, primary and secondary data were collected for each process with respect to water inputs (including type and location), raw materials, inputs, electricity and fuel, water discharged, contaminants, products and co-products.

For the Life-Cycle Impact Assessment (LCIA), we selected categories of environmental impact related to the quality (acidification, eutrophication and toxicity) and quantity (scarcity) of water. The methods used can be seen in Table 2.

Table 2. Environmental impact assessment methods

	IMPACT CATEGORY	DESCRIPTION	ASSESSMENT METHOD
WATER QUALITY	Aquatic acidification	This refers to an increase in the acid content in the atmosphere caused by the emission of sulfur oxides and nitrogen oxides, which are dissolved by atmospheric moisture and return to the earth's surface in the form of acids. This effect is popularly called "acid rain."	Impact 2002+
	Eutrophication	This refers to an increase of nutrients in water, principally nitrogen and phosphorus, leading to an increase in the proliferation of algae and to a drop in the concentration of oxygen available, which affects higher-level organisms such as fish. Eutrophication can cause undesirable changes in the number of species in an ecosystem and is thus a threat to biodiversity.	ReCiPe 2016 Midpoint (H)
	Toxicity	This refers to negative impacts on human health or ecosystems caused by exposure to toxic substances present in the environment — air, water or soil.	USEtox 2 (recommended + interim)
AMOUNT OF WATER	Water shortages	This refers to the consumption of water compared to its availability and the existing water demands at the location, evaluating the potential for water shortages.	AWARE 1.01

SOURCE: adapted from SDC (2020) and CADIS et al (2016)

The environmental impact assessment methods mentioned above relate system inputs and outputs to their potential effect on the environment. It is worth highlighting that the water shortage footprint was assessed using the AWARE method, using annual, regionalized factors for the Brazilian states (BOULAY & LENOIR, 2020).

### 4.3. **Assumptions and limitations of the study**

Throughout this study, a variety of assumptions and methodological choices were made and some limitations were found. Namely:

- The water footprint results presented in this study correspond only to the product and scope analyzed and cannot be used for generalizations of any kind;
- We do not intend to use the results of this study to make comparative statements for public dissemination.
- For the water scarcity analysis, we used the AWARE method, with characteristics specific to the year and state. A better way to represent the water availability of each region would be to increase the degree of regionalization of the AWARE method to the basin level.
- Whenever possible, primary data collected from the company was used. However, some secondary data was used for background processes. In this case, preference was given to Brazilian data from the ecoinvent database v 3.5, and foreign data was used when domestic data was unavailable.
- Lastly, this study was limited to analyzing only the environmental impacts associated with water resources using the water footprint technique. However, there are other environmental impact categories, such as climate change, that can play an important role in the environmental footprint of products. They therefore need to be taken into account when making decisions.

#### 4.4. Results of the calculation of the water footprint

The consolidated results of the water footprint analysis of the products selected by the three companies participating in the Water Unites Us – SuizAgua Brasil Initiative are presented below.

##### Technical results



##### CORPORATE WATER FOOTPRINT Companhia Brasileira de Alumínio

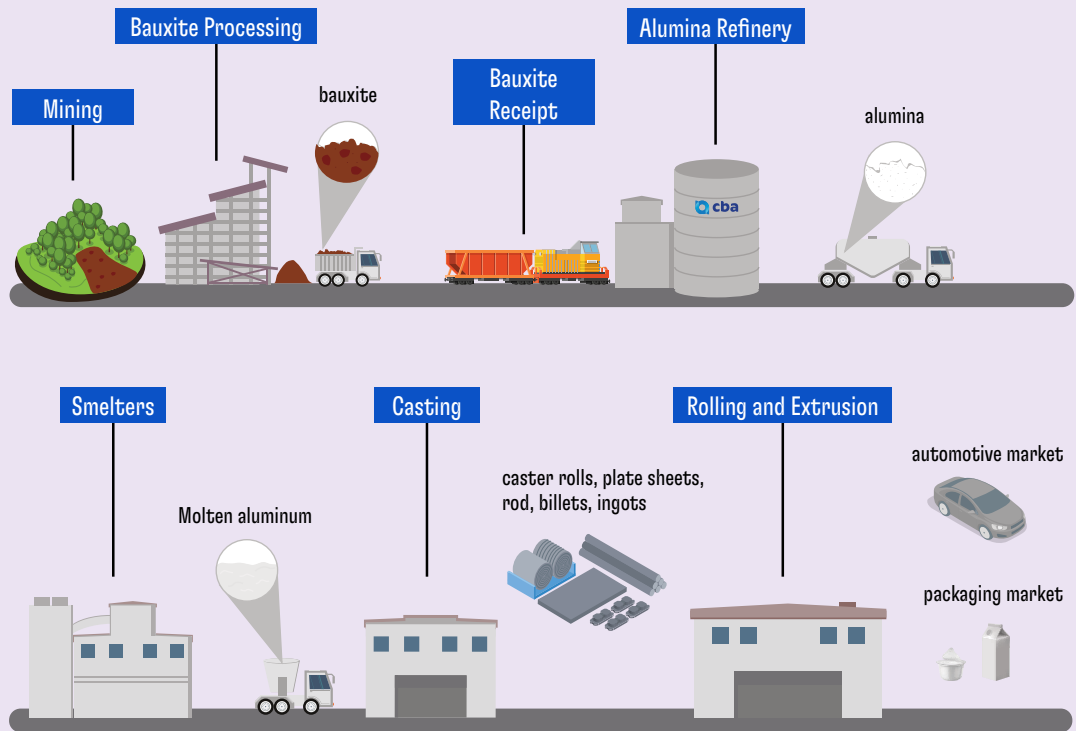
A CBA is an aluminum producing company, responsible for all production stages, from mining and processing of bauxite, through refining, electrolysis, casting to finishing of final laminated and extruded products.

##### Objective

To analyze the impact of water use, from the extraction of raw materials to the production of 1 ton of thin aluminum foil, using the Water Footprint tool.

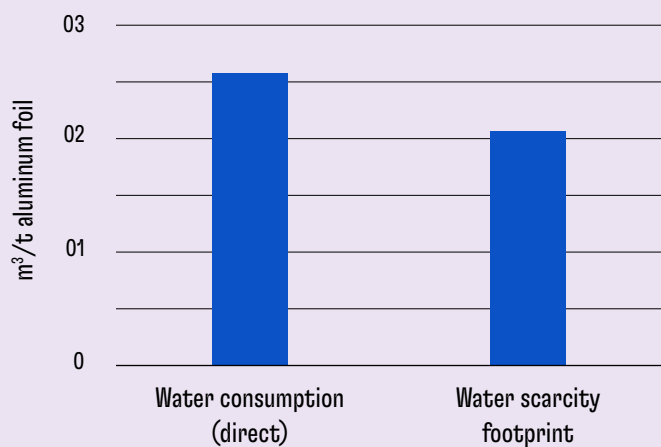
##### Product and System Analysis

The thin aluminum foil was the product chosen for the water footprint analysis. It is the product manufactured at CBA that has the shape closest to that used by the final consumer. The aluminum foil can be used as “aluminum foil” or compose several types of packaging. The packaging market represents a significant percentage of the company's revenue.



## Direct Water Use

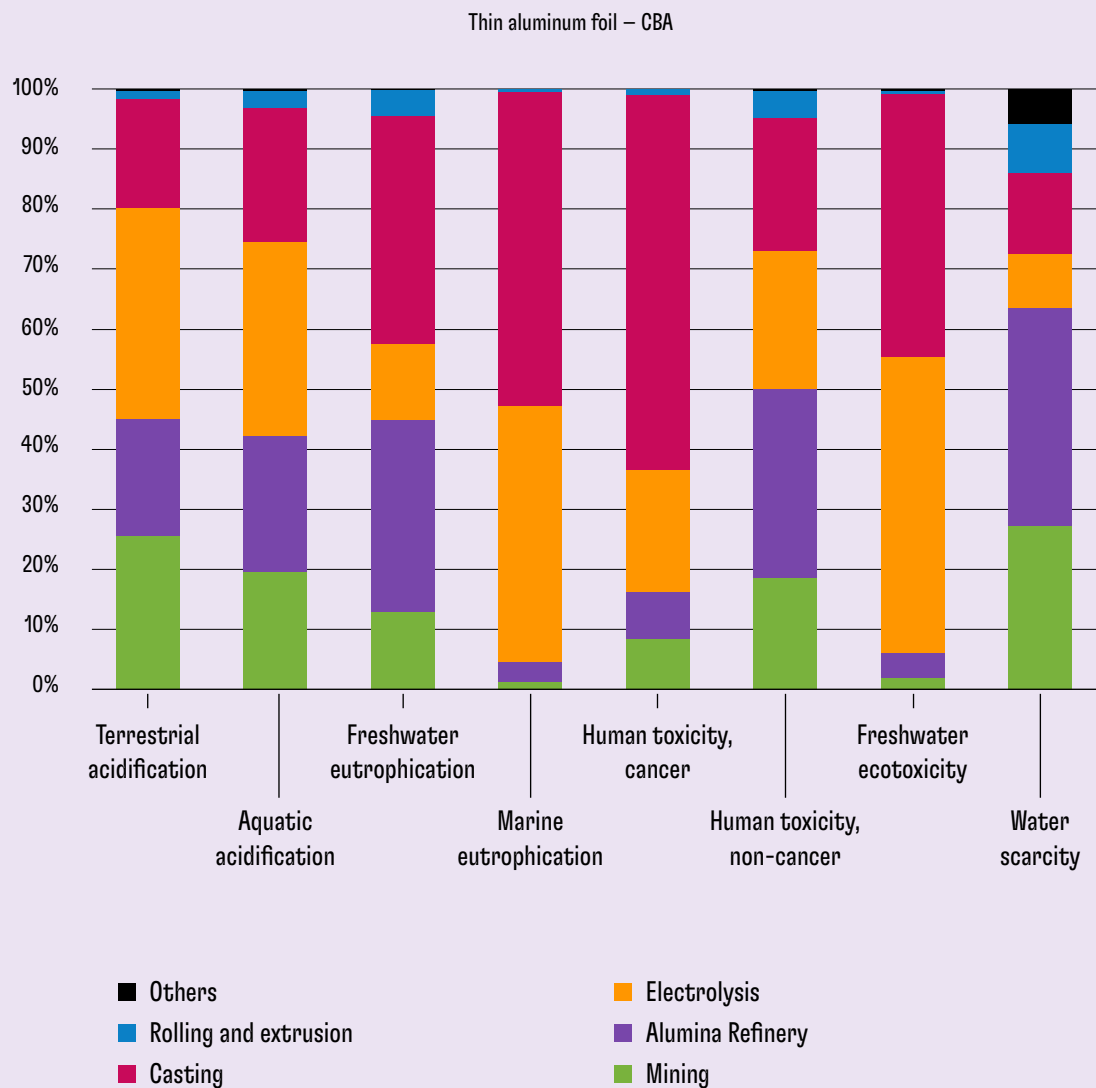
Water is essential in aluminum production. At CBA, it is used in the treatment of bauxite, in the refinery, wet gas scrubbing systems and cooling processes. At the CBA plant, water is collected from 6 different locations of surface and underground bodies of water surrounding the plant. After its use, the effluents are treated and reused on-site in a closed-loop system.



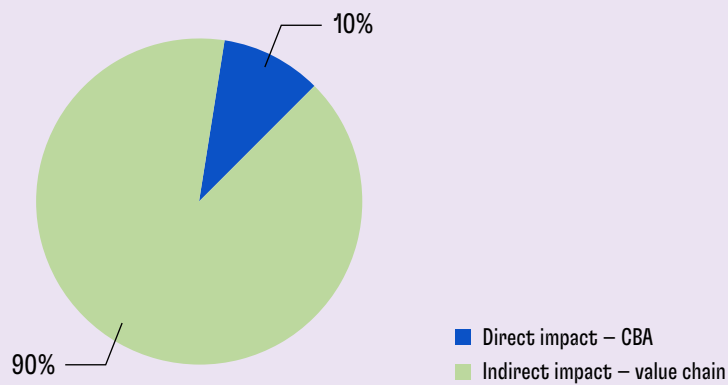
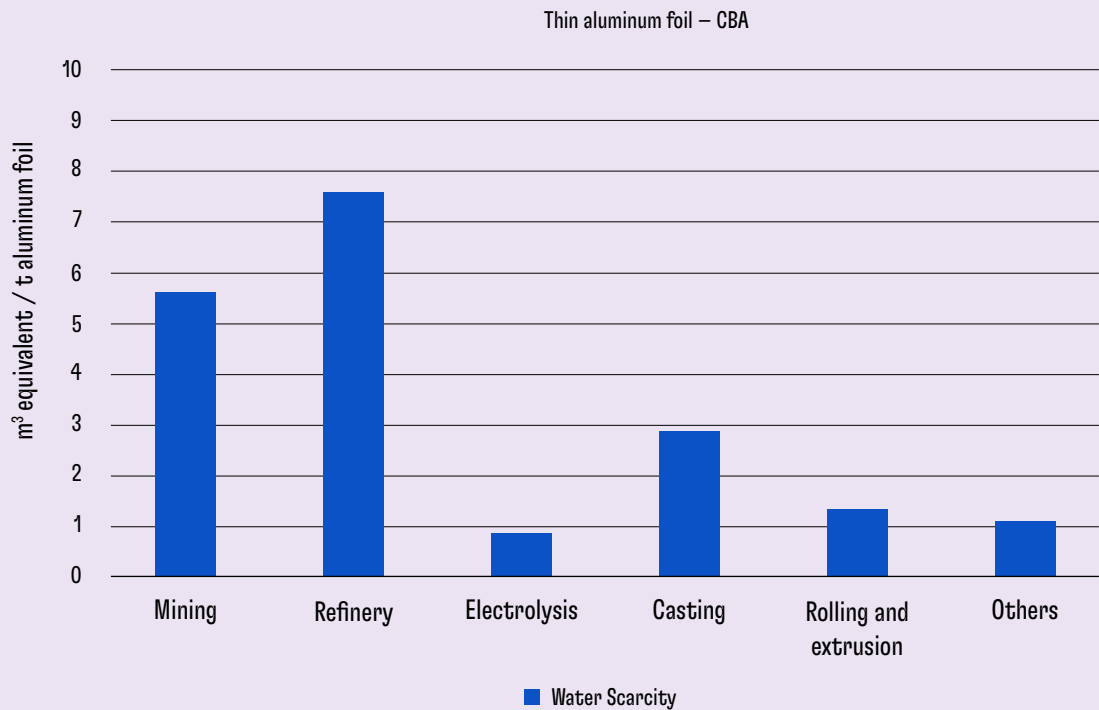


The water scarcity footprint (AWARE) is a key indicator that assesses the potential of water deprivation to humans or ecosystems, building on the assumption that the less water is available per area, the more likely another user will be deprived of it.

## Water Footprint Profile



The main impacts on the water scarcity footprint of thin aluminum foil relate to the processes of aluminum oxide extraction (Alumina Refinery) and bauxite extraction (Mining).



Since the energy matrices vary considerably from one country to another, we have opted to exclude the impacts of electricity consumption from this study, so as to compare it to the results from the global aluminum market. Still, 90% of the aluminum foil water scarcity footprint is indirect and occurs during production of the inputs needed to manufacture thin aluminum foil.

## Water scarcity footprint by process:

- Mining: 70% in the production of fuel to transport bauxite
- Refinery: 98% in the production of caustic soda used in refining aluminum oxide
- Electrolysis: 92% in the production of fluoride used to produce liquid aluminum
- Casting: 82% in the production of silicon antialloy added to the cast products

## Main Reduction Actions

Possible actions to reduce the water footprint include:

- To monitor new and existing projects that aim to reduce the consumption of inputs identified as critical;
- To engage the suppliers of these inputs regarding sustainability criteria.

Calculations based on ISO 14046:

Water Footprint – Principles, requirements and guidelines

SOURCE: the authors

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## Technical results



### CORPORATE WATER FOOTPRINT

#### Klabin

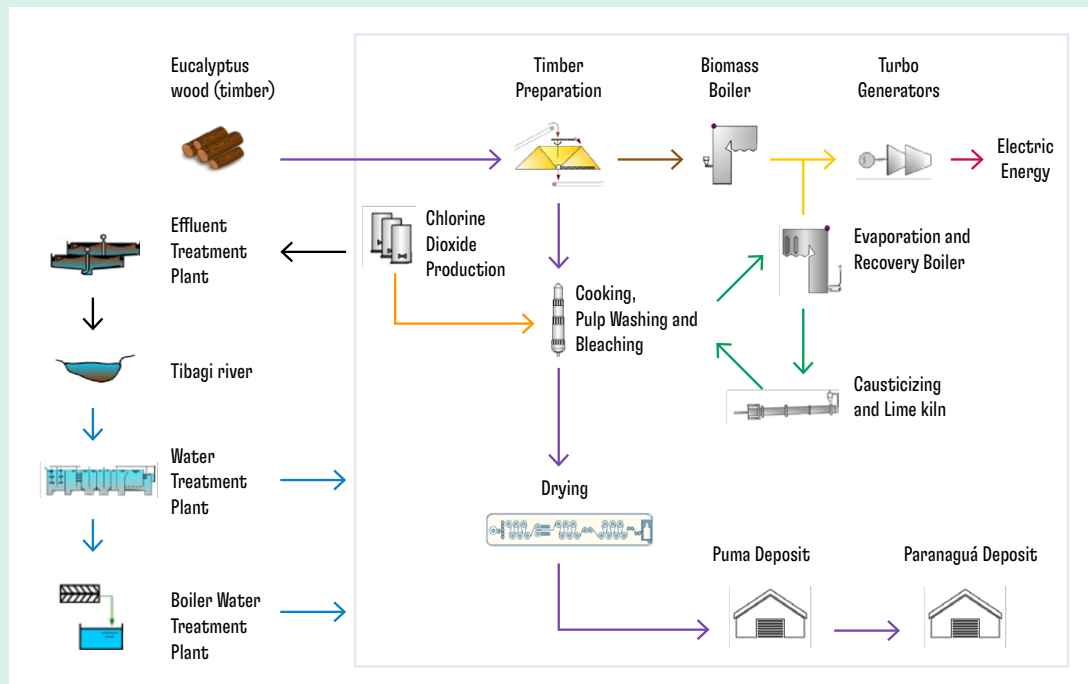
Klabin is a leading company in the production of packaging paper and board, corrugated cardboard packaging and industrial bags. In Brazil, it is the only company to offer short pulp, long pulp and fluff pulp solutions.

#### Objective

To analyze the impact of water use and contamination, from the extraction of raw materials to the production of 1 ton of short pulp, using the Water Footprint tool.

#### Product and System Analysis

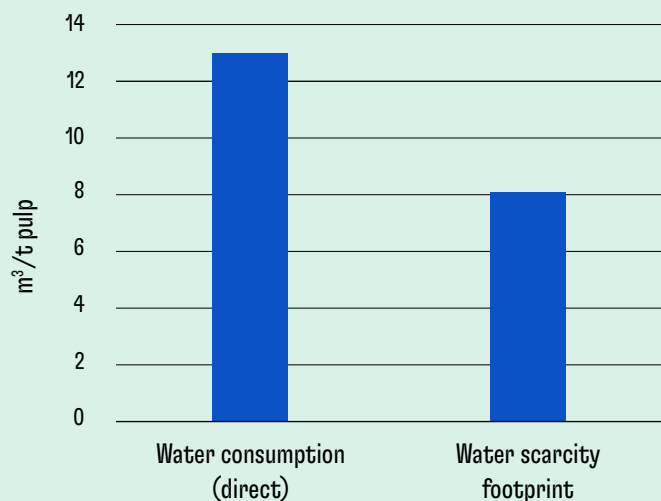
The product under analysis was eucalyptus pulp, produced at the PUMA unit, located in Ortigueira, Paraná. In short, two macro steps compose the production process: (i) planted forests: silviculture, harvesting and transport; (ii) industry: timber preparation, cooking and washing, bleaching and drying.



SOURCE: the authors

## Direct Water Use

In forestry production, water is used mainly in the silviculture stage. In the industry, water is captured and used mainly for steam generation and for cooking, pulp washing and bleaching.

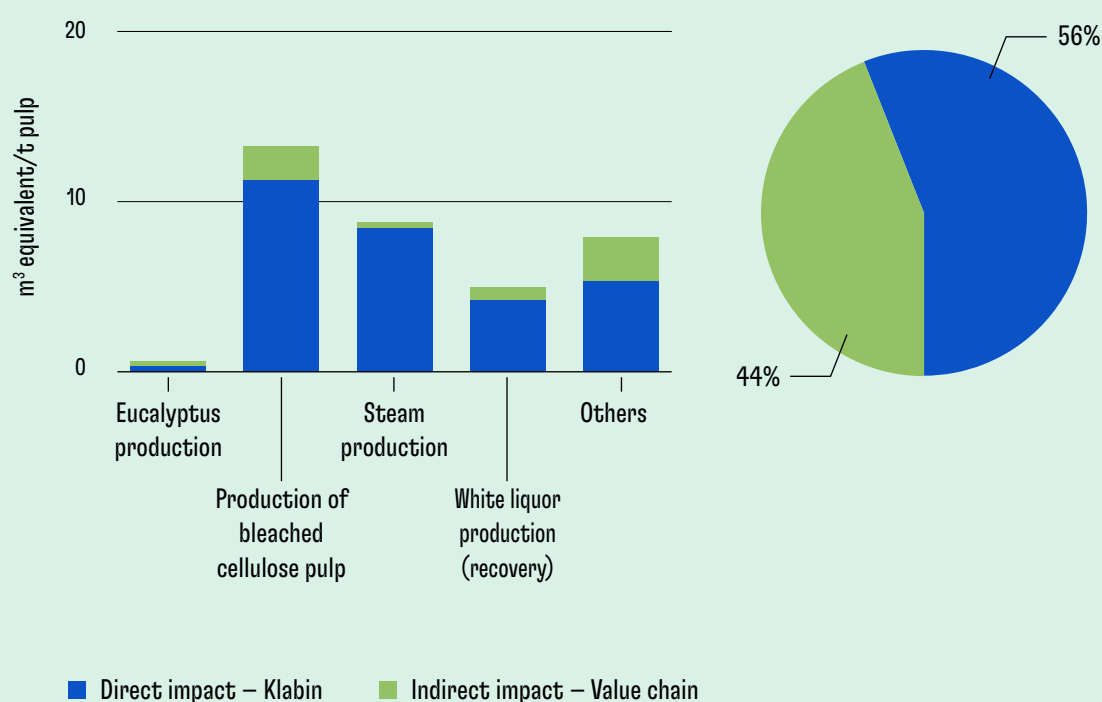


The water scarcity footprint (AWARE) is a key indicator that assesses the potential of water deprivation to humans or ecosystems, building on the assumption that the less water is available per area, the more likely another user will be deprived of it.

## Water Footprint Profile

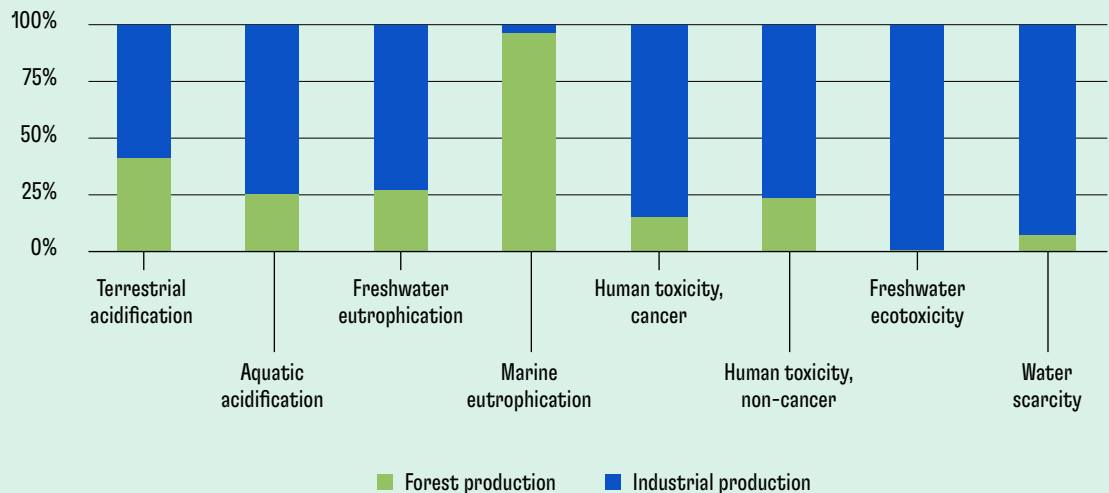
### WATER SCARCITY FOOTPRINT

Forest production represents 7% of the pulp water scarcity footprint and the remaining 93% is a result of the industrial process. The main hotspots of the water scarcity footprint were: in the production of branched cellulose pulp, in the production of steam in the biomass and recovery boilers, and in the production of white liquor through the chemical recovery cycle of the process. 56% of the impact is direct and 44% of the impact is in the supply chain.



## POTENTIAL IMPACT INDICATORS

Evaluating industrial and forest processes in the production of Eucalyptus pulp, the largest impacts are indirect, i.e., they occur in the supply chain of agricultural inputs. For the industrial process, water consumption and effluent generation stand out as other environmental impacts.



## Main Reduction Actions

Among the main activities to be carried out are:

- Precision agriculture study to reduce the volume of water consumed in the application of herbicides;
- Study to increase the generation of higher quality condensate in evaporation, allowing greater use in the pulp cooking and washing process.

Calculations based on ISO 14046:

Water Footprint – Principles, requirements and guidelines

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SOURCE: the authors

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## Technical results



### CORPORATE WATER FOOTPRINT

#### Votorantim Cimentos

Votorantim Cimentos is a mining and construction materials producer, with locations in 11 countries. In Brazil, it is the largest cement manufacturer, with 18 complete factories, 9 mills, 38 concrete plants, among other production and support units. The focus of this study was the Basins of Alto-Tietê and Tietê-Sorocaba, in the state of São Paulo, regions which are subject to water scarcity.

#### Objective

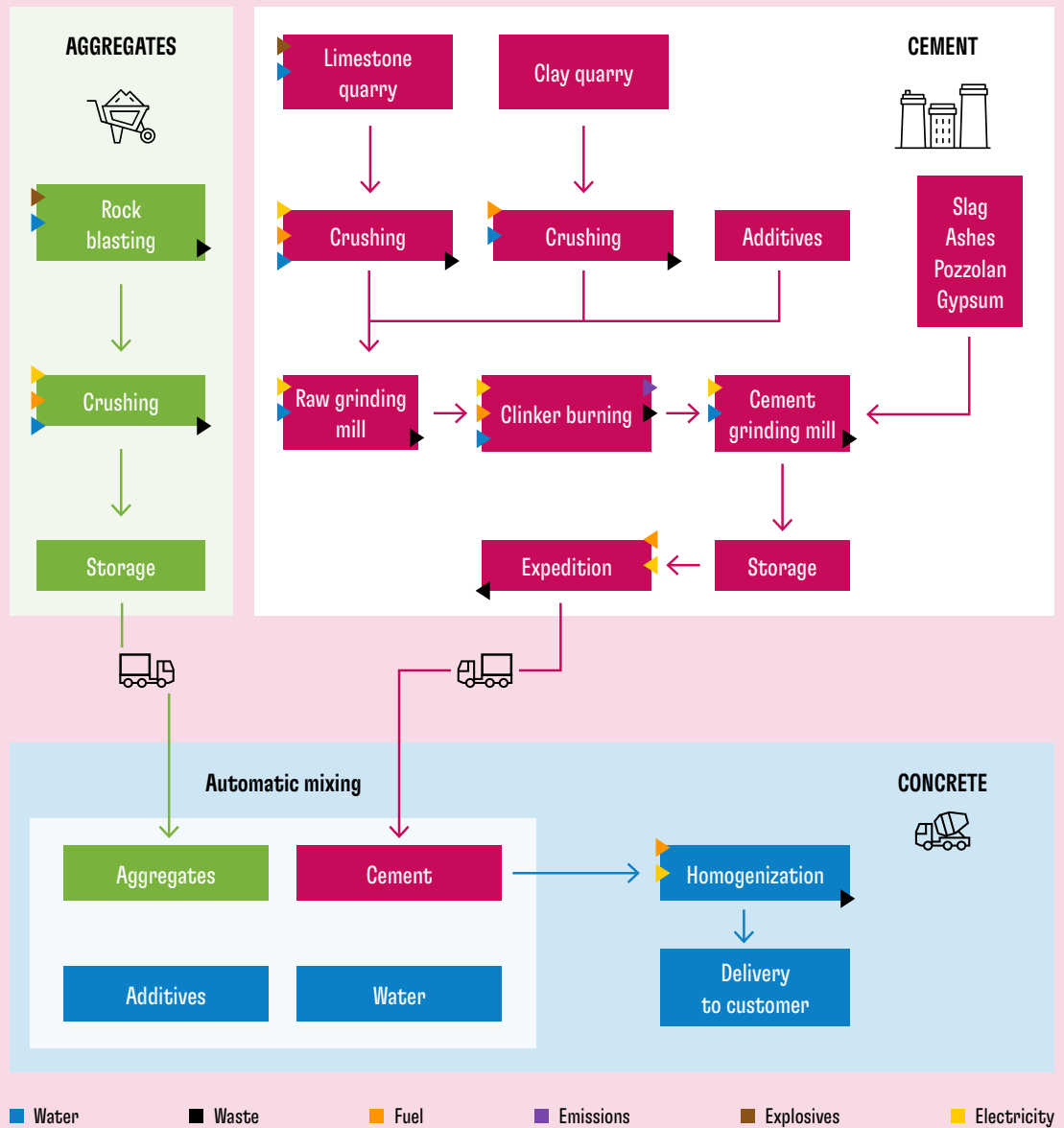
To analyze the impact of water use and contamination, from the extraction of raw materials to the production of 1 m<sup>3</sup> of concrete using the Water Footprint tool.

#### Product and System Analysis

The product under analysis was the “Concrete mix in Central” produced at Engemix – Jaguaré unit, located in the city of São Paulo – Brazil. With a production capacity of 230,000 m<sup>3</sup>/year of concrete, this unit is prominent in the local civil construction market. The production stages are: 1. Receipt/storage of inputs; 2. Mixing and homogenization and; 3. Shipment to the client. Due to the importance of cement and aggregates to produce concrete, this study was extended to the plants that produce these inputs,



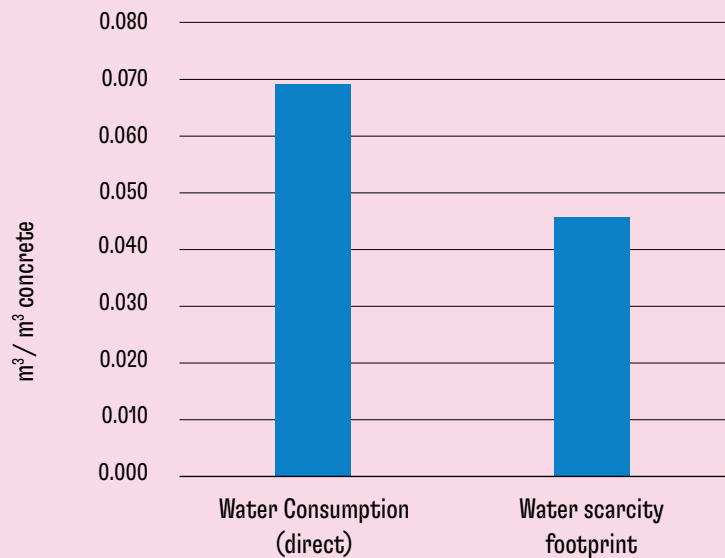
Santa Helena Cement Factory, in the municipality of Votorantim – SP, and the Araçariguama Aggregates Unit, in the municipality of Araçariguama.



SOURCE: the authors

## Direct Water Use

Votorantim Cimentos uses water in the units under analysis largely to moisten roads (in the mining stage); for equipment cooling (in the industrial stages) and in the production of concrete (in the mixing stage). It should be highlighted that the industrial stages of crushing and grinding are energy-intensive.

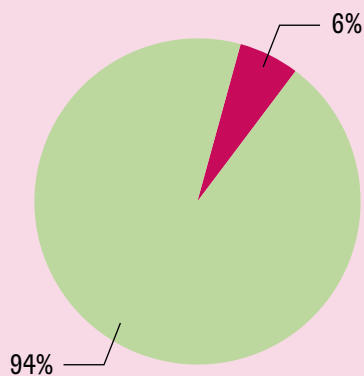


The water scarcity footprint (AWARE) is a key indicator that assesses the potential of water deprivation to humans or ecosystems, building on the assumption that the less water is available per area, the more likely another user will be deprived of it.

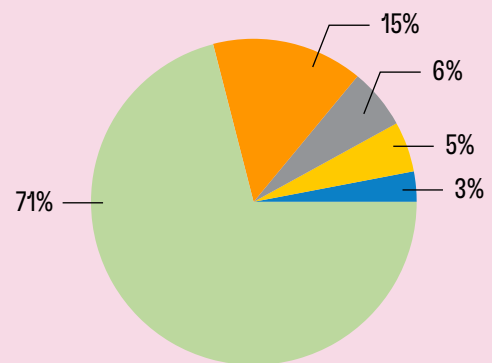
## Water Footprint Profile

### WATER SCARCITY FOOTPRINT

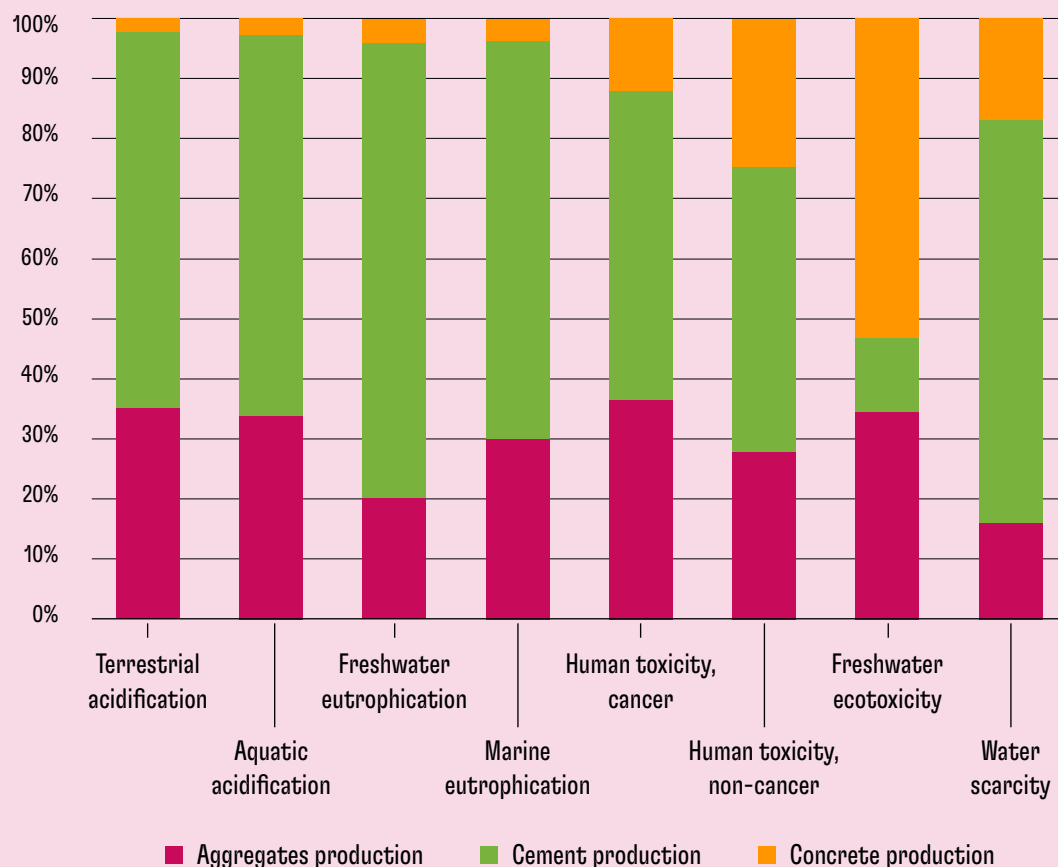
The direct impact of water consumption in the concrete, cement and aggregates plants represents only 6% of the water scarcity footprint, and the remaining 94% are indirect impacts from the production of inputs and energy. In addition, by analyzing the indirect impacts, the results indicate that cement production has the largest impact on the water footprint of concrete (71%), followed by the production of drinking water (15%) and aggregates (11%).



■ Direct impact – Votorantim Cimentos  
■ Indirect impact – Value chain



■ Electricity  
■ Sand  
■ Gravel  
■ Tap water  
■ Cement



#### POTENTIAL IMPACT INDICATORS

Cement production impacts nearly all aspects under analysis, except ecotoxicity, on which concrete production has a larger impact. The full study shows the large impact of the processes which are intensive in electricity (crushers and mills) and in fossil fuels (clinker) and that produce waste and atmospheric emissions on the water footprint.

## Main Reduction Actions

As avenues to reduce the water footprint, we can list actions aiming to reduce direct water consumption and the consumption of electricity and thermal energy.

- To improve consumption management by measuring consumption and acting in case of non-compliance;
- To use electric power from renewable sources;
- To increase the use of thermal energy from alternative fuels

Calculations based on ISO 14046:

Water Footprint – Principles, requirements and guidelines

SOURCE: the authors

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## 4.5. **Water footprint reduction plans**

Understanding the magnitude of environmental impacts along the value chain is essential for more efficient, integrated management of water resources. Once the product's water footprint has been calculated, including analysis of the results and the critical points identified, one can define action plans to reduce impacts. This section describes the process of defining and implementing these plans by the companies participating in the Water Unites Us initiative.

The process of defining the water footprint reduction plans was carried out in internal meetings with the companies' teams, generally involving managers and their teams of engineers, analysts and consultants in the fields of sustainability, the environment, continuous improvement, etc. At the same time, the companies continue to work on disseminating knowledge throughout the teams in order to continually monitor and evaluate their water footprints.

In general, the results of the water footprint method showed that a large part of the impact comes from the production of inputs used in the production process. For this reason, the companies took internal actions, of direct control, in order to: (i) increase the efficiency of processes, (ii) reduce and/or reuse water and (iii) reduce the consumption of inputs that contribute the most to the water footprint. In other cases, external actions (or indirect control) were taken to ensure that the suppliers of these inputs would improve their indicators and performance.

DIRECT CONTROL ACTIONS	INDIRECT CONTROL ACTIONS
<p><b>Actions related to operations over which the company has direct control, “within the company’s walls.”</b></p> <p>In this category we can include operational actions oriented toward increasing the efficiency of processes, reducing water and energy consumption, and reducing consumption of critical inputs, but also governance actions to develop a management plan or a broader corporate water strategy.</p>	<p><b>Actions that are not under the direct control of the company, but allow it to extend management “beyond its walls.”</b></p> <p>In this category we can include actions oriented towards engaging suppliers of critical inputs regarding their indicators and environmental performance.</p>

Many of the water footprint reduction plans require investments in technology and innovation. On the other hand, once the reduction plans are implemented, there are often significant savings in resources and operating costs.

The main water footprint reduction plans for the products selected by the companies can be seen in Table 3. It is important to emphasize that the action plans could be long-term and do not necessarily need to be completed before the end of the Water Unites Us Initiative. Furthermore, other measures to reduce the water footprint can be studied/evaluated.

Table 3. Summary of CBA's Main Water Footprint Reduction Plans

COMPANY	REDUCTION PLAN	DESCRIPTION OF BEST PRACTICES/TECHNOLOGIES
CBA	PLAN 1	Identification of projects that would result in sustainability gains in Competitiveness Management.
	PLAN 2	Mapping of all internal initiatives to reduce inputs that are critical for the water footprint, calculating potential gains and monitoring projects for the following initiatives: Competitiveness Management, Lean 6Sigma Projects, IdeAL, Tecnologia, etc.
	PLAN 3	Monitoring of new projects, calculating their respective potential gains.
	PLAN 4	Purchase of the software SimaPro® to carry out LCA with primary data from suppliers of critical inputs, and constant updating of the water footprint.
	PLAN 5	Sustainable Supplies Project: incentives to suppliers to improve internal indicators.
KLABIN	MANAGEMENT	Formation of an internal committee to manage the water used by the factory.
	PLAN 1	Installation of a new trim condenser in Evaporation Plant I.
	PLAN 2	Clean streets with rainwater.
VOTORANTIM CIMENTOS	MANAGEMENT	Review and update the Water Management Plan (WMP).
	PLAN 1	Increase in thermal substitution by co-processing class I waste at the Salto unit.
	PLAN 2	Allocation of wind power for the Santa Helena unit.
	PLAN 3	Review and adjustment of the industrial water supply system at Santa Helena.
	PLAN 4	Improvement in the feeding system of the Santa Helena cement mill.
	PLAN 5	Reduction in the quantity of extra air in the raw grinding mill – Santa Helena.
	PLAN 6	Replacement of crushers in Araçariçuama.
	PLAN 7	Dissemination of results to management and employees at the factories involved.

SOURCE: the authors



## 5. Forming Partnerships and Sharing Knowledge

With the objective of improving implementation of tools for more efficient water management, the Water Unites Us – SuizAgua Brasil initiative joined forces with partners in order to broaden knowledge on the subject and encourage dialogue and the exchange of experiences between different stakeholders.

To this end, two strategic partnerships were signed, with the consulting firm ACV Brasil and with the Brazilian Network of the UN Global Compact. Furthermore, from 2018 to 2021, FGVces scheduled Training, Events and Meetings to continue improving practices and the collaborative construction of knowledge on the Water Footprint technique as a corporate management tool.

Within the scope of the Project and through the Latin American Community of Practice, we were also able to learn about an innovative incentive program developed by the Autoridad Nacional del Agua of Peru – Blue Certification. This initiative, first implemented by the Peruvian government in 2015, has also been used in Chile since 2019. Other Latin American countries (like Brazil, Mexico and Colombia) have also been considering implementing it.

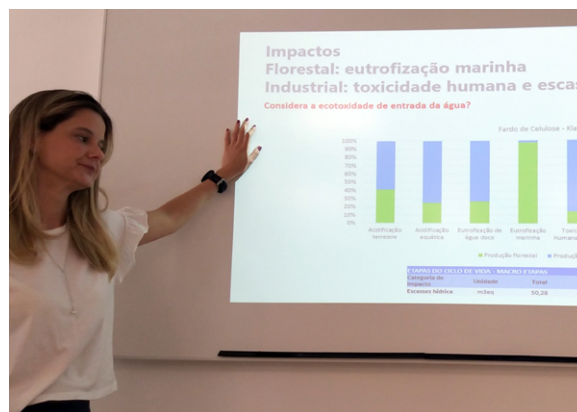
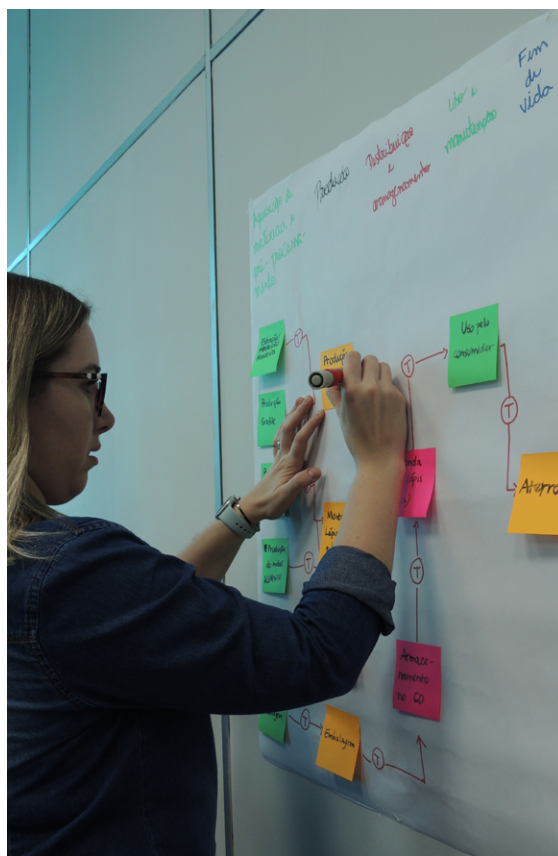
Interactions between countries, between different levels of government, and between different sectors of civil society and the private sector led to important discussions that advanced the water management agenda in Brazil. Below is a brief description of the actions carried out in this context.

## 5.1. Partnership with ACV Brasil

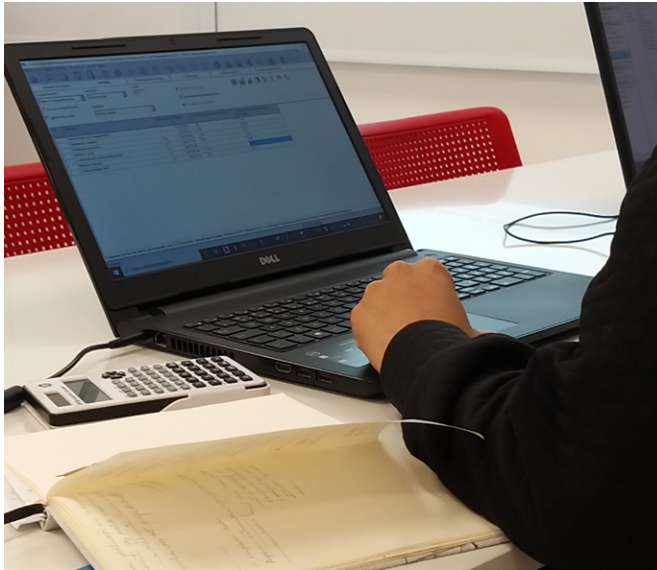


In 2019, FGVces entered into a partnership with ACV Brasil, the company representing SimaPro<sup>®</sup> software in Brazil. SimaPro<sup>®</sup>, developed by the company PRé Consultants, has users in more than 80 countries and is the most popular software program for Life-Cycle Assessment.

The partnership gave the member companies of the Water Unites Us Initiative — CBA, Klabin and Votorantim Cimentos — the opportunity to work directly with Simapro<sup>®</sup>, learning, in practice, how to model data and explore the results of the water footprints of products. To this end, the companies also received training on how to use Simapro<sup>®</sup>.







## 5.2. Partnership with the Brazilian Network of the UN Global Compact



Another important partnership was signed in 2020 between FGVces and the Brazilian Network of the Global Compact – the corporate sustainability initiative linked to the United Nations (UN). Together, the two organizations intend to attain Sustainable Development Goal (SDG) 6, which seeks to ensure the availability and sustainable management of water and sanitation for all by 2030. Within the scope of this rich partnership, two webinars were held on awareness of and training on the water footprint approach and SDGs.

## 5.3. Blue Certification

Blue Certification<sup>2</sup> is a federal government certification, granted by its National Water Agency, to all companies that conduct activities or implement technologies to improve water use and reduce their water footprint. This certification emerged in Peru in 2015, through a partnership between a government agency and the SDC, and was implemented in Chile in 2019.

The initiative hopes to create synergies between the private sector, the public sector and communities in order to promote sustainable water use at the basin level. According to Giovanni Calderón, former Executive Director of the Agency for Sustainability and Climate Change of Chile, this instrument provides two great incentives for private companies:

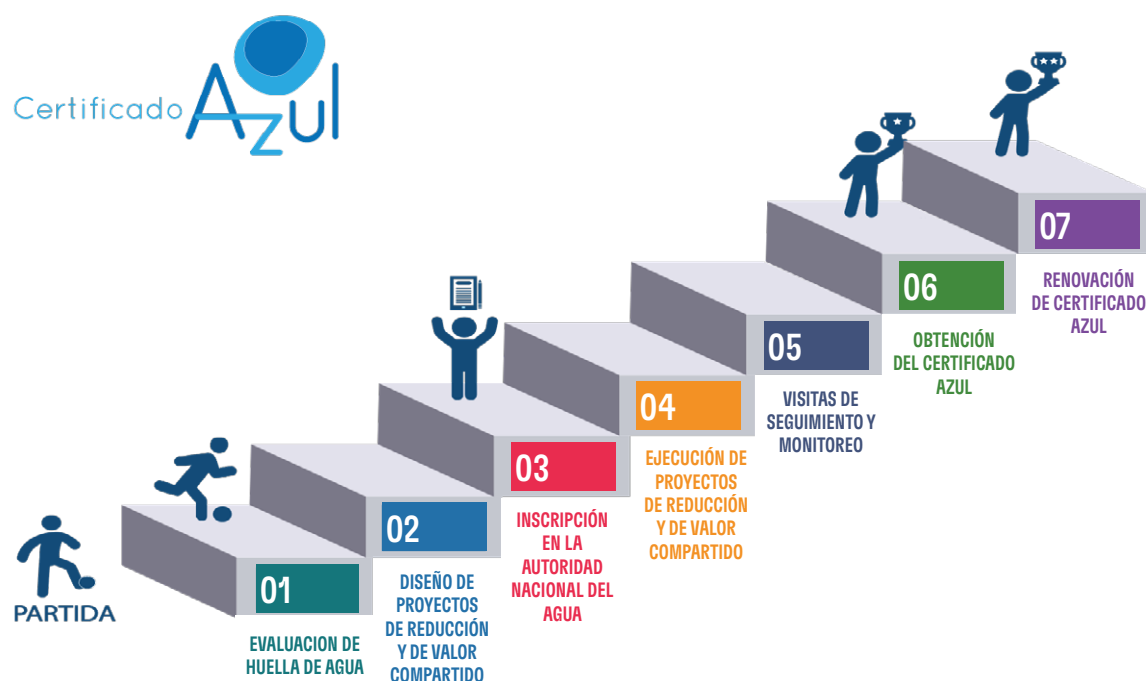
<sup>2</sup> <http://certificadoazul.ana.gob.pe/>

1. Cost-efficient solutions: With the water footprint diagnosis for their products, companies are able to identify critical points and implement plans to reduce the water footprint along their value chain. They can make their production processes cleaner and more efficient, reducing operational expenses.
2. Benefits for the company's reputation: the certification can strengthen the image and the brand of the company in the eyes of clients, suppliers, investors and the entire community.

Furthermore, other public incentives can be added to the certification program. The Chilean government, for example allows tax deductions for private sector investments in more sustainable actions and technologies. In Peru, certified companies have additional advantages when competing in public procurement procedures.

To obtain Blue Certification, companies must complete the following steps (Figure 4):

Figure 4. Steps to obtain Blue Certification



SOURCE: adapted from Mariluz & Mayolo (2021)

1. Determination of the water footprint of a facility's current operations;
2. Development of a plan and commitment to reduce the company's water footprint at the site;
3. Collaboration between the private sector, the public sector and the community to develop a water resources management plan and share water resources at the river basin level;
4. Execution, by the company, of the plans and commitments outlined in the plans for changes, both at the site and in the river basin;
5. Evaluation of the company's execution of the plans by the National Water Authority Committee (Peru Water Authority)

Blue Certification, through the water footprint tool, permits calculation of environmental impacts throughout a product's life cycle and allows the private sector to take actions to reduce water impacts and risks more broadly, taking the entire chain of value into consideration.

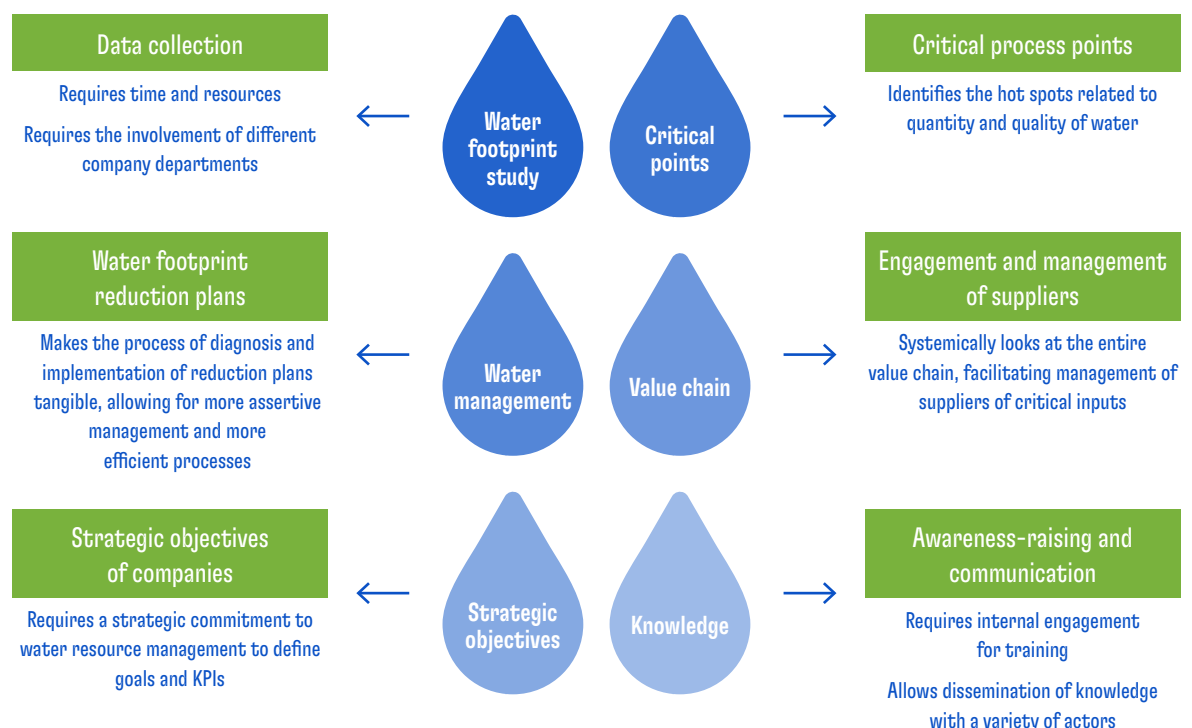


## 6. Challenges and Lessons Learned

The Water Unites Us Initiative has proven to be an important water management success story in Brazilian companies. Through our experience in this initiative, we noted that that, despite the lack of similar projects in Brazil, there is a growing demand from corporations for management tools like the water footprint technique.

Naturally, over the 32 months of the project, several challenges were faced and important lessons were learned. These are summarized in Figure 5 and are shared below.

Figure 5. Principal challenges and lessons learned from the Water Unites Us – SuizAgua Brasil Initiative



SOURCE: the authors

The water footprint is a management tool that can provide a wide range of information about a given product, making the process of diagnosis and implementation of reduction plans tangible and helping companies move towards more assertive, efficient management of resources. Despite this, this tool still faces limitations, such as the lack of representative data on what really occurs in Brazil and the need for a large time investment, specialized professionals and financial resources.

The lack of regional data on the production of inputs and the technologies adopted is a major challenge for its implementation. The financial investment needed to purchase lifecycle assessment software and databases is yet another challenge faced by companies.

Furthermore, different sectors of the companies must be involved from the initial stages of the project. The business world's lack of knowledge about the methods, tools, software and applicability of the water footprint technique is an additional hurdle for implementation and strengthening of the initiative; therefore, a long process to raise awareness and engagement must be carried out before starting the project itself.

The Water Unites Us initiative will only be successful if water management is among the strategic objectives of the companies. This alignment with the commitments of CBA, Klabin and Votorantim Cimentos facilitated the process of internal engagement, the definition of goals and indicators, and the implementation of water footprint reduction plans.

Lastly, introducing a new theme in the sustainability management practices of companies is not an easy task, and there is still a lot to be explored. Changing a company's thinking to the systemic view provided by the water footprint is a challenging process that requires that companies alter their risk mitigation strategies and supply chain management.



## 7. Final conclusions

The water footprint is one of the various water management tools than can be used in industry. As previously mentioned, its adoption provides companies with a transversal view of the product, showing not only direct impacts, but also possible indirect impacts from other links in their production chain. Additionally, it allows more comprehensive, integrated management of environmental impacts related to water resources (quantity and quality).

As a management tool, the water footprint made possible the quantification of the environmental impacts arising from the quantity and quality of water used for the products selected by the companies CBA, Klabin and Votorantim Cimentos. Analysis of these results identified hotspots throughout the value chain, increasing knowledge of the direct and indirect impacts related to the product.

Although the study is limited to a few operational units, the results support the need for development of a culture of efficiency and reduction of waste, both in terms of water consumption and consumption of inputs identified as being critical. The actions defined for each company in this project can be replicated for other products and factories. Additionally, calculation of the water footprint should not be a one-time exercise, but rather periodical, as a complement to other company indicators.

In addition to the technical results, participation of companies in Water Unites Us – SuizAgua Brasil allowed sharing of knowledge and lessons learned in Brazil and Latin America, inspiring other actors to a more efficient use of water. Through the dissemination of techniques

and initiatives such as those presented in this report, companies can obtain more complete diagnoses in order to outline goals for reducing water impacts throughout their value chain.

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