brazilian tree industry

CARING FOR WATER MEANS CARING FOR THE FUTURE

Water management in the tree plantation sector

2026 EDITION

Water: performance and transparency

The Brazilian tree plantation sector grows trees for industrial purposes and restoration, and is exemplary when it comes to water management.

It is a global reference for bioeconomy on a large scale, offering biologically based products made sustainably from renewable raw materials. The sector plants over 10 million hectares of trees for commercial purposes, and preserves another 7 million hectares of native vegetation. These areas are essential for water conservation, since they protect springs, maintain soil stability, and regulate water availability.

For decades, sustainable forest management and a commitment to water have ranked among the strategic pillars of this sector. Water management is founded on science, responsible management, and ongoing dialog with society.

This is particularly important as global demand for water continues to grow: an average of 1% per year since the 1980s.[1] At the same time, climate change has added another level of complexity with extreme events that affect water availability such as intense rainfall and lengthy droughts.[2]

The response to this scenario involves more governance, planning, and action. Organized industrial sectors can make decisive contributions by reducing their water use, innovating in their processes, and investing in responsible management to maintain balance in water sources.

This infographic presents some of the advances in the sector, in tree plantations, manufacturing, and at the corporate level, considering the commitments described in Ibá's 2021 publication *Cuidar da Água é Cuidar do Futuro de Todos [Caring for water means caring for everyone's future].*[3]

The **water cycle** in trees

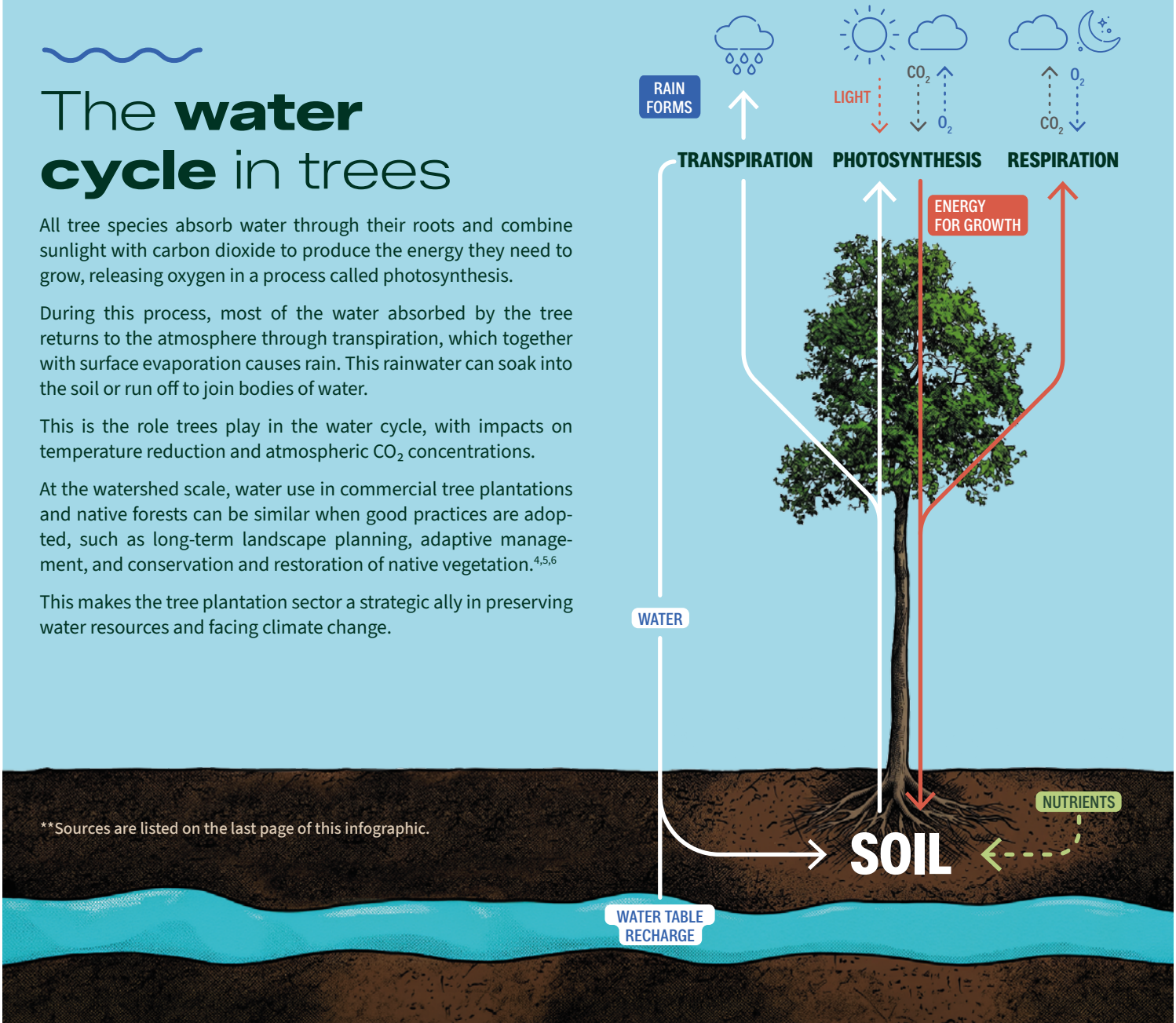
All tree species absorb water through their roots and combine sunlight with carbon dioxide to produce the energy they need to grow, releasing oxygen in a process called photosynthesis.

During this process, most of the water absorbed by the tree returns to the atmosphere through transpiration, which together with surface evaporation causes rain. This rainwater can soak into the soil or run off to join bodies of water.

This is the role trees play in the water cycle, with impacts on temperature reduction and atmospheric CO_2 concentrations.

At the watershed scale, water use in commercial tree plantations and native forests can be similar when good practices are adopted, such as long-term landscape planning, adaptive management, and conservation and restoration of native vegetation.[4,5,6]

This makes the tree plantation sector a strategic ally in preserving water resources and facing climate change.



**Sources are listed on the last page of this infographic.

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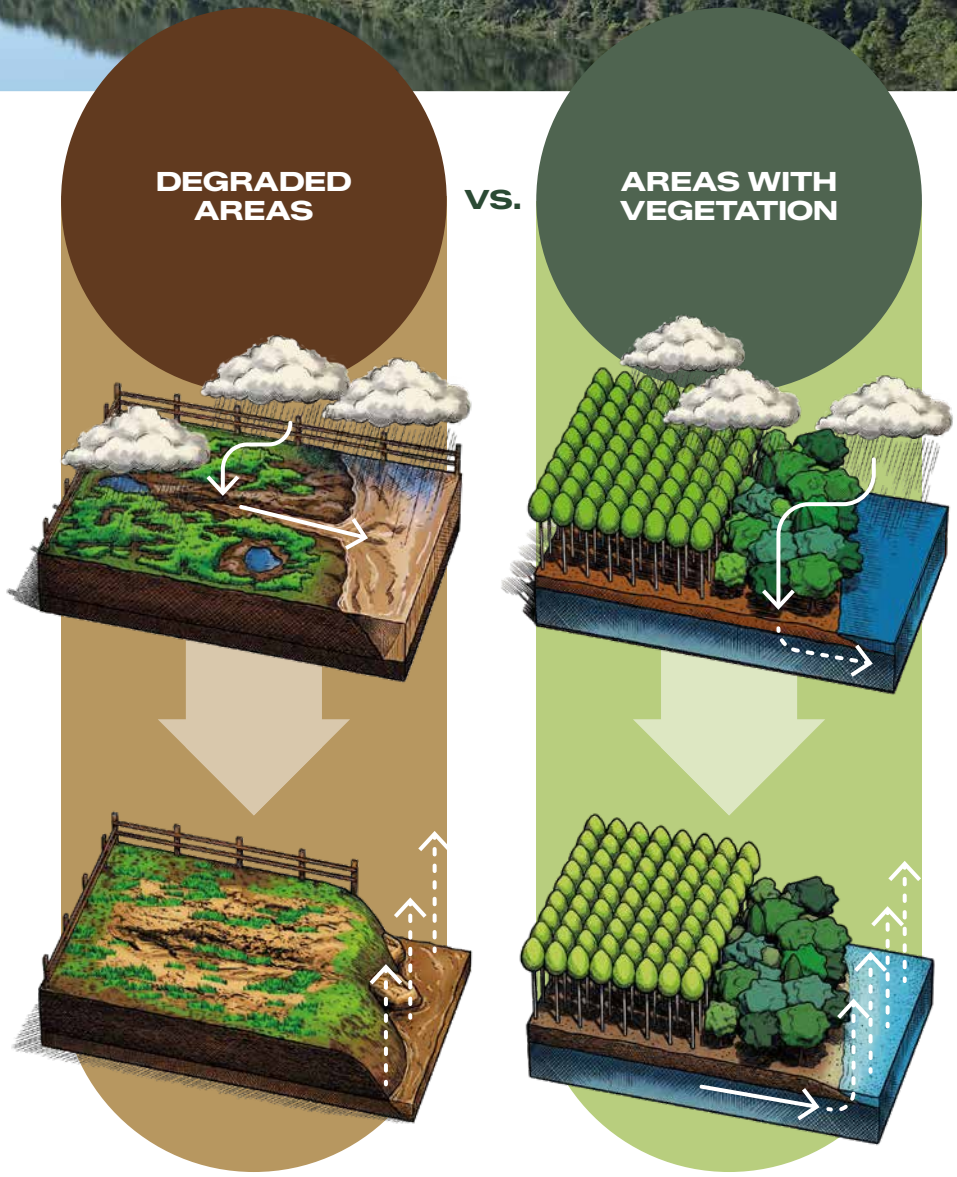
Benefits from forests

Vegetation cover is essential for preserving water.

When rain falls on degraded areas, the water runs off faster and in greater volume; this carries off sediment, reduces soil fertility, increases the risk of flooding, provokes erosion, and affects refilling of aquifers. When vegetation is present, the opposite occurs.

And it is within this context that the tree plantation sector plays another important role. Expansion in the sector mostly occurs in areas with some degree of degradation.[6] When these areas are converted into well-managed commercial plantations or native forests, they can contribute to water quality and regulation over time, in turn expanding availability of this resource.



The **potential for restoration** in Brazil

Brazil has over 100 million hectares of pasture that is degraded to some degree and can be restored or converted into sustainable production systems.[14] The country also has a legal responsibility to create 19 million hectares of natural forests in the form of Legal Reserve and Permanent Preservation Areas.[15]

This dimension offers a major opportunity for large-scale restoration in Brazil.

Restoration is an innovative business, since it makes recovery of ecosystem services possible while also generating benefits for society from projects involving carbon credits, which help companies meet their neutrality commitments.

When plans take local conditions into account,[7] restoration can help regulate water flows and boost ecosystem resilience.[8]

Good practices in tree plantations

The tree plantation sector takes measures to conserve water in an integrated manner throughout the entire production process, from the forests to the factory.

The boxes below describe some of the main activities adopted in forestry; these good practices are founded upon rigorous international management certifications like FSC® and PEFC. In 2024, 61% of the area managed by the sector was certified, with annual third-party verification that requirements were met.

Bracell

MOSAIC PLANTING

Companies plan their tree plantations at the landscape level, in mosaics that integrate preservation areas with productive stands containing different ages and clones. This strategy alleviates variations in river flows,[13] helping to balance water use[6] and stabilize watercourses in the landscape.[9] Mosaic plantings also contribute to biodiversity conservation and biological control of pests and diseases.

LONG-TERM MONITORING

Companies conduct quantitative and qualitative monitoring to understand how water use by trees and management practices are related to water quality and availability in watersheds, permitting adjustments when necessary. These long-term studies support more sustainable decisions.[4,6]

PRESERVATION & RESTORATION

For each hectare of forests planted for commercial use, the sector preserves 0.7 hectares of natural vegetation and carries out restoration projects in degraded areas. These areas serve as buffer zones, preventing erosion and silting,[13] which enhances aquifer recharge and improves water quality[12] by retaining sediment.[6]

SOIL CONSERVATION

The sector takes measures to conserve soils, with direct impacts on water quantity and quality.[11] Some examples include using post-harvest waste as ground cover,[12] and erosion monitoring and prevention through maintaining roadways and rainwater containment structures. These good practices are also implemented in outsourced areas.

SPECIES SELECTION

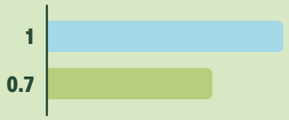
Companies in this sector have a history of investments in applied research for selective plant breeding, focusing on climate adaptation and resistance to pests and diseases. A tree's water use depends directly on the species and clone, as well as soil and climate conditions. Choosing clones with water needs that are compatible with the availability of this resource in their specific watershed is one practice used in the sector.[5]

EFFICIENT USE IN THE NURSERY

The tree plantation sector rigorously monitors the volume of water used in its forest nursery facilities, a stage that is essential in the development of high-quality seedlings. For an average of three months, young trees receive controlled irrigation and care to ensure good performance in the field. This phase is where the sector's main efforts to reuse water in forestry activities take place.

7 million

hectares preserved.For each hectare of tree plantations, the sector preserves another 0.7 hectares of natural forests.



100%

of forest units adopt some type of practice to preserve soils and water, and 64% also do so in areas belonging to third parties.

79%

of forest units conduct some type of monitoring of qualitative aspects, and 69% conduct quantitative monitoring. Participation in quantitative monitoring has more than doubled compared to 2016 levels.

78%

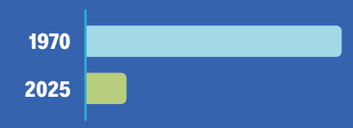
of forest units implement mosaic planting.

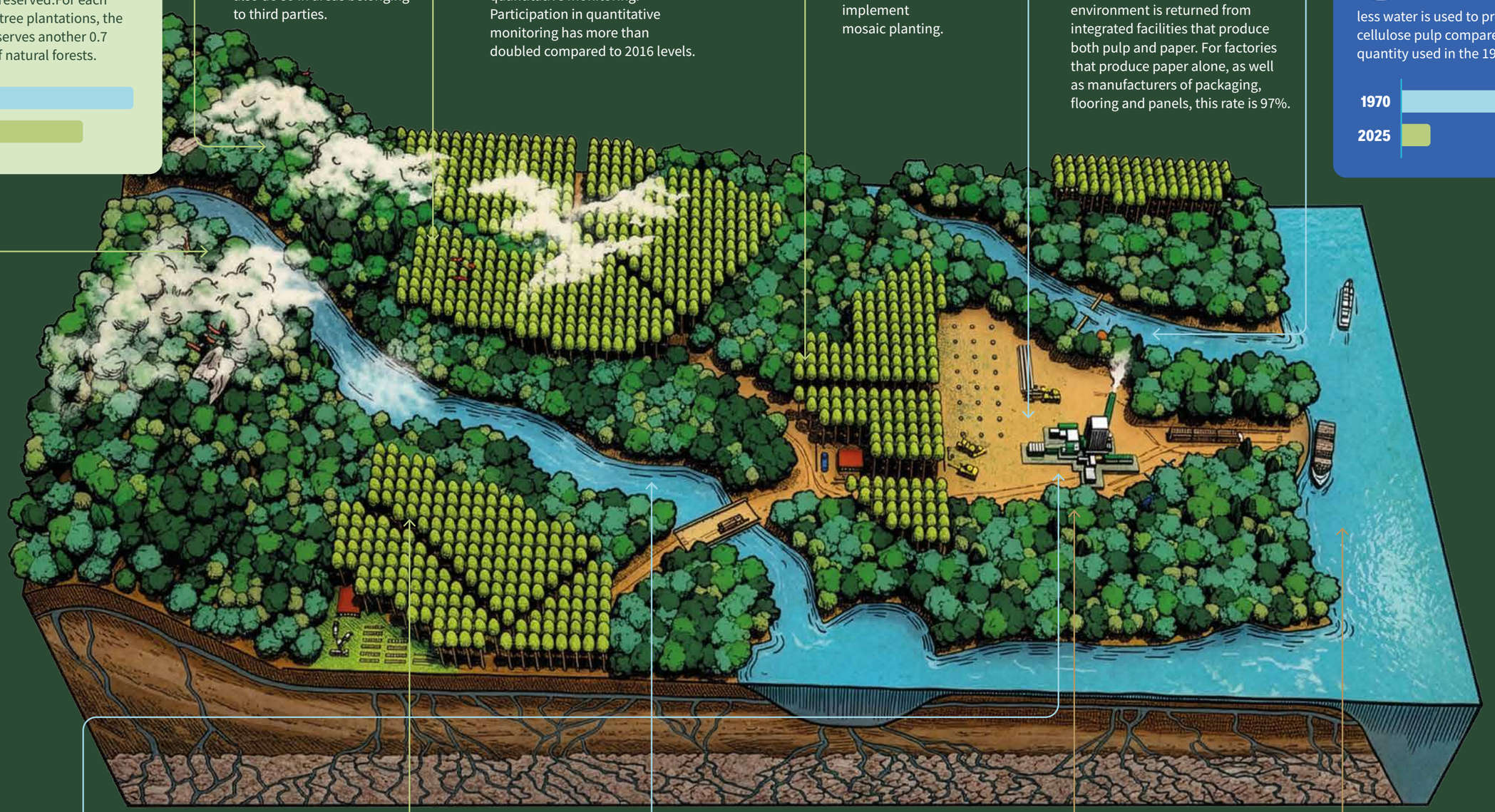
99%

of water withdrawn from the environment is returned from integrated facilities that produce both pulp and paper. For factories that produce paper alone, as well as manufacturers of packaging, flooring and panels, this rate is 97%.

84%

less water is used to produce 1 ton of cellulose pulp compared to the quantity used in the 1970s.[16]





71%

of manufacturing facilities reuse by-products from wastewater treatment.

24%

less water is used to produce one seedling in 2025 compared to the amount used in 2016.

89%

of pulp and paper factories reuse and/or recirculate water. This number is 74% for manufacturers of just paper or packaging, and 54% for flooring and panel producers.

45%

of companies have water-related research partnerships. This percentage has doubled compared to 2016.

70%

of companies have goals related to water use. These types of commitments have tripled since 2016.

Water efficiency in manufacturing

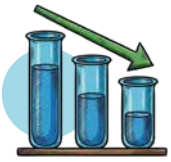
In manufacturing, there have also been consistent advances in responsible water management. Below we can see how factories rely on continuous improvement, circularity, and technological innovation to reconcile production and preservation.

REUSE AND RECIRCULATION

In most manufacturing processes water is recirculated and/or reused, in line with leading strategies for reducing withdrawal of fresh water. Recirculation is when water is reused in the manufacturing process without the need for full treatment. Water that is not recirculated is sent to a wastewater treatment facility, and after treatment it can be reused in the production process or returned to the body of water it came from.

In the pulp and paper sector, water and steam are recirculated. This is most common in pulp washing, the cooling tower, shaping the pulp into paper, and fiber transport.

While part of the process to produce flooring and wood panels is dry and uses little water, recirculation still takes place in the chip washing and defibration stages. Water is also reused to wash equipment and control airborne particulates.



REDUCING WATER USE

The main strategies include eliminating leaks, investing in new equipment and technology, and expanding reuse, ensuring environmental compliance and product quality.

CIRCULAR ECONOMY AND WASTE

In factories, the notion of circularity is important. Substances resulting from wastewater treatment are used as fertilizer or as a fuel for generating energy.

RETURNING WATER TO THE ENVIRONMENT

Most of the water that mills withdraw is returned to the original body of water after treatment, in accordance with legal parameters. Some returns to the environment as water vapor, and a small percentage remains in the product and by-products.

Klabin

Corporate activities

The sector's work is built on active listening, research, innovation, and robust governance. In the factories as well as the forests, operations are continually refined as the result of investments in research, development, and innovation in partnerships with universities and research institutions. This continuous improvement is rooted in governance based on transparency and corporate responsibility, with targets to reduce water use and withdrawal.

Methodological Notes

This material is the result of monitoring that includes data reported annually by some of Ibá's member companies since 2016. The numbers in this edition refer to 2025.

The responding companies account for 38% of Brazil's commercial plantations, 84% of pulp and paper production, and 36% of flooring and panel production.

The indicators were defined in a collaborative manner by the companies, entities in the sector and academic research institutions. All indicators have reporting instructions in order to ensure uniformity among all companies that respond.

The data were collected and processed with support from the ESG Tech consulting company.

The technical content of this publication was developed based on the following technical and scientific references.

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[2] Impacto da mudança climática nos recursos hídricos do Brasil
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[4] Paired catchments with native vegetation as a reference for water quality in streams in forest plantation areas
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[5] The myth that *Eucalyptus* trees deplete soil water — a review
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[6] Effects of *Eucalyptus* plantations on streamflow in Brazil: moving beyond the water use debate
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[7] Shedding light on the complex relationship between forest restoration and water services
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[8] Forest restoration improves habitat and water quality in tropical streams: a multiscale landscape assessment
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[9] Managing forest plantation landscapes for water conservation
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[10] 26 anos de monitoramento hidrológico de uma microbacia sob manejo florestal: uma revisão do passado e prospecção do futuro
Queiroz et al., 2023

[11] How do management alternatives of fast-growing forests affect water quantity and quality in southeastern Brazil? Insights from a paired catchment experiment
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[14] Conversão de pastagens degradadas em sistemas de produção agropecuários e florestais sustentáveis: Priorização de áreas e estimativas de investimentos
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