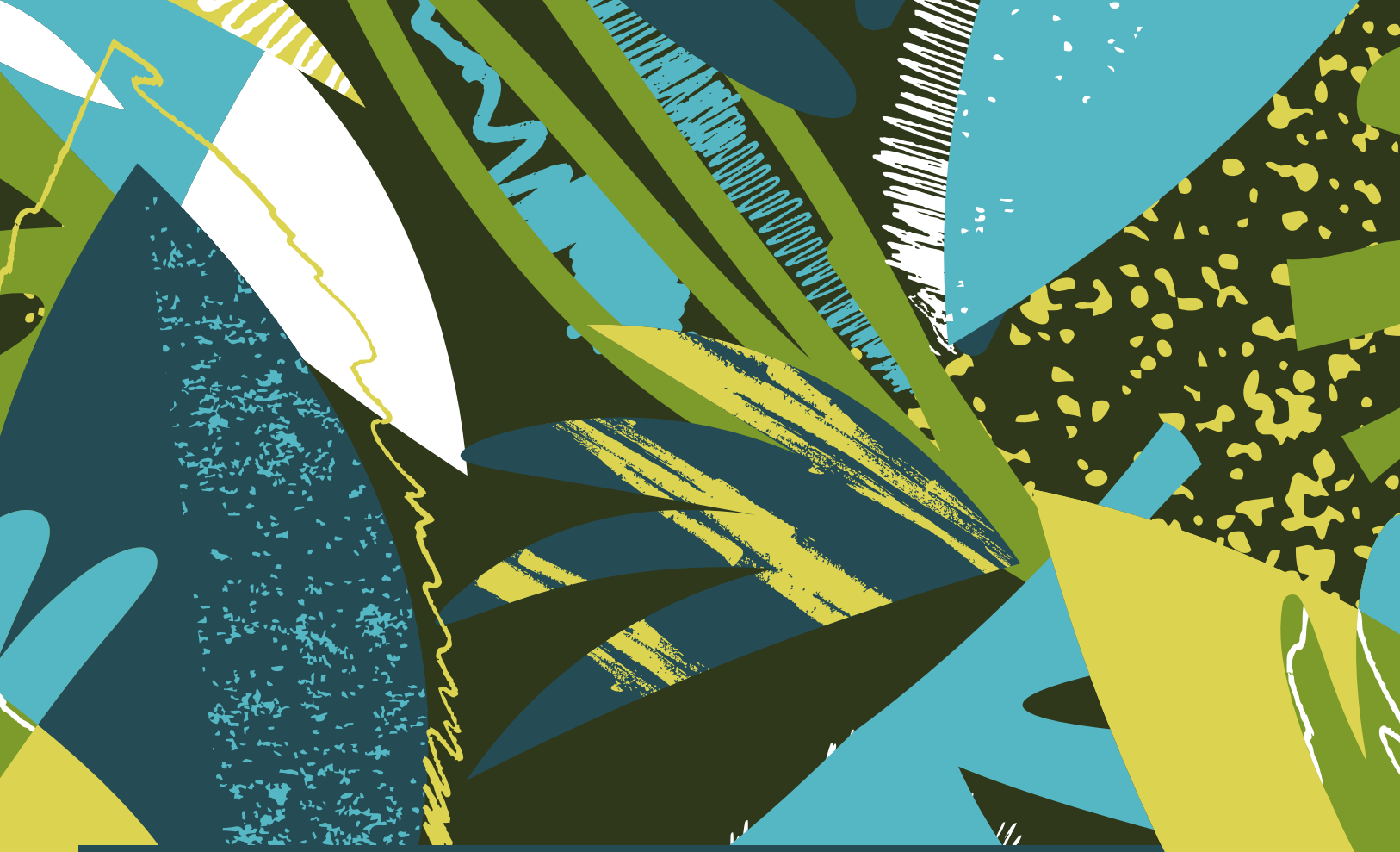

The leading role of Brazilian forests in the global climate agenda

AN OVERVIEW FOCUSING ON THE LARGEST FOREST BIOMES AND ON FORESTRY

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The leading role of Brazilian forests in the global climate agenda

AN OVERVIEW FOCUSING ON THE LARGEST FOREST BIOMES AND ON FORESTRY

Brazil's forests: a central role in the world's climate agenda

ROBERTO S. WAACK* AND BETO VERÍSSIMO**

Brazil is the quintessential forest country. Not only does it hold the largest massif of native tropical rainforests on the planet, but it also has other forest formations in the Cerrado (scrubland), Caatinga (woodland), Pantanal (wetland), and even the Pampas (prairie) biomes. They represent around 500 million hectares of native forests, or almost 60% of Brazil's territory. Additionally, Brazil is a world leader in planted forestry, particularly with exotic species that have high productivity and contribute to social and economic development. And, more recently, the participation of the forest restoration sector has grown, taking advantage of the window of opportunity in the carbon market.

The forest cover diversity in Brazil defines the forest continuum concept, which includes preserved native forests, activities of forest restoration with native species, and also the forestry activity with native and exotic species, aimed at many different industrial purposes. To this continuum are added activities that combine forests with the production of food, fibers, and energy, in diverse agroforestry systems. In all fronts, Brazil has the most advanced technologies for conservation, restoration, and planting, positioning itself among the most competitive in the world.

Brazil's forests play a central role in the global climate agenda. These forests store vast carbon reserves, regulate rainfall and water cycles, and are home to one of the greatest biodiversities on the planet. In addition, forests, particularly the Amazon, provide a fundamental environmental service to the Brazilian economy by regulating rainfall patterns. In fact, the forest returns the water it collects from the rain to the atmosphere, which allows wind currents to carry moisture to much of Brazil, in a phenomenon known as "flying rivers". These "flying rivers" play an essential role by providing rainfall across much of Brazil, enabling hydroelectric power generation, agricultural production, river navigation, and water supply for industrial and home uses.

The conservation of native forests is intrinsically linked to the presence of indigenous peoples, who

have been the guardians of their conservation. Furthermore, Brazil has programs for the conservation of its forest heritage (Brazil holds the largest absolute area of protected areas on the planet) and has led initiatives for payment for avoided deforestation, such as the Amazon Fund and, more recently, the Tropical Forests Forever Fund (TFFF). Brazil is also a benchmark in policies to fight deforestation, notably with the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm). Brazil has made progress in the production of technical and scientific knowledge in fields such as conservation, management, forest restoration, and forestry.

For private land, Brazil has a legal framework for conservation that is a reference in the world – the Forest Code – which seeks to guarantee permanent protection areas and forest reserves in all rural properties. Regarding public land, Brazil has a legal framework that ensures the protection of Indigenous Lands. It also has one of the largest sets of Conservation Units in the world and a legal framework, the National System of Conservation Units (SNUC), which is internationally respected.

In recent years, Brazil has led the way in forest restoration using native species, with a unique dynamism driven by the combination of mainstream financial players with highly professional operators. In the field of exotic species forestry, it holds the leading position worldwide in pulp exports, with operations and companies that have significant technological and economic power. Brazil has shown an undeniable capacity for domesticating exotic species such as eucalyptus and pine, and utilizes production models recognized by the most demanding existing certification systems.

For all these forestry models, Brazil leads globally in the field of monitoring systems, which are broadly disseminated, public, and transparent, developed from civil society initiatives, in a good combination with governmental mechanisms.

In general, no country combines the natural, geographical, academic excellence (in ecology, management and forestry), technological, and business conditions like Brazil, which, in addition, has a framework of institutionalized public policies that allow it to aspire to an even greater share of the forestry industry. Brazil already holds the largest stock of forest carbon on the planet and could increase this stock if it achieves its targets of drastically reducing deforestation in the national territory – combining this effort with ongoing actions to increase carbon removal from the atmosphere through activities of forest restoration with native species and forestry.

This document presents facts and data related to the main segments of the Brazilian forestry sector. It seeks to show the effective integration and synergies between the many forest formations that make up the forest continuum. At the same time, it seeks to expose the challenges and paths for Brazil to achieve, as soon as possible, the forest transition (that is, to reverse the curve of forest cover loss and start to have a net forest gain), with an increase in carbon stock in the forests. Brazil's Nationally Determined Contribution (NDC) is highly dependent on forests. Brazil could achieve its NDC targets with strong deforestation control, which would allow surplus forest carbon to be exported. In fact, Brazil has the greatest comparative advantages in the world to lead in the removal of carbon from the atmosphere through forest restoration.

We hope that this document will contribute to the opportunity that COP, held in the world's leading forest country, offers for the consolidation of a wish: that natural capital and nature-based solutions, represented by forests, become a highly attractive asset class for the financial market. At the same time, that it points to alternatives so that the peoples who live in the most forested regions can achieve the best development indicators in Brazil, instead of experiencing the harmful environmental and economic consequences resulting from deforestation. And that the ambition to be the country with the largest forest carbon stock in the world provides the best opportunities for removing carbon from the atmosphere through the growth of forest restoration and forestry activities.

***Roberto S. Waack**
Boards of MBRF and the Arapyaú Institute
****Beto Veríssimo**
Amazon Institute of People and the Environment (Imazon) and Amazon 2030

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LETTERS

FORESTS ARRIVED FIRST AND, SINCE THE DAWN OF HUMANITY, HAVE BEEN SUSTAINING LIFE ON THE PLANET. THEY SHELTERED SOCIETIES, SHAPED CULTURES, PROVIDED ENERGY AND ESSENTIAL MATERIALS, AND REGULATED CLIMATE AND WATER.

No ecosystem combines so many functions simultaneously, and tropical forests stand out as the most complex and diverse. We Brazilians have inherited the largest stretch of tropical forests in the world, in a country that is home to unique features such as the Amazon, the Atlantic Forest, the forested Cerrado (Brazilian scrubland), and other biomes that concentrate incomparable biodiversity. This is a legacy that we have an obligation to pass on to new generations.

As an Amazonian from the state of Acre, I am proud of the history of the forest peoples, who were part of the saga that led the Amazon to become the stage for a unique economic boom in the late 19th and early 20th centuries. The management of Hevea brasiliensis, a tree better known as the rubber tree, has sustained the national economy for decades, becoming Brazil's third largest economic asset. Rubber, extracted from this tree, shaped global industrialization and, above all, taught a lesson: it is possible to generate growth and strength with the sustainable use of the forest – in this case, with a single species of tree, which transformed the global economy.

Imagine, then, what we could achieve if we invested in a consistent policy to encourage the forest economy, capable of valuing biodiversity in all its breadth—from the production of pharmaceuticals and cosmetics to biotechnology, from bioenergy to innovative materials. All this while keeping the forests standing and offering local population the development and quality of life by this work.

In Brazil, we have not yet managed to see forests as one of our most important economic assets. But we can move towards that end. This book plays an important role in strengthening this vision: standing forests have strategic, economic, social, and climate value. The current Forest Code (Law No. 12,651/2012), on which I was a rapporteur in the Brazilian Federal Senate, already points the way by allowing the recovery of degraded areas and adopting agroforestry systems (SAF), instruments that can transform local realities. In the Amazon, for example, restoration of areas associated with carbon sequestration can offer positive results as early as the first year, in particular when connected to forest-compatible product chains. This means income opportunities for smallholders, security for traditional communities, and global climate benefits.

Among the most relevant instruments of the Code are the Permanent Preservation Areas (APP) and the Legal Reserve (RL), which establish mandatory conservation percentages per biome — 80% in the Amazon, 35% in the Cerrado and the Legal Amazon region, and 20% in the other biomes. Far from representing obstacles, these rules can be drivers of a new green economy, integrating conservation, restoration and production in a balanced way.

And Brazil is a fertile ground when it comes to forest restoration, which is already expanding: a country with a world-renowned tradition in forestry engineering, capable of domesticating exotic species and now applying it to native species. Agroforestry systems, bioeconomy and sustainable management reinforce the idea of a forest continuum, in which conservation, use and restoration coexist.

Brazil thus emerges as a mosaic of solutions: protected areas, responsible extractivism, agroforestry systems, technological innovation, cutting-edge industrial operators, and traditional communities working side by side. The future points to a forest that is not only preserved but also integrated into development, consolidating itself as natural capital and a strategic asset of inestimable economic and social value.

Reading this book invites us to see the forest as biodiversity, culture, economy and future. It shows that our legacy to future generations is more than preserving: it is valuing the standing forest, recognizing it as the key to a sustainable and competitive development model.

The world is currently suffering its worst crisis: the climate crisis, which threatens life. It was caused by the actions of man himself. We can only overcome this challenge if we have the forest as an ally.

Jorge Viana
Forestry engineer, former governor of the state of Acre, former senator and President of ApexBrasil

THE ATLANTIC FOREST IS ONE OF THE RICHEST AND MOST THREATENED BIOMES ON THE PLANET. ORIGINALLY COVERING APPROXIMATELY 130 MILLION HECTARES, IT OCCUPIED 15% OF BRAZIL'S TERRITORY AND IS PRESENT IN 17 BRAZILIAN STATES.

It is considered a global biodiversity hotspot, home to more than 20,000 species of living beings and great social and cultural diversity, being home to indigenous peoples, quilombola communities and traditional populations.

Despite its importance, it is the biome with the highest degree of destruction: only 24% of its original forest cover remains, in a scenario in which 97% of forest fragments cover less than 50 hectares, only 9.8% of the area is protected by Conservation Units, and 80% of what remains is in private hands.

In this context, the Atlantic Forest Law was sanctioned in 2006, which contributed to reduce deforestation, although it still occurs at worrying levels. On the other hand, the biome also has a significant capacity for regeneration: between 1985 and 2023, there was a loss of 9.8 million hectares and the regeneration of 4.9 million hectares of natural forests. As of 2010, a period of net gain in forest cover began, although deforestation persists.

More than a natural heritage site, the Atlantic Forest is today a living laboratory for ecological restoration. Amid the global climate crisis, it proves that regenerating ecosystems is not a utopia: it is science, economics, and public policy in action. Devastated by the economic cycles of sugar, coffee, and urbanization, it now shows that it is possible to revive and inspire other tropical biomes, offering lessons and inspiration to the Amazon and other tropical biomes facing increasing pressures.

The accumulation of scientific and technical knowledge, combined with strong social mobilization around restoration, led the Atlantic Forest to be chosen as one of the 10 global flagship regions of the UN Decade on Ecosystem Restoration. Its conservation and restoration are strategic actions for facing climate and biodiversity crises, in addition to contributing to the achievement of targets such as zero deforestation, recovery of native vegetation and protection of species. They are also essential for mitigating and adapting to the impacts of climate change, which are already showing themselves in extreme events such as droughts, floods, and landslides, particularly affecting vulnerable populations in urban areas of the biome.

In addition to its environmental benefits, the Atlantic Forest is the invisible infrastructure that provides water to millions of people, energy to Brazil, and conditions for agricultural production. It supports 72% of the Brazilian population, 80% of national GDP and the main metropolises in Brazil.

Additionally, the Atlantic Forest offers great potential for sustainable development through activities and businesses based on environmental balance and nature conservation, such as tourism in parks and reserves, and multisector partnerships that value the standing forest, create jobs and generate income, and strengthen local economies. Investing in biome conservation and restoration, therefore, not only protects biodiversity and natural resources but also promotes inclusive social and economic opportunities, in particular for local communities.

Protecting and restoring this biome is, therefore, a crucial measure for Brazil's environmental, climate, and social and economic security and key to reconciling development, biodiversity, and climate.

Márcia Hirota
Environmentalist and President of the Board of the SOS Mata Atlântica Foundation

THE BRAZILIAN PLANTED TREE INDUSTRY IS GOING THROUGH A PHASE OF GREAT EVOLUTION. AMID CLIMATE, SOCIAL, AND ECONOMIC CHALLENGES, IT HAS BEEN SHOWING ITS ABILITY TO ALIGN PRODUCTIVITY WITH POSITIVE IMPACT.

There are 10.52 million* hectares in Brazil that supply essential production chains, such as pulp, paper, renewable energy, and bioproducts, and around 7 million hectares of original native vegetation aimed at preserving biodiversity and associated environmental services. This balance between economic development, social inclusion, climate mitigation, and environmental conservation is currently a reality in the industry.

Climate crisis is a present and latent component in our industry and, as it depends on nature, it needs to concentrate efforts and investments to find solutions that allow for the longevity of businesses in view of the challenges. In 2024, Brazil saw one of the worst waves of forest wildfires caused by high temperatures, draught, and human action.

Suzano, based on integrated efforts with governmental organizations, other companies from the industry, and local brigades (such as indigenous brigades that the company supports), among other players, and investments in technologies that enable the early detection of theses occurrences, achieved a historical reduction of 61% in forest wildfires in planting areas.

At the same time as it endures the consequences, our industry is also part of the solution for these challenges since the forests, both those planted for commercial purposes and preserved native forests, account for the capture of 4.92 billion metric tons of carbon dioxide equivalent (tCO_2e).

With respect to social reality, which brings together economic development and social inclusion, we understand that it is directly connected with the business' success. That is, the prosperity of a company is connected with the prosperity of a land area. And prosperity only comes when we exercise active listening and adopt dialogue as a nonnegotiable tool for developing relationships based on mutual respect and trust.

This process is a journey that is taken at many levels. At Suzano, this dialogue takes place with the more than 1,600 communities with which we relate in the more than 220 municipalities where we operate, whether or not traditional communities (such as indigenous and quilombola); through partnerships with local, regional, national and international organizations focused on the social and sustainable development of each land area; and close to governmental bodies for designing solutions that take into consideration the attributes necessary for the business and good for society.

We understand that more perennial solutions are the result of joint development. An example are the initiatives carried out by Suzano together with partners that have already enabled the increase of the land areas' resilience in a strategic manner and lift more than 97,000 people out of poverty between 2020 and 2024.

Science and innovation are also levers that drive the evolution of the planted tree industry. Based on extensive research and technology, the best genetic materials produced in an operational scale and capable of adapting themselves to different soil and climate conditions and geographical characteristics are developed for the purpose of delivering the largest productive biomass volume per planted hectare with the efficient use of natural resources, lower environmental impact, and removal of carbon from the atmosphere. There are 1.8 million trees being planted every day and 1.2 million by Suzano alone.

It is worth noting that in Brazil, the industry – and Suzano – carries out the planting mostly in areas that were degraded before, such as old pastures. Plantations are managed in a sustainable manner and, as a result, contribute to environmental recovery, soil preservation, and generation of benefits that are relevant for biodiversity and the climate, such as the removal of carbon from the atmosphere.

Technology also makes industrial complexes evolve, creating job opportunities and generating production volumes for both domestic and foreign markets – composed of consumers that increasingly demand renewable-based products aiming at the new bioeconomy and low-carbon emission.

In view of this context, we believe that it is possible to increase the productivity of our plantations at the same time as increasing the positive impact generated by our activity, overcoming challenges with collective intelligence, innovation, science and, long-term vision. This means to increase the use of Nature-based Solutions (NbS), strengthening sustainable value chains and ensuring that the mitigation of the climate crisis, fair transition, and economic growth walk side by side.

At Suzano, we believe that the planted tree industry has a lot to offer – and to learn. This report is another step in this journey, collecting data, reflections, and commitments, which help us see the present with clarity and the future with ambition.

* Annual Report 2024 - Brazilian Tree Industry (Ibá)

Malu Pinto
Executive Vice President of Sustainability, Communication and Brand at Suzano

PUBLIC FORESTS: TRANSFORMING CHALLENGES INTO CLIMATE AND ECONOMIC ASSETS

Brazil faces two strategic challenges: transforming its vast forest assets into an engine of development without compromising the ecological integrity that sustains the climate, biodiversity, and local livelihoods; and meeting the growing annual demand for timber—approximately 12 million cubic meters of logs—through sustainable forest management.

Forest concessions emerge as a point of convergence between the State, the market, and civil society — an instrument that anchors economic value in forest conservation and restoration. In this architecture, public authorities offer legal security, scale, and governance, demanding strict environmental rules and benefit transfer mechanisms for local development.

Between 2008 and 2025, 23 concession agreements were entered into in nine National Forests, totaling 1.3 million hectares under sustainable management in the states of Amapá, Amazonas, Pará, and Rondônia. The concessions work as a territorial management instrument: bidding, management plans, monitoring, and continued presence create economic incentives aligned with conservation, internalizing value in standing forests and strengthening territorially based legal chains.

The benefits directly impact the territories: job creation, private investments, decentralized transfers, and continued institutional presence that inhibits illicit activities. For every 1,000 hectares granted, 2.7 direct jobs and 5.4 indirect jobs are created and require investments of approximately R$ 1,000 over the course of the agreement. It is important to note that we are talking about regions with a low human development index (HDI), making these investments very important for these regions.

In recent years, the concessions have incorporated a new instrument: additional charges. These are contractual financial obligations intended for projects of public interest in conservation, monitoring, wildfire prevention and fighting, restoration, applied research, training and social and productive inclusion. Free, prior and informed consultations (FPIC) with indigenous peoples living near the projects allowed for the inclusion of mechanisms for transferring benefits to these communities: reserving up to 30% of the additional charges for initiatives agreed upon with indigenous peoples, bonuses for hiring indigenous professionals, and purchase of seedlings and seeds from local villages.

In 2024, Law No. 11,284/2006 was amended to include, in the scope of the concessions, the generation and sale of carbon credits by the concessionaires. This opens two complementary paths: forest restoration concessions (ARR), in which carbon sequestration in degraded areas becomes a legitimate source of revenue; and sustainable management with REDD+, certifying avoided emissions when reductions against robust baselines are demonstrated.

The emblematic case of this new generation is the concession of the Bom Futuro National Forest, in the state of Rondônia, whose auction is scheduled for the first quarter of 2026. Created in 1988, with a history of invasions and illegal exploitation, the unit covers approximately 98,000 hectares, of which approximately 14,000 hectares are degraded and require restoration; the remainder requires protection from further pressures. The call notice, submitted for public consultation in 2024, structured two blocks and a contractual term of 40 years. The concessionaires must restore the degraded area and preserve the remaining forest. In return, they will be able to trade carbon credits generated by the increase in biomass and reduction in deforestation.

Studies indicate the potential to sequester around 6 million metric tons of CO_2 equivalent over the next few decades, with gross revenue estimated at approximately R$ 1.2 billion and costs of around R$ 600 million for restoration and protection. The project incorporates a strong climate justice dimension: Bom Futuro National Forest borders the Karitiana Indigenous Land, where consultation was carried out and a long-term partnership was established. Today, the Karitiana people are one of the main advocates of the initiative.

In short, Brazil is converting historical challenges – deforestation and land grabbing in public forests – into opportunities for institutional and financial innovation. The updated legal framework internalizes climate value in concessions; the Bom Futuro experience shows the economic and social viability of carbon-based restoration; and the planned expansion to 5 million hectares of concessions by 2027 will significantly expand the scale of the public policy.

Fully meeting these challenges involves three main issues:

1. Recognizing that there is a private sector interested in the sustainable use of forests, different from the one that acts in a predatory and illegal manner;
2. Offering financial instruments with terms, grace periods and guarantees that are compatible with the particularities of the forestry sector;
3. Investing in research and development to expand the use and the market value of lesser-known forest species.

Garo Batmanian
Director General of the Brazilian Forest Service
Renato Rosenberg
Director of Concessions of the Brazilian Forest Service

MESSAGES FROM THE ORGANIZATIONS INVOLVED

COP 30 takes place at a decisive moment for the world and places Brazil—its forests, biomes, and people—at the center of the discussion, reinforcing the country's global leading position in the climate agenda. Over the years, the Arapyaú Institute has driven and supported the emergence of networks that today operate with autonomy and impact, such as the Uma Concertação pela Amazônia (A Concertation for the Amazon) initiative, the Brazilian Coalition on Climate, Forests and Agriculture, MapBiomas, the Connect Forest People, and several regional initiatives in south of the state of Bahia. These networks represent a cooperation ecosystem that brings together science, data, communities, the private sector, and public authorities around systemic solutions for the development of Brazil.

As a Brazilian philanthropy, the Arapyaú Institute closely monitors discussions and fosters networks and dialogues among diverse audiences to promote fair, inclusive, and low-carbon development models. In its forest agenda, the institute understands that Brazil has unique conditions to be a global leader in large-scale restoration and in the conservation of some of the greatest biodiversity on the planet. At COP 30 – and beyond – Arapyaú reaffirms its role in strengthening networks that contribute to Brazil being a leading player in building solutions for the climate and nature crisis and sees this initiative as a great opportunity for action and materialization of the potential that the country has before the world.

Renata Piazzon, from the Arapyaú Institute

The document *The Leading Role of Brazilian Forests in the Global Climate Agenda* is of strategic importance for understanding how Brazil can transform its immense natural wealth into the foundation of a new development model, based on productivity, sustainability, innovation, and the appreciation of natural capital. By describing the role of forests in mitigating climate change, the text shows that Brazil is home to the largest continuous expanse of tropical forests on the planet and holds the greatest potential for restoration and sustainable management, conditions that place it in a unique position to lead the global transition towards a resilient economy.

The data presented show that Brazilian forests play a central role in global carbon absorption and that conservation and deforestation control policies have already delivered concrete results in reducing emissions. The text also highlights the progress of forestry and forest restoration as highly productive sectors with a positive impact, capable of combining income generation, employment, and technological innovation with direct environmental benefits, such as climate regulation and water security.

By quantifying results and mapping opportunities, the document provides a solid foundation for guiding public policies, private investments, and multi-sector partnerships aimed at consolidating Brazil as a global reference in Nature-based Solutions (NbS). A thriving economy is an essential condition for financing climate change mitigation and adaptation. The world is seeking to align economic growth with decarbonization, a context in which forests and nature-based solutions (NbS) are proving to be strategic assets for a more productive economy that is positive for the climate, nature, and people.

Marcelo Furtado, from Itaúsa and the Itaúsa Institute

Brazil arrives at COP 30 with the challenge of presenting concrete and large-scale solutions in forests, agriculture and climate, reaffirming its ability to lead the debate and contribute to the global decarbonization agenda. In this context, the Brazilian Coalition on Climate, Forests and Agriculture plays a strategic role. By bringing together more than 400 members in favor of a low-carbon economy and sustainable land use, it has become one of the main places for coordination and consensus-building in Brazil, reinforcing the network's capacity to convene, mobilizing leaders and enhancing the debate with quality information and analysis. This collective effort strengthens the Brazilian agenda, allowing it to not only show solutions that are already underway but also project a vision of the future that places Brazil as a climate leading player, while also identifying the challenges that must be overcome to expand its contribution. Times like this are unique opportunities to raise national ambition and ensure that the Brazilian narrative inspires and mobilizes the world.

Carolle Alarcon, from the Brazilian Coalition on Climate, Forests and Agriculture

COP 30 in the Amazon represents a historic moment for Brazil to consolidate its global leading position in the transition to a climate-, nature- and people-positive economy. We support the Forest Coalition's initiative to present recommendations to unlock the full potential of biodiversity conservation, restoration, and sustainable use to accelerate decarbonization. At the Brazilian Business Council for Sustainable Development (CEBDS), we are committed to mobilizing the private sector to transform ambition into concrete action, building scalable solutions that generate economic prosperity from standing forests, providing better living conditions for the peoples that live there.

Marina Grossi, from the Brazilian Business Council for Sustainable Development (CEBDS), COP 30 Special Envoy for the Business Sector

The Brazilian sector of planted trees for industrial purposes and restoration of native species is a concrete example of how it is possible to combine productivity, innovation and conservation on a large scale. With more than 10 million hectares of plantations and another 7 million hectares of natural areas preserved by companies, this segment is consolidating itself as one of the pillars of bioeconomy, offering renewable solutions that replace fossil-based products and contribute to mitigate climate change. In view of enormous global challenges, this document is a way for us to reaffirm our commitment to being part of the solution, strengthening the Brazil's leading position in the climate agenda and building bridges to a greener, fairer, and more decarbonized economy.

Ambassador José Carlos da Fonseca Jr, of Brazilian Tree Industry (Ibá)

This document not only attests to Brazil's forestry calling but also to its capacity to provide life to all beings and economic activities that depend on nature. The massive amount of information gathered by researchers and processed by the Página22 team to write and edit this document is a sample of the magnitude and sophistication of the knowledge that has already been developed in Brazil about forests in all their configurations. Our team takes great satisfaction in making journalism—a daily, day-to-day work—a long-term exercise, with a historical legacy, that serves as a compendium, memory, and projection of the future.

Amália Safatle, from Página22

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EXECUTION:

Índice

Executive Summary

KEY MESSAGES:

- Forests are among the most scalable and cost-effective climate solutions available today. They absorb about 1/3 of the annual global greenhouse gas emissions from human activity. Without preserved, managed and restored forests, there is no way the world can meet the targets of the Paris Agreement
- Brazil is the most important player in this equation, as it holds the largest areas of tropical forests in the world and, at the same time, has the greatest potential for forest restoration on the planet
- If deforestation is controlled and forest restoration area and forestry development is maintained, Brazil will be able to reverse the forest loss curve and see an increase in forest cover and growth in carbon stocks
- Brazil has already shown that it is capable of reducing deforestation rates, particularly in the Legal Amazon. Command and control policies, combined with land-use planning and market mechanisms, could lead Brazil to zero illegal deforestation by 2030*
- Through the Forest Code, Brazil has 215 million hectares of preserved forests and reforested areas on rural properties dedicated to food production
- The Tropical Forests Forever Fund (TFFF) and Jurisdictional REDD+ (JREED+) are promising mechanisms for financing the conservation of standing forests.
- Ecosystem restoration is attracting interest from major private sector players and is heading towards a scale of millions of hectares by 2035
- Exotic species forestry in Brazil, the most competitive in the world, expects an increase in planted area from 4 million hectares to 6.2 million hectares in 10 years. The expansion of forestry areas occurs mainly in previously degraded areas, replacing low-productivity pastures with the planting of fast-growing trees that capture carbon from the atmosphere and provide fundamental ecosystem services.

* Literature shows that the 80% reduction in deforestation was a combination of command and control with land-use planning – particularly the creation of protected areas.

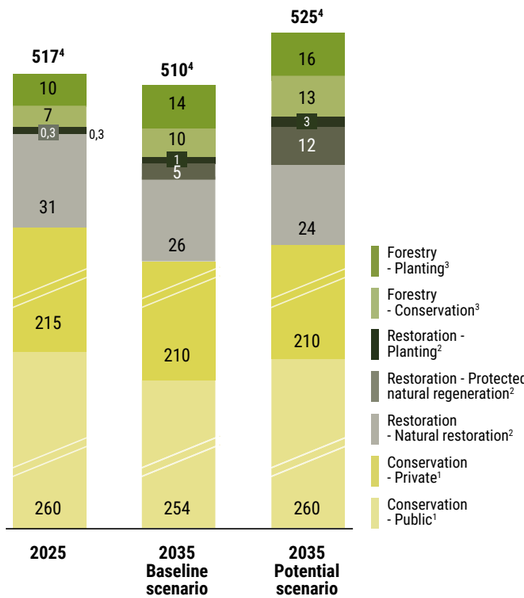
Brazil can increase its forest cover in the near future without competition for land for food production, which has a significant impact on the carbon equation and, consequently, on the contribution to global climate balance. By illustrating the balance between carbon emissions and removal through native forests, forests to be restored and planted, the following charts outline two scenarios considering deforestation rates, forest restoration, and forestry.

The baseline scenario represents a loss of approximately 1% of the carbon stock in national forest formations resulting from deforestation at current average levels. Meanwhile, the potential scenario represents a gain of around 1%, represented by the achievement of zero deforestation targets within the period provided for by Brazil's Nationally Determined Contribution (NDC), by the growth of secondary forest areas that start to be protected and by planting activities for the restoration of native forests and forestry with exotic species.

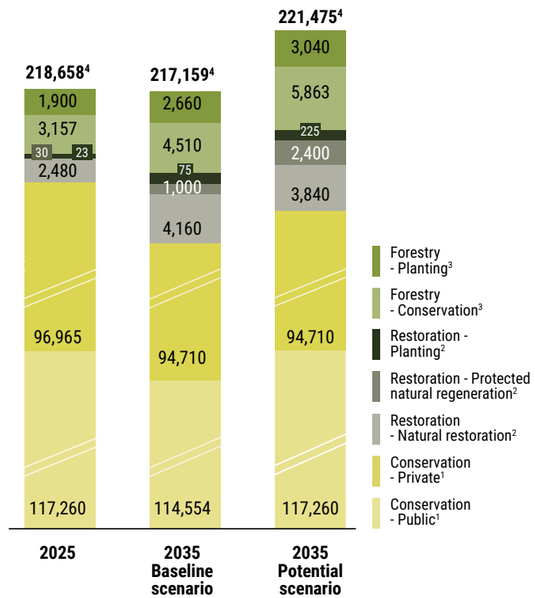
DEFORESTATION, PLANTING AND CARBON STOCK SCENARIOS IN BRAZILIAN FOREST FORMATIONS – 2025 AND 2035

		2025			2035 – Baseline scenario			2035 – Potential scenario		
		Area (million ha)	t CO_2 e/ha	Total carbon stock (million t CO_2e)	Area (million ha)	t CO_2 e/ha	Total carbon stock (million t CO_2e)	Area (million ha)	t CO_2 e/ha	Total carbon stock (million t CO_2e)
Conservation[1]	Public	260	451	117,260	254	451	114,554	260	451	117,260
	Private	215	451	96,965	210	451	94,710	210	451	94,710
Restoration[2]	Natural restoration	31	80	2,480	26	160	4,160	24	160	3,840
	Protected natural regeneration	0,3	100	30	5	200	1,000	12	200	2,400
	Planting	0,3	75	23	1	75	75	3	75	225
Forestry[3]	Conservation	7	451	3,157	10	451	4,510	13	451	5,863
	Planting	10	190	1,900	14	190	2,660	16	190	3,040
Total[4]		**517**		**218,658**	**510**		**217,159**	**525**		**221,475**

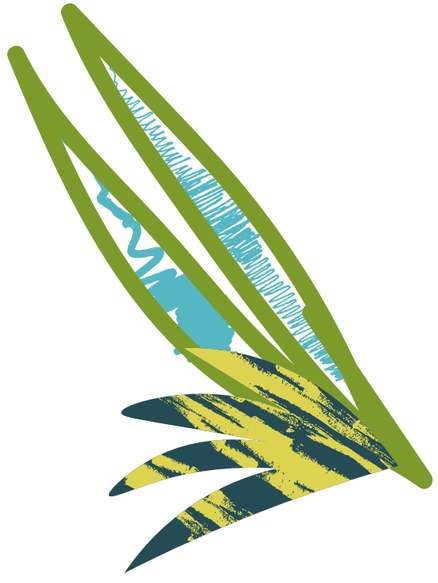
AREA (million ha)



TOTAL CARBON STOCK (million tCO_2e)



1. The total forest area of Brazil in all its biomes was considered. Areas of shrub and grassland vegetation present in the Cerrado (scrubland), Pampa (prairie), Pantanal (wetland), Caatinga (woodland) and, to a lesser extent, in the Amazon and high-altitude fields of the Atlantic Forest are not included.
   For public areas, the following were considered: (i) Conservation Units registered in the National Registry of Conservation Units, excluding Private Natural Heritage Reserves (RPPN) and Environmental Protection Areas (APA), (ii) public land and/or non-designated public forests, (iii) Indigenous Lands, (iv) military areas.
   For private areas, official information from the Rural Environmental Registration File (CAR), rural settlements, quilombola community lands and unregistered public lands was used.
   The distinction between public and private areas was made based on the Land Atlas, generated by the *Cartas da Terra* (Letters from Earth) project, which consolidates information from Incra, Funai, MMA and ICMBio, among others.
   For the baseline scenario in 2035, a loss of 11 million hectares due to deforestation was considered in the period from 2025 to 2035, equally divided between public and private areas.
   For the potential scenario in 2035, it was assumed that gross deforestation will be close to zero in 2030 and, in the following years until 2035, losses will be replaced or offset by restoration. Thus, the amount of forests in public areas will not change and, in private areas, the accumulated deforestation of 5 million hectares will be maintained, practically derived from the period from 2025 to 2030.
   Carbon volumes (tCO_2e/ha) were calculated based on the application of carbon factors from the National Inventory of Greenhouse Gas Emissions for the forest formations considered, divided by the total forest area.
2. For natural restoration, data from MapBiomas was used, which indicated that, in 2024, Brazil had 31.2 million hectares of secondary forests (in recovery).
   For the baseline scenario in 2035, it was considered that part of the natural restoration (5 million hectares) will start to be protected, reaching, in the potential scenario in 2035, the target of 12 million hectares.
   For restoration by planting, the quantities indicated by the Brazilian Coalition on Climate, Forests and Agriculture and the Pre-Competitive Forest Restoration Movement (Floraz Movement) were considered, including targets announced by companies for the base and potential scenarios.
   To calculate the carbon volumes (tCO_2e/ha) used, an average annual growth of 8 tCO_2e/year was assumed for the forests, considering the removal factors of the National Inventory of Greenhouse Gas Emissions for the forests in each biome. Considering that natural restoration will take place over the course of 10 years (2025 to 2035), the average age of the forests will be 5 years and, therefore, the average additional stock of these areas will be 80 tCO_2e/ha, reaching 160 tCO_2e/ha for the base and potential scenarios.
   For protected natural regeneration, the average annual growth will increase to 10 tCO_2e/ha, reaching a total of 200 tCO_2e/ha in both scenarios in 2035.
   For planting, an average annual growth of 15 tCO_2e/ha was considered. For existing plantations in 2024, the average forest age was estimated at 5 years and, therefore, 75 tCO_2e/ha. The base and potential scenarios considered that, in 2035, plantations will also have an average of 5 years and, therefore, the same 75 tCO_2e/ha.
3. For forestry, data from the Brazilian Tree Industry (IBÁ) and BM2C Consultoria were assumed. For 2025, the actual planting and conservation areas were assumed according to IBÁ data. For 2035, in the baseline scenario, 14 million hectares were assumed and, in the potential scenario, 16 million hectares, due to the increase in demand. Data on carbon stocks refer to the average of existing plantations, considering the different growth stages of these forests.
4. According to the Brazilian Institute of Geography and Statistics (IBGE), the Brazilian Forest Service (SFB), and MapBiomas, Brazil has more than 500 million hectares of natural forests; the most recent MapBiomas survey (Collection 10) indicates 507 million hectares of forests in 2024. The total presented in the table also includes the amounts for forestry planting and excludes the amounts related to conservation in forestry, which are already included in native vegetation areas in private land.



These scenarios reaffirm not only Brazil's calling as a forested country but also its decisive role in the world by contributing to the mitigation of climate change, particularly in a scenario of increased forest cover by 2035 in the potential scenario. Furthermore, Brazil's forests make a superlative contribution to biodiversity conservation and provide diverse ecosystem services that sustain life on Earth and support all social and economic activities.

In the Conservation, Forest Restoration, and Forestry fronts, Brazil is a leading player, with a solid legal framework for forest protection and advances in the field of forest restoration, including opportunities for the private sector, and greater competitiveness in the production of exotic trees. The areas designated for the maintenance of the original plant cover – the vast majority as preserved forest – represent 66.3% of the national area

This document addresses these three fronts from the perspective of the forest continuum. This is a concept used internationally, which encompasses a view of the different landscapes with forest physiognomy across an area. The continuum begins with the permanent preservation of untouched forest massifs; continues with increasing human intervention with native forests under a sociobioeconomic management system; goes through the recovery of native forests affected by forest degradation; continues with forestry enrichment; advances in forest restoration (that is, planting native trees and/or natural regeneration) of deforested areas; passes through reforestation with the planting of long-cycle exotic species (possibly combined with native species); and ends, at the extreme, with the reforestation of species such as eucalyptus and pine or other species, whether native or not, for economic purposes with well-defined markets, inserted in agribusiness or traditional forestry, and

which maintain conservation areas upon compliance with the Forest Code (Law No. 12,651/2012).

Common to the different landscapes along the forest continuum are trees. Trees are highly efficient at converting carbon into biomass and therefore contribute significantly to carbon storage throughout their growth cycles and even when processed. Additionally, trees provide numerous environmental services and are key to preserving biodiversity. Without standing trees, the world cannot comply with the Paris Agreement, a necessary step to address the climate crisis – which is essential to ensure to humanity and other species the conditions to survive on Earth. And forests are the home and the social, economic and cultural foundation for tens of millions of people around the world.

Forests are among the most scalable and cost-effective climate solutions available today. They absorb about 1/3 of the annual carbon emissions from human activity and are absolutely essential to achieve global climate targets. Tropical forests influence the climate by storing carbon, shaping rainfall patterns, regulating climate (regional and global), and harboring superlative biodiversity. Particularly in the case of tropical forests, the benefits are not only climatic but also ecological and social. Tropical forests are home to more than 50% of all terrestrial species, making them the most biodiverse ecosystems on Earth.

Among the holders of tropical forests, Brazil stands out, as it is home to the largest of them – the Amazon – and one of the main biodiversity hotspots – the Atlantic Forest – which combines a high incidence of species diversity in one of the most devastated biomes in Brazil. This report also includes cases of forest restoration and forestry carried out in the Cerrado (Brazilian scrubland) biome. The approach in the field of business solutions addressed in this document focuses on the conservation fronts of the Amazon and Atlantic Forest biomes, forest restoration activities with native species and forestry of exotic species (although the latter two are carried out in the Cerrado biome).

Although Brazil is still the champion in deforestation, it has the greatest potential for carbon capture (particularly through forest restoration) and for generating income and creating jobs associated with this capture. Brazil has already shown that it knows how to protect forests and fight deforestation. Between 2004 and 2012, for example, the deforestation rate fell 80% as a result of a successful monitoring, command and control policy and the creation of protected areas. It should be noted that this reduction occurred even while agricultural and livestock production in the Amazon region practically doubled.

Although deforestation increased in subsequent years – mainly from 2018 onwards – the resumption of the policy to fight deforestation in 2023 was able to generate a further reduction in the rate. In fact, according to the report by Prodes, a satellite deforestation monitoring system of the National Institute of Space Research (Inpe), there was a 30.6% reduction between

August 2023 and July 2024, reaching the lowest rate since 2016. Fighting deforestation, combined with expanding the native forest area in Brazil, will not come at the expense of productive activities such as agribusiness – which, in fact, depends on the rainfall patterns provided by forests through the "flying rivers" phenomenon. In Brazil, there is enough land in unused and underutilized deforested areas to meet all the demand from agribusiness expansion in the region, and there are still areas left for forest restoration, reforestation of areas for pulp or paper products, and for palm oil plantations.

Brazil already has a legal framework for forest protection that few other countries in the world have. Forests are one of the pillars of the environmental and land-use regulatory framework. The Forest Code, the main reference in this field, establishes rules for the use and protection of native vegetation on rural properties, including Permanent Preservation Areas (APP) and Legal Reserves (RL). The law arose from the need to reconcile agricultural and livestock production with environmental conservation, following a long process of legislative and social debate. Brazil also has a legal framework for Protected Areas, whether through the National System of Conservation Units (SNUC), or through Indigenous Lands and Quilombola Community Territories.

Based on this framework, it is up to Brazil to make the command and control policy as effective as possible at the same time as it develops market systems that reward conservation, forest restoration, and industrial planting of forests, such as mechanisms linked to carbon credits and funds for financing tropical forests.

Other important actions include protecting indigenous peoples and traditional populations that live off the forest, as well as developing a low-carbon, forest-based economy (bioeconomy) and improving well-being indicators for populations inhabiting the most anthropized areas of the Amazon – considering that most of the Amazonian population is urban – so that they are not driven away by predatory activities or even activities linked to organized crime, which has increased its presence in the region. The Amazon region shows indicators of social progress that are lower than the rest of Brazil.

With respect to forest restoration, it can be considered a promising frontier of the Brazilian economy. In addition to being a hub for attracting international capital, it is one of the strategic pillars for achieving national climate (NDCs), biodiversity and sustainable development targets. And with comparative advantages: Brazil has vast areas that are suitable for forest recovery, accumulated technical capacity, and growing public and private engagement, although it still needs to solve critical points to scale up. Demands from the carbon market, food production, and timber supply drive opportunities.

The forestry sector already operates projects in the voluntary carbon market, prioritizing production and ecological diversity, with environmental and social co-benefits and the generation of high-integrity credits that attract important financial and business players. This is a capital-intensive agenda with a strong territorial impact and a long-term vision, with the perspective of planting today to deliver robust results from 2030 onwards. Forest restoration of private and public areas (concessions for forest restoration), complementary to public conservation policies, can be an essential lever for the ecological transition – and, with the Climate COP 30 in Belém, the opportunity grows for Brazil to consolidate its global leading position in Nature-based Solutions (NbS).

Expansion depends above all on adequate financing appropriate to the characteristics of the sector, regulatory and tax improvements, access to titled land and strengthening of the supply chain and the creation of consumer markets for the products. Furthermore, greater integration is needed with sector policies that borders on the issue, as well as the productive inclusion of family farmers and traditional peoples and communities in the agenda.

The future outlook is that the forest restoration segment using native species will gain similar strength to that which exists today in the exotic species forestry market. To this end, there are a number of challenges to overcome in the segment's main pillars: technological, market, financial, land access, and social development.

The planted forest industry has a positive effect on climate and a regenerative effect on the environment. Its environmental and social results can go far

beyond the ambitions of most productive activities, which need to operate in the field of reducing and compensating impacts.

In forestry activities involving exotic species, which in Brazil uses mostly eucalyptus and pine, the cycle of beneficial effects begins with the removal of carbon from the atmosphere, which is accentuated in young, rapidly growing forests; it continues to store carbon at many levels, in roots, soil, and aboveground forest biomass; and advances with the retention of carbon in end products as diverse as books, flooring, poles, furniture, plywood, lumber for construction, and biochar. The latter, an increasingly important input for other agribusiness sectors to protect the soil efficiently, operates in a sustainable manner, and be perceived as such in the global market.

The forestry industry allows for varied arrangements, in agroforestry systems (SAF) and integrated with livestock and other crops, which can be planned for maximum value creation and the most necessary nature-based solutions for the surroundings, from food security to thermal regulation. Thus, forest cultivation is characterized by offering a rare and valuable combination – carbon removal, forest conservation, diverse environmental services, and intensive production, with high value and job creation.

The potential of the forestry sector as a provider of environmental services, for Brazil and the world, is leveraged by the high productivity achieved in Brazil. Like the technology of other sectors of tropical agriculture, the technology of planted forests needed to be developed or adapted to Brazilian conditions, which vary between regions of Brazil and are different from those known in temperate climate countries, where techniques for planting trees for industrial purposes originated.

The European Institute of Planted Forest (IEFC) defines “fast-growing trees” as those with a Mean Annual Increase (MAI) of 10 cubic meters or more per hectare per year (m3/ha/year) or more. The average MAI in planted forests in Brazil is 31 m3/ha/year, in the case of pine, and more than 34 m3/ha/year, in the case of eucalyptus. This is an extraordinary difference compared to the rate found in other parts of the world for these two genera of trees.

This equation includes the forestry’s sector expertise in fields such as the domestication of exotic species, genetic improvement, mechanization, integrated pest management, and forest management in general, as well as Brazil’s strong tradition in high-productivity tropical agriculture.

Currently, planted forests form an asset class with their own standardization, return prospects, and risk management. The set of planting and maintenance technologies, as well as the consolidated management experience, could also be applied to the restoration of native forests – which, also as an asset class with predictable returns, would gain new potential to attract international investments.

Below are some of the progresses already made in the Conservation, Restoration and Forestry fronts, as well as the points yet to be achieved.

Conservation

PROGRESSES ALREADY MADE:

- Protection defined by law: the National System of Conservation Units covers 42% of Brazilian territory, along with Indigenous Lands. Conservation Units and Indigenous Lands have the lowest deforestation rates in Brazil
- Advanced technological apparatus for monitoring and inspecting deforestation using satellite imagery, territorial intelligence, and inspection
- Consolidated legal framework. Of particular note is the Forest Code, which protects a significant portion of forest (although the implementation of the Rural Environmental Registration File (CAR) is necessary to enable restoration projects)
- Institutional capacity to fight deforestation through public command and control policies

FUTURE TO CONQUER:

- Illegal deforestation must be eliminated and incentives have to be created to bring legal deforestation close to zero, considering that the expansion of the agricultural and livestock frontier can occur in already deforested and degraded areas.
- If Brazil does not achieve near-zero deforestation by 2030, the country and the world risk losing one of the most important systems for absorbing carbon on a large scale. The Amazon is especially important in this equation because it represents half of the world’s tropical forests.
- Therefore, the development of the Amazon, which presupposes the elimination of deforestation and the flourishing of a forest-based and low-carbon economy, depends on the well-being and human development of its population.
- Viewing the forest as an economic asset will be essential for to its conservation. This presupposes a new financial model, based on two systems: one to reward regions for avoiding emissions resulting from deforestation and degradation (Jurisdictional REDD+) and reward the protection of existing forests (such as TFFF and REDD), and, the other, to ensure the forest restoration of degraded areas, either through natural regeneration or the planting of native trees.
- Expansion of legal timber management, forest bioeconomy, and biobusinesses associated with innovative agroforestry systems that are beginning to be developed in the Amazon.

Restoration

PROGRESSES ALREADY MADE:

- The legal framework is expanding, notably through the National Plan for the Recovery of Native Vegetation (Planaveg) and the National Program for the Conversion of Degraded Pastures (PNCPD), aimed at recovering 40 million hectares by 2030, including forest restoration, formation of productive pastures, and planting of grains
- Forestry companies are attracting investments from global corporations in carbon credits to restore large-scale degraded areas in the Amazon and Atlantic Forest
- This sector is already operating projects in the voluntary carbon market, prioritizing high integrity of credits, ecological diversity, and generation of environmental and social co-benefits
- Consolidation of regional collectives, networks, and alliances to support the demand for restoration and monitoring of the areas
- Launch of a pre-competitive Native Species Forestry program to boost the sector with timber production and carbon credits

FUTURE TO CONQUER:

- The future outlook is that the forest restoration segment using native species will gain similar strength to that which exists today in the exotic species forestry market
- New resources to promote forest restoration have been announced by major financial institutions
- There are a number of challenges to overcome in the segment's main pillars: technological, market, financial, titled land access, and social development
- The activity is in a process of maturation towards a scale of one million hectares by 2035. Private restoration companies are already planting today to deliver concrete results as of the next decade
- Restoration of private areas, complementary public conservation policies, can be an essential lever for ecological transition, enabling Brazil to consolidate its global leading position in Nature-based Solutions (NbS)
- Regulation of national and international mechanisms for access to the international carbon market, such as corresponding adjustments and international transfers of credits

Forestry

PROGRESSES ALREADY MADE:

- Planted forests in Brazil already form an asset class with their own standardization, return prospects and risk management, counting on significant participation from international and domestic investors via TIMOs (timber investment management organizations)
- Advanced planting techniques. The mosaic system, which alternates areas of trees cultivated for industrial purposes with conservation areas, offers a double benefit: greater productivity in the planted area and protection for the preserved area, with the resulting environmental services
- This sector is one of the most adapted in Brazil to extreme weather events, although there is room for improvement. Genetic improvement of species (important for crops to achieve high productivity in all regions of Brazil) increases resilience to climate change and its consequences, such as water deficit
- The use of digital technology and robotics in forestry enables the early detection of risks that could affect the productivity and production of forest plantations. Examples include machinery specifically designed for tree cultivation areas, the use of UAVs (unmanned aerial vehicles), online monitoring of wildfire outbreaks, digital measurement of timber volume, and real-time monitoring of field activities
- The sector supplies more than 5,000 bioproducts, which include timber items and a range of non-timber products

FUTURE TO CONQUER:

- Appropriate public policies on land tenure, logistics, water use, and science and technology issues that contribute to the sustainable expansion of the activity, its climate adaptation, and its coexistence with communities and other sectors.
- Production of second-generation ethanol, which can be obtained from forest waste such as tree trimmings, wood, and sawdust. The expansion of the ethanol production base is part of a broader context: the consolidation of Brazil as a global leader in the use of biofuels, with the benefits of these value chains being well distributed throughout Brazil's territory.
- Diversification of the forestry economy in Brazil. With the application of the concepts of forest mosaic and forest continuum, contiguous areas – each with adequate forest cover and mutually reinforced protection structure – can be dedicated to different purposes, such as food, oil and fiber production, livestock activity (through Integrated Livestock-Forestry), extractivism and ecotourism.
- Generating carbon credits as an essential and integrated activity within the industry's processes, based on clear rules within Brazil's carbon legal framework and capable of stimulating this practice, in order to maximize the environmental services provided by tree cultivation.

Introduction

EFFORTS IN CONSERVATION, FOREST RESTORATION, AND FORESTRY ACTIVITIES IN BRAZIL INDICATE THAT THE COUNTRY MAY HAVE MORE FORESTS IN THE FUTURE THAN IT DOES NOW.

This is great news for the climate agenda, but it's not the only issue. The expansion of forests in Brazil generates advantages that go far beyond combating the increase in global temperature: the benefits for the climate are produced while preserving the greatest biodiversity on the planet, and it also generates income and well-being and creates jobs for those who live and depend on forestry activities, not to mention the maintenance of ecosystem services that are essential for people and the economy.

But of course, this glimpse of the future for Brazilian forests depends on effectively controlling deforestation right now, something that Brazil has already shown it can do, particularly in the 2004-2012 period, when it reduced deforestation in the Legal Amazon by 80%.

The study of scenarios on carbon emissions and removals through forests in Brazil – in the Conservation, Forest Restoration and Forestry fronts – shown in the table and charts below, indicates that the projections considered for 2035 are achievable, provided that there are advances in structural issues such as regulation of the carbon market, investments, financing systems, land tenure regularization, and research and development (R&D). Combined with deforestation control, this would allow Brazil to halt within 10 years the loss of forest stock and begin to reverse the trend, as most developed countries have already done.

Brazil can increase its forest cover in the near future without competition for land for food production, which has a significant impact on the carbon equation and, consequently, on the global climate balance. By illustrating the balance between carbon emissions and removal through native forests, forests to be restored, and planted forests, the following charts outline two scenarios considering deforestation rates, forest restoration, and forestry.

The baseline scenario represents a loss of approximately 1% of the carbon stock in Brazil's forest formations and a reduction of about 1.5 million hectares of forests due to deforestation, if the current trend continues. On the other hand, the potential scenario represents a gain of around 1% in carbon stocks and an increase of approximately 2.8 million hectares of forest cover, obtained by achieving the zero-deforestation targets within the period expected by Brazil's Nationally Determined Contribution (NDC), as well as by the growth of secondary forest areas that start to be protected. Furthermore, there would be an increase in planted areas, for both restoration of native forests and forestry with exotic species.

The charts also indicate the integration between the many fronts presented in this document: for example, forest conservation in private areas occurs in both forestry and forest restoration, through compliance with the Brazilian Forest Code. An important part of the forest restoration agenda will be provided by natural regeneration, which in turn is closely related to the field of conservation.

For these targets to be achieved, it is important to have a monitoring system that tracks not only the evolution of carbon emissions but also the improvement of the conditions that enable this scenario. Therefore, it is proposed that Brazil should have an integrated system for monitoring forestry targets. It is suggested that, over the course of 2026, this study be revisited and instruments be established so that this monitoring can be done in advance for COP 31.

As a result, after a systematic study of the many fronts in this document, a second edition will be presented at COP 31, incorporating this refinement and the suggestion of an integrated monitoring system.

THE FOREST CONTINUUM APPROACH

This document presents an overview of Brazilian forests, from those best preserved in their original characteristics to forests planted by human hands with exotic species, including forest restoration projects using native species. For each of these fronts, it presents data on the current situation and a vision of the future; that is, it shows where Brazil is now, where it wants to go, and what challenges and opportunities are inherent in that path.

The three fronts – Conservation, Forest Restoration and Forestry – are addressed in this report based on the forest continuum. This is an internationally used concept that encompasses a view of the diverse landscapes across a given area.

The forest continuum begins with the preservation of untouched forest massifs; continues with increasing human intervention in forests with sustainable use via forest management; progresses to the forestry enrichment of degraded forests; proceeds to forest restoration and then to the planting of native forests with lower species diversity; includes the planting of long-cycle exotic species (possibly combined with native species); and ends, at the extreme, with the planting of monocultures of species such as eucalyptus or other species, whether native or not, for economic purposes with well-defined markets, inserted in agribusiness or traditional forestry[1].

Throughout the continuum, it can be stated that all alternatives generate some type of positive impact. Pure conservation ensures that carbon stays in the environment, within a natural pattern of greenhouse gas balance, and also that water resources, environmental services, and biodiversity are maintained. At the other end of the continuum, intensive and homogeneous forest plantations provide accelerated absorption of atmospheric carbon for economic purposes with well-defined markets, inserted in agribusiness or in traditional forestry, and even non-timber forest products, including carbon credits, and which maintain conservation areas upon compliance with the Forest Code (Law No. 12,651/2012).

DEFORESTATION, PLANTING AND CARBON STOCK SCENARIOS IN BRAZILIAN FOREST FORMATIONS – 2025 AND 2035		2025			2035 – Baseline scenario			2035 – Potential scenario		
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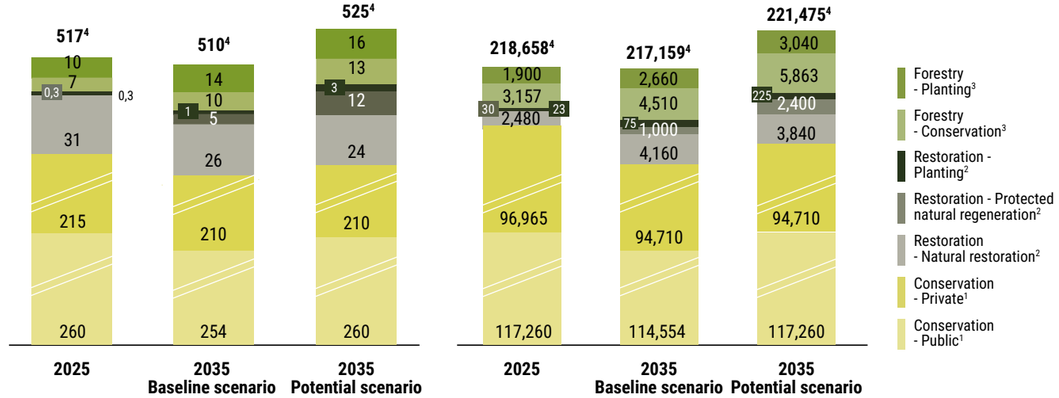
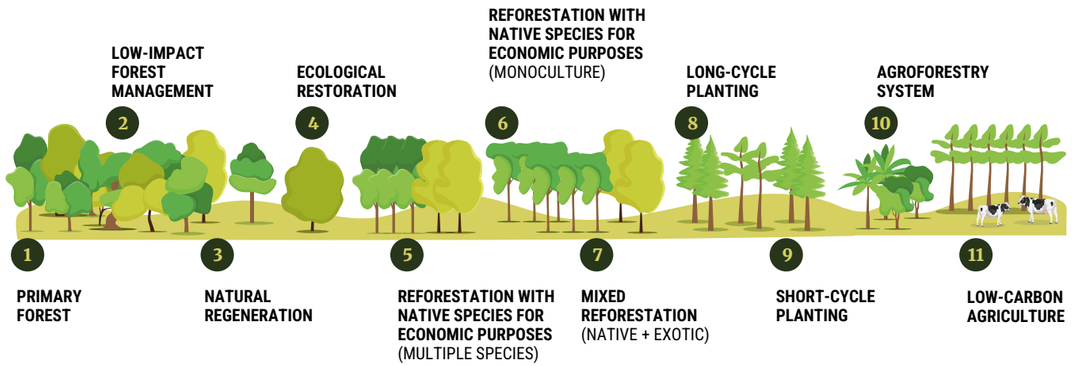
Total[4]		**517**		**218,658**	**510**		**217,159**	**525**		**221,475**



1. The total forest area of Brazil in all its biomes was considered. Areas of shrub and grassland vegetation present in the Cerrado (scrubland), Pampa (prairie), Pantanal (wetland), Caatinga (woodland) and, to a lesser extent, in the Amazon and high-altitude fields of the Atlantic Forest are not included. For public areas, the following were considered: (i) Conservation Units registered in the National Registry of Conservation Units, excluding Private Natural Heritage Reserves (RPPN) and Environmental Protection Areas (APA), (ii) public land and/or non-designated public forests, (iii) Indigenous Lands, (iv) military areas. For private areas, official information from the Rural Environmental Registration File (CAR), rural settlements, quilombola community lands and unregistered public lands was used. The distinction between public and private areas was made based on the Land Atlas, generated by the *Cartas da Terra* (Letters from Earth) project, which consolidates information from Incra, Funai, MMA and ICMBio, among others.For the baseline scenario in 2035, a loss of 11 million hectares due to deforestation was considered in the period from 2025 to 2035, equally divided between public and private areas. For the potential scenario in 2035, it was assumed that gross deforestation will be close to zero in 2030 and, in the following years until 2035, losses will be replaced or offset by restoration. Thus, the amount of forests in public areas will not change and, in private areas, the accumulated deforestation of 5 million hectares will be maintained, practically derived from the period from 2025 to 2030. Carbon volumes (tCO_2e/ha) were calculated based on the application of carbon factors from the National Inventory of Greenhouse Gas Emissions for the forest formations considered, divided by the total forest area.**2.** For natural restoration, data from MapBiomas was used, which indicated that, in 2024, Brazil had 31.2 million hectares of secondary forests (in recovery). For the baseline scenario in 2035, it was considered that part of the natural restoration (5 million hectares) will start to be protected, reaching, in the potential scenario in 2035, the target of 12 million hectares. For restoration by planting, the quantities indicated by the Brazilian Coalition on Climate, Forests and Agriculture and the Pre-Competitive Forest Restoration Movement (Floraz Movement) were considered, including targets announced by companies for the base and potential scenarios. To calculate the carbon volumes (tCO_2e/ha) used, an average annual growth of 8 tCO_2e/year was assumed for the forests, considering the removal factors of the National Inventory of Greenhouse Gas Emissions for the forests in each biome. Considering that natural restoration will take place over the course of 10 years (2025 to 2035), the average age of the forests will be 5 years and, therefore, the average additional stock of these areas will be 80 tCO_2e/ha, reaching 160 tCO_2e/ha for the base and potential scenarios. For protected natural regeneration, the average annual growth will increase to 10 tCO_2e/ha, reaching a total of 200 tCO_2e/ha in both scenarios in 2035. For planting, an average annual growth of 15 tCO_2e/ha was considered. For existing plantations in 2024, the average forest age was estimated at 5 years and, therefore, 75 tCO_2e/ha. The base and potential scenarios considered that, in 2035, plantations will also have an average of 5 years and, therefore, the same 75 tCO_2e/ha. **3.** For forestry, data from the Brazilian Tree Industry (IBÁ) and BM2C Consultoria were assumed. For 2025, the actual planting and conservation areas were assumed according to IBÁ data. For 2035, in the baseline scenario, 14 million hectares were assumed and, in the potential scenario, 16 million hectares, due to the increase in demand. Data on carbon stocks refer to the average of existing plantations, considering the different growth stages of these forests. **4.** According to the Brazilian Institute of Geography and Statistics (IBGE), the Brazilian Forest Service (SFB), and MapBiomas, Brazil has more than 500 million hectares of natural forests; the most recent MapBiomas survey (Collection 10) indicates 507 million hectares of forests in 2024. The total presented in the table also includes the amounts for forestry planting and excludes the amounts related to conservation in forestry, which are already included in native vegetation areas in private land.

FOREST CONTINUUM
It covers different types of landscapes, from primary forests to low-carbon agricultural systems, with different associated benefits



Source: Waack, 2016 and 2021; Batista et al., 2017

Restoration with reforestation with native species, in addition to recovering biodiversity, can generate timber and non-timber products with relevant social and economic impacts, in addition to providing ecosystem services[2]. Sustainable forest management, even with the removal of some trees, ensures the permanence of the forest in regions with high pressure for conversion, generating income and products with applications in furniture and civil construction, replacing materials that are high emitters of greenhouse gases, such as concrete, plastic and metals. The forest continuum area also incorporates agroforestry systems (SAF) and integrated crop-livestock-forestry (ICLF).

By addressing these three fronts, this report uses as a cut of the two largest forest biomes – the Amazon and the Atlantic Forest – but also includes case studies on restoration and forestry conducted in the Cerrado (Brazilian scrubland) biome.

Regarding the data surveyed for this document, it may be noted that the Forestry front presents more detailed information due to the higher level of maturity of this activity in Brazil. In Forest Conservation and Restoration, the information shows greater variability, depending on the assumptions and calculation methodologies chosen by the different sources. This shows that these two fronts are in the process of maturation, in addition to the fact that they operate in highly complex scenarios.

A key piece in the climate puzzle

WITHOUT FORESTS, THE WORLD CANNOT COMPLY WITH THE PARIS AGREEMENT, A FUNDAMENTAL STEP TO MITIGATE THE CLIMATE CRISIS AND THUS ENSURE TO HUMANITY AND OTHER SPECIES THE CONDITIONS TO SURVIVE ON EARTH

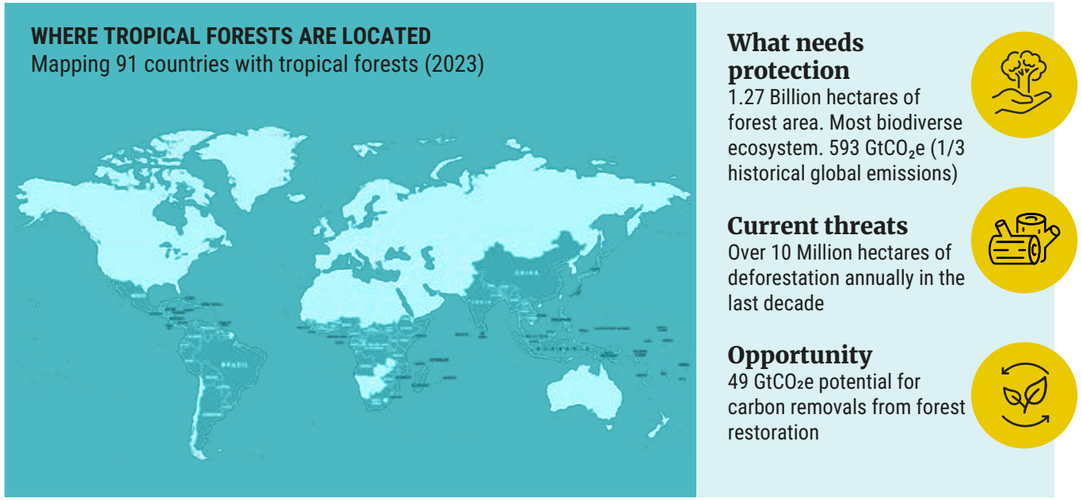
Forests regulate climate and rainfall, contribute to soil conservation, and provide significant benefits for agriculture, hydroelectric power generation[3], river navigation, and human water supply. Conserving them also helps to control pests and prevent the spread of zoonotic diseases, many of which originate in disturbed wildlife habitats. Forest destruction accelerates the loss of biodiversity and makes it more difficult for local communities to maintain traditional ways of life. Therefore, protecting high-integrity forests that are currently facing deforestation pressure is crucial[4].

Trees are highly efficient at converting carbon into biomass and contribute significantly to carbon storage throughout their growth cycles. Carbon removed from the atmosphere is stored in different compartments: aboveground biomass (trunks, branches, and leaves), belowground biomass (roots), leaf litter, dead wood, and soil carbon. Restoration and reforestation activities are recognized as Nature-based Solutions (NbS) precisely because of their ability to remove carbon from the atmosphere in a natural and scalable way, directly contributing to the mitigation of climate change.

This is why forests are among the most scalable and cost-effective climate solutions available today. They absorb about 1/3 of the annual CO_2 emissions from human activity and are essential to achieve global climate targets.

Particularly in the case of tropical forests, the benefits are not only climatic but also ecological and social. Tropical forests are home to more than 50% of all terrestrial species, making them the most biodiverse ecosystems on Earth (Pillay et al. 2021). This biodiversity is not only valuable in itself; it plays a critical functional role in maintaining forest resilience and supporting essential ecosystem services, including carbon sequestration, water regulation, and soil fertility (Myers et al. 2000), according to The Forest-Climate Nexus report[5].

Forests provide livelihoods for more than 1.6 billion people worldwide, particularly in rural areas,



Note: There are also tropical rainforests in Australia, Zambia, Burundi, and the U.S..
Source: CPI/PUC-Rio with data from Hansen et al. (2013) - v1.11, CHIRPS precipitation (2023), and TerraClimate temperature (2020), 2025.

supplying food, medicine, fuel, timber, fibers, and income-generating opportunities through formal and informal markets (Grima et al., 2023). For many communities, particularly indigenous peoples and traditional populations, forests are not only a source of material sustenance but also the basis of cultural identity, spiritual life, and social cohesion (UNEP, 2021).

They also contribute to the climate change adaptation agenda. Forests help people, communities, and economies adapt to climate impacts by regulating water cycles, protecting soils, reducing the risks of floods and droughts, and providing food, fuel, and other products that work as safety nets in times of crisis. These services are indispensable for sectors that are particularly sensitive to climate, such as agriculture, water resource management, and energy.

However, forests are becoming increasingly vulnerable to the impacts of climate change, including higher temperatures, changes in rainfall patterns, prolonged droughts, and more frequent forest wildfires. This two-way dynamic means that forest loss accelerates climate change, whereas climate change erodes the resilience of forests[6].

Brazil's role

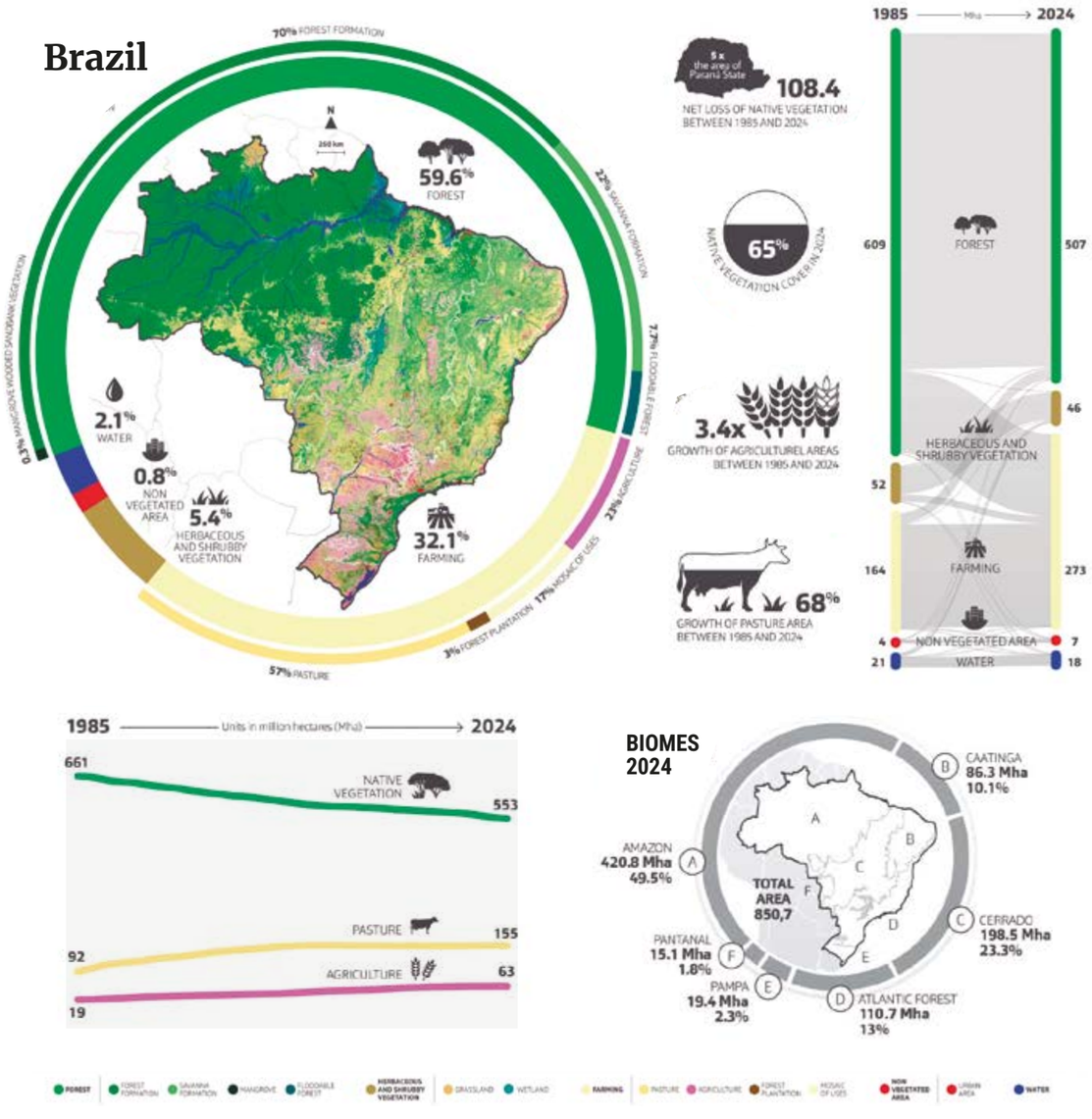
IF TROPICAL FORESTS ARE FUNDAMENTAL TO CLIMATE AND THE MAINTENANCE OF LIVING CONDITIONS ON EARTH, THEN BRAZIL IS THE MOST IMPORTANT PLAYER IN THIS EQUATION, AS IT HOLDS THE WORLD'S LARGEST AREAS OF TROPICAL FORESTS AND AT THE SAME TIME HAS THE GREATEST POTENTIAL FOR CARBON CAPTURE THROUGH FOREST RESTORATION

Although Brazil still faces major challenges in fighting deforestation *(see map on page 42)*, it has the greatest potential for carbon capture and obtaining income associated with it. McKinsey estimates at 3.3 gigatons of carbon equivalent ($GtCO_2e$) the potential of emission reduction by 2050 through the restoration of degraded pastures with tropical forests, reduced deforestation, and improved land use practices[7]. Amazon 2030[8] studies project show that with carbon prices exceeding US$25 per metric ton of CO_2 forest restoration could capture approximately 16 gigatons of carbon over the next 30 years.

In addition, conservation, forest restoration, and forestry with exotic species are key conditions for Brazil to fulfill its Nationally Determined Contribution (NDC) under the Paris Agreement, making a decisive contribution to CO_2 removal and the development of a low-carbon economy in Brazil. The stock of carbon dioxide equivalent (CO_2e) in planted forests intended for production has been increasing over the past decade and is currently estimated at 1.9 billion metric ton, or 1.9 gigaton *(learn more on Forestry on page 107)*.

CHANGES IN 40 YEARS

Annual evolution of plant cover and land use (1985-2024)



Source: MapBiomas

CRISIS AND OPPORTUNITY

Brazil, which holds the largest areas of tropical forests in the world, is a champion in deforestation but also in carbon capture potential

Largest area of tropical rainforest in the world

WORLD
1.27 billion
hectares

BRAZIL
358 million
hectares*

*of humid tropical forests, out of a total of 507 million hectares of tropical forests

Largest deforested area in the world*

WORLD
189 million
hectares

BRAZIL
50.7 million
hectares

*in the 2001-2023 period

Greater potential of carbon capture from deforested areas*

WORLD
49 $GtCO_2e$

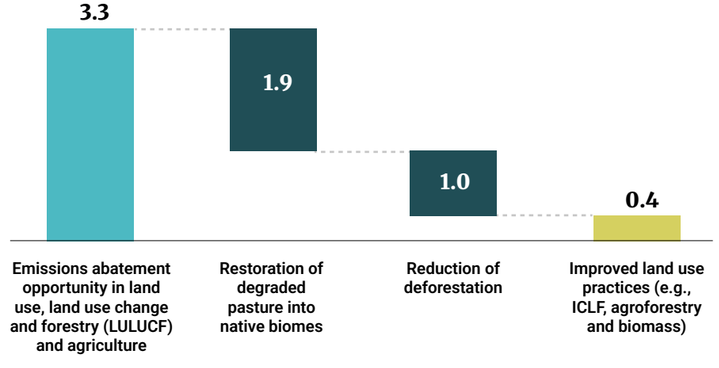
BRAZIL
16.7 $GtCO_2e$

*in the 2001-2023 period

Sources: CPI/PUC-Rio with data from Hansen et al. (2013) - v1.11, 2025, CHIRPS precipitation (2023), and TerraClimate temperature (2020), 2025. MapBiomas

MASSIVE DECARBONIZATION OPPORTUNITIES

Potential reduction of emissions by 2050 in land use, land use change and forestry, and agriculture sectors (in $GtCO_2e$)



Source: Beyond Net Zero: Brazil's massive opportunity to decarbonize the world, September, 2023

GLOSSARY

Description of some technical terms used in this document.

Forestry
Science and practice that deals with the cultivation, management and regeneration of forests for economic, environmental, and social purposes, including species selection, soil preparation, planting, cultivation practices and harvesting operations.

Forest Restoration
A set of actions aimed at recovering tree cover and ecological processes in degraded areas, which may involve both native and exotic species, with different purposes (ecological or productive).

Passive Restoration
Based on natural regeneration, it harnesses the ecosystem's intrinsic recovery potential with minimal intervention.

Active Restoration
Involves direct intervention (planting seedlings, sowing, ecological nucleation), used when natural regeneration is not sufficient.

Ecological Restoration
The intentional process of recovering degraded ecosystems to reestablish integrity, resilience, and ecosystem services, taking natural ecosystems as a reference.

Productive Restoration
A restoration model that combines environmental recovery with economic production, integrating native species of timber value, fruits, non-timber forest products, or agroforestry systems, reconciling conservation with income generation.

Natural Regeneration
Spontaneous recovery of native vegetation through seed banks, seed rain, or sprouting, with no direct human intervention.

Ecological Succession
A process of gradual changes in the composition and structure of biological communities, until greater stability is reached (climax stage).

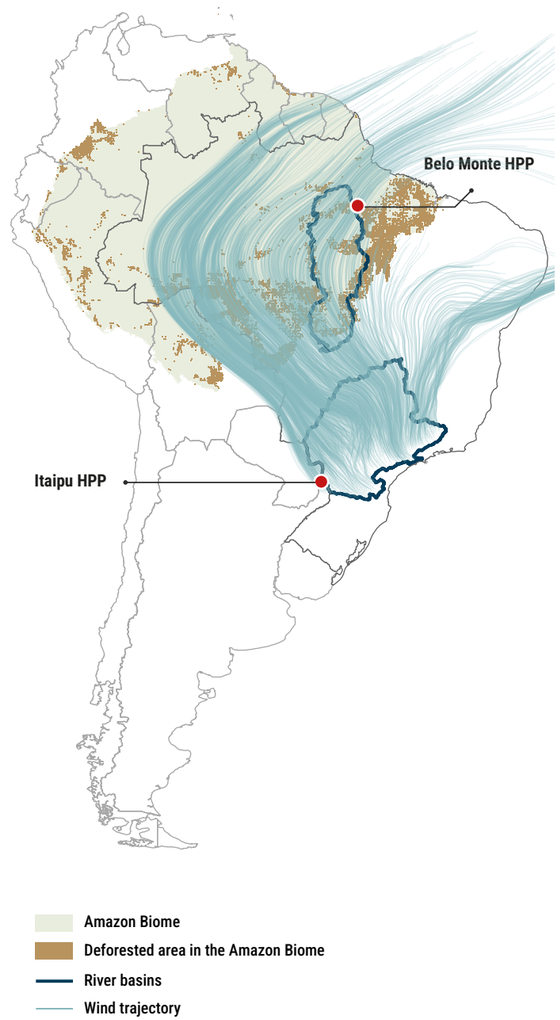
Sources: re.green and LERF/LCB/Esalq/USP

In addition to capturing significant amounts of carbon, Brazilian forests provide basic ecosystem services for the proper operation of the economy and can also generate revenue, either by maintaining standing forests that do not need to be deforested or by restoring degraded areas that currently do not generate income – gains that can be obtained through mechanisms like carbon credits and protection funds, such as the Tropical Forests Forever Fund (TFFF), which is to be created *(learn more in the Conservation section, on page 51)*. Additionally, there are the benefits provided by forestry of exotic species, which contribute to carbon sequestration while maintaining mosaics with preserved forest areas.

Contrary to common belief, fighting deforestation, combined with expanding forest area in Brazil, will not come at the expense of productive activities such as agribusiness – which, in fact, depends on the rainfall patterns regulated by forests. In Brazil, there is enough land in unused and underutilized deforested areas to meet all the demand for the agribusiness expansion in the region, and still allow for the production of commodities from sustainable agricultural and livestock and forestry systems.

A clear example of the advantage of maintaining and recovering forests is the guarantee of rainfall for agricultural and energy production, as shown in the map below. The image illustrates the so-called "flying rivers", air currents laden with moisture that, starting in the Amazon, run along the eastern edge of the Andes Mountains in a north-south direction, carrying a large amount of moisture. Tropical forests play a crucial role in recharging this moisture in air currents. Through the transpiration of trees, the Amazon evaporates 20 billion metric tons of water

ENERGY DEPENDS ON THE LIVING FOREST
Flying Rivers and the basins that feed the Itaipu and Belo Monte hydroelectric plants



Source: CPI/PUC-Rio based on data from Copernicus-ERA5 (2023), MapBiomas (2023), Aneel (2023) and IBGE (2021), 2025 in "Deforestation Cuts the Lights: Itaipu, Belo Monte, and the Price of Lost Forest" – Amazônia2030

per day, and this moisture is transported to the mid-south part of Brazil via atmospheric currents.

Since rainfall patterns in river basins are influenced by currents, these currents become essential for energy production. But when air currents pass through deforested areas, they do not receive the water recharge they would obtain in forested areas. This makes them less damp, which reduces the incidence of rain along the way. Consequently, the flow of rivers located in the way of air currents is reduced, decreasing the hydroelectric generation capacity of power plants. In other words, the loss of forest vegetation directly impacts the productivity of hydroelectric power plants.

The good news is that Brazil already knows how to protect forests and fight deforestation. Between 2004 and 2012, for example, the deforestation rate fell 80%, as a result of a successful monitoring, command and control policy and the creation of protected areas. In addition, the creation of protected areas or Conservation Units has protected more than 55 million hectares of forests in the Amazon (equivalent to the area of the state of Minas Gerais). It should be noted that this reduction occurred even while agricultural and livestock production in the Amazon region practically doubled[9].

Although deforestation increased in subsequent years – mainly from 2018 onwards – the resumption of the policy to fight deforestation from 2023 onwards was able to generate a further reduction in deforestation. In fact, according to the report by Prodes, a satellite deforestation monitoring system of the National Institute of Space Research (Inpe), there was a 30.6% reduction between August 2023 and July 2024, reaching the lowest rate since 2016. MapBiomas Alerta indicates that in 2024 there was a reduction in deforestation for the first time in all biomes.

This demonstrates that fighting deforestation depends on effective public policies, which in turn depend on political will, particularly from the Executive and Legislative branches at the federal and state levels.

Brazil already has a modern legal framework for forest protection like few other countries in the world have, while also making commitments in many international agreements *(see table on page 47)*.

Forests are one of the pillars of the environmental and land-use regulatory framework. The Forest Code (Law No. 12,651/2012), the main reference in this field, establishes rules for the use and protection of native vegetation on rural properties, including Permanent Preservation Areas (APP) and Legal Reserves (RL). The law arose from the need to reconcile agricultural and livestock production with environmental conservation, following a long process of legislative and social debate.

One of the key instruments for its implementation is the Rural Environmental Registration File (CAR), a mandatory national system that gathers self-reported information about the environmental status of rural properties. CAR allows for the identification of liabilities and areas in compliance, serving as a basis for Environmental Regularization Programs (PRA) and monitoring and transparency policies. In this context, it is essential that Brazil accelerates the validation of the CAR because only after this step will it be possible to advance in the adherence to the PRA and, consequently, scale up the restoration actions.

INTERNATIONAL AGENDA
Brazil has made several commitments to the global community regarding forests, including:

- **Convention on Biological Diversity (CBD)** – Brazil is a signatory to the 1992 convention, through which it commits to the "conservation of biological diversity" and "the sustainable use of its components".
- **Glasgow Declaration on Forests and Land Use** – Since 2021, Brazil and 144 other countries have signed the document resulting from COP 26, committing to zero deforestation by 2030.
- **New York Declaration on Forests** – Since 2014, three Amazonian states – Acre, Amapá, and Amazonas – have committed to zero deforestation by 2030.
- **Initiative 20x20** - In 2014, Brazil and 17 other countries in Latin America and the Caribbean committed to jointly protect and restore 50 million hectares of degraded land by 2030.
- **The Bonn Challenge** – In the initiative launched in 2011, Brazil committed to restoring at least 4.28 million hectares of degraded land by 2030.
- **The Trinational Atlantic Forest Pact** – The joint target of Brazil, Argentina, and Paraguay to restore up to 1 million hectares of the biome by 2030 and 15 million hectares by 2050 was listed by the UN at COP 15 on Biodiversity in 2022 as one of the 10 "Global Restoration Initiatives". The Pact has been under construction by a network of institutions since 2009.
- **Latin American Model Forest Network** – Local governments and NGOs have committed to preserve five forest areas (distribted across the states of Bahia, Espírito Santo, Goiás, Mato Grosso do Sul, Minas Gerais, and Pará) while simultaneously improving the quality of life for local communities.

The delay in validation has been a major obstacle, as most rural landowners prefer to wait for this process before making commitments, particularly because restoration implies direct costs. Therefore, alignment with instruments such as the Payment for Environmental Services (PES) becomes strategic, as it demonstrates that the recovery of RL and APP does not need to fall exclusively on the producer, but can even generate economic benefits.

Furthermore, over the past few years, Brazil has consolidated a set of programs and policies that support the forestry agenda, such as the National Plan for the Recovery of Native Vegetation (Planaveg), the National Program for the Conversion of Degraded Pastures, the ABC+ Plan, the Forest+ Program, the National Policy on Payment for Environmental Services, and the Public Forest Management Law, which established forest concessions *(learn more in the Conservation section, on page 51)*.

Through the BNDES Forest initiative, the Brazilian National Bank for Economic and Social Development (BNDES) connects different financial (reimbursable and non-reimbursable) and technical instruments aimed at developing and consolidating, on a large scale, the forest restoration and bioeconomy sector in Brazil. According to the institution, R$ 3.4 billion investments have already been raised to boost restoration, its production chain, and forest bioeconomy, with expectations of creating 23,500 jobs.

Through frameworks such as these, areas designated for protected and preserved vegetation in Brazil now represent 66% of the national territory. Only the areas designated for vegetation preservation in rural properties registered in the Rural Environmental Registration File (CAR) correspond to 20% to 30% of the national territory (depending on the CAR validation process). This shows that conservation and restoration are practices that extend across Brazilian rural properties, throughout the entire forest continuum area of the Brazilian territory.

This publication uses a cut of the two largest Brazilian forest biomes – the Amazon and the Atlantic Forest. The Amazon Rainforest represents 1/3 of the world's tropical forests, holds 20% of the planet's fresh water, and contains more than half of the planet's biodiversity. But the Amazon is not just forest nor is it a homogeneous place.

The Legal Amazon can be classified into five zones based on remaining plant cover: forested, forest under pressure, deforested, non-forested (Cerrado – Brazilian scrubland), and urban (Amazon 2030 Project). These are the so-called Five Amazons, which extend along a forest continuum area, as shown in the maps below. This distinction is fundamental for guiding social and economic development policies, in line with the environmental characteristics of each place.

In the forest part, the role of Indigenous Lands in conservation is noteworthy. According to data from the Deforestation Alert System (SAD) of Amazon's Institute of Man and the Environment (Imazon), Indigenous Territories have the lowest rate of deforestation in the Amazon. From 2012 to 2024, they had 1,825 km² of deforested areas, only 3% of all the devastation recorded in the region.

THE CONTRIBUTION OF INDIGENOUS LANDS TO CONSERVATION AND CLIMATE

1% was the loss of native vegetation
in Indigenous Lands, compared to

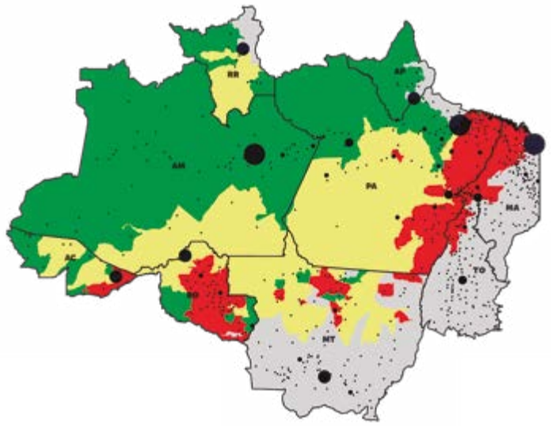
28% in private lands,
between 1985 and 2023

31.8 million metric tons of CO_2 avoided per year
is the climate potential of Indigenous Lands in Brazil

Source: MapBiomas/WRI

THE FIVE AMAZONS

The Amazon 2030 Project classifies the Legal Amazon into five zones based on remaining plant cover: forested, forest under pressure, deforested, non-forested (Cerrado – Brazilian Scrubland), and urban.



The Five Amazons
- Forested
- Forested under Pressure
- Deforested
- Non-Forested (Cerrado)
- Urban Amazonia

Resident Population
- < 100,000
- 100,000 - 250,000
- 250.000 - 500,000
- 500,000 - 1,000,000
- >1,000,000

Note: The Forested Amazon, in green, occupies 39% of the Legal Amazon region and corresponds to the most preserved municipalities. The Amazon under pressure, in yellow, covers 29% of the region and has municipalities with extensive forest cover; however, these municipalities suffer from recent deforestation, illegal logging, and land grabbing. Meanwhile, the municipalities in the deforested Amazon, in red, account for 11% of the region's area. The non-forested Amazon, in white, corresponds to 21% of the Legal Amazon region, covered mainly by cerrado vegetation, concentrated in the states of Mato Grosso, Tocantins and Maranhão. The majority (76%) of the population lives in urban Amazonia.

	TERRITORIAL AREA (2022)	RESIDENT POPULATION (2024)
FORESTED AMAZON	39% – 1.9 million km²	6.4 million – 23%
DEFORESTED AMAZON	11% – 0,5 milhão km²	8,8 milhões – 31%
AMAZON UNDER PRESSURE	29% – 1.4 million km²	3.2 million – 11%
NON-FORESTED AMAZON (CERRADO)	21% – 1 million km²	9.9 million – 35%
TOTAL AMAZONIA	TERRITORIAL AREA (2022) 5 million km² – 100%	100% – RESIDENT POPULATION (2022) 28.3 million

Source: Based on data from IBGE and Veríssimo et al. 2023. AMZ 2030.

The challenge of restoring and conserving the most pressured biome in Brazil

THE ATLANTIC FOREST IS ONE OF THE MOST BIODIVERSE AND HISTORICALLY PRESSURED BIOMES IN BRAZIL, REQUIRING AN INTENSE RESTORATION AGENDA

In view of this, one of the initiatives created was the Atlantic Forest Pact, a multi-sector movement with over 300 members, which has been working to induce the large-scale restoration of ecosystems within this Biome since 2009. The coordination work and results achieved in the field were recognized by the UN as one of the most promising and relevant in the world, being declared one of the top 10 World Restoration Flagship Initiatives in the UN Decade on Ecosystem Restoration (2021-2030).

The Pact has already contributed to restoring more than 140,000 hectares across the 17 Brazilian states that control part of the Atlantic Forest. In addition, approximately 1 million hectares are estimated to be already in the process of restoration in the biome, either through active restoration projects or through the natural regeneration of areas abandoned by landowners and communities. Accordingly, it is necessary to ensure the monitoring of current processes and also to expand restoration to an additional 15 million hectares so that the Pact's target can be achieved in the next 26 years *(learn more on Restoration on page 81)*.

At the same time, the planted forest sector has been showing that it is possible to integrate forest production with nature conservation. The presence of productive mosaics, corridors of native vegetation, and conservation areas within business properties directly contributes to habitat recovery, landscape connectivity, and provision of ecosystem services.

/1

Conservation

Much more than maintaining protected areas

CONSERVATION ACTIVITIES ENSURE ECOSYSTEM SERVICES FOR AGRICULTURE, ENERGY AND WATER SECURITY IN CITIES AND INDUSTRIAL PRODUCTION, DIRECTLY PARTICIPATING AS AN ECONOMIC DEVELOPMENT FACTOR

The deep geoclimatic transformations that occurred approximately 65 million years ago, with the retreat of the Caribbean Sea and the rise of the Andes, created perfect conditions of temperature, humidity and nutrients for the emergence of the largest portion of tropical forest on the planet – today, in the global spotlight. Safeguarding this vast green area, with high diversity of lives and rich in natural resources, represents a victory in the face of the current climate, biodiversity, and social inequality crises.

With 7.8 million square kilometers, this large portion of forests – the Pan-Amazon – covers almost half of the South American continent. Within it, the Brazilian Amazon, covering 64% of the region, shared by nine countries, stands out not only for the size of the area. Beyond the superlatives for encompassing the largest river basin on the planet and a significant portion of its biodiversity, Brazil has the opportunity to show to the world the results of a long trajectory of coexistence with the forest and its environmental and social impacts, lessons learned, and challenges yet to be overcome in the conservation and sustainable use of this natural heritage.

The Atlantic Forest, today with a little over 30 million hectares of native vegetation, is one of the richest areas in terms of diversity of life on the planet. It covers around 15% of the national territory, in 17 states; 72% of the Brazilian population and 80% of national GDP. Essential services such as water supply, climate regulation, agriculture, fishing, electric energy and tourism depend on it. Today, only 24% of the forest that originally existed remains, including fragments of secondary vegetation. Of these, 12.4% are mature and well-preserved forests. In four decades, 11% of the biome's native vegetation was lost.

In total, Brazil has around 220 million hectares of protected forests. In addition, there are around 50 million hectares of public forests in the Legal Amazon region that are not yet under protection and remain at risk of illegal invasion (public land grabbing) and deforestation. If Brazil allocates these 50 million hectares as Protected Areas, total public forests could reach 270 million hectares by 2035[1].

The conservation of tropical forests – along with the restoration of what has already been destroyed, as will be seen in the following section – is one of the main elements that differentiate the various Amazons and their complexities, presented earlier in this report. The preserved areas also make up the mosaic of landscapes that characterize the great forest continuum and their distinct uses and purposes, in the different Brazilian biomes, with essential contributions to Brazil and the planet to achieve their climate targets.

The conservation frontier is comprehensive; it goes beyond creating and maintaining protected areas. It ensures ecosystem services for agriculture, hydroelectric power generation, river navigation, and water security in cities and industrial production, for example. It supplies raw materials for many consumables – and, accordingly, it directly participates as a factor of Brazil's economic development.

Valuing the standing forest, with sustainable and often innovative uses of its assets, is one of the main conservation strategies in the competition with activities that deforest and degrade. On the path to zero deforestation by 2030 as Brazil's climate target, forest loss is a constant point of attention, despite the reduction in rates over the last two years. Brazil is in a privileged position to reframe the way tropical forests are treated in global climate efforts: not only because they are a source of carbon emissions when they are cut down, but because of the assets involved in their mitigation. The conservation of tropical forests is not just a national concern, it is a global priority.

Source: MapBiomas, 2024

MAPBIOMAS

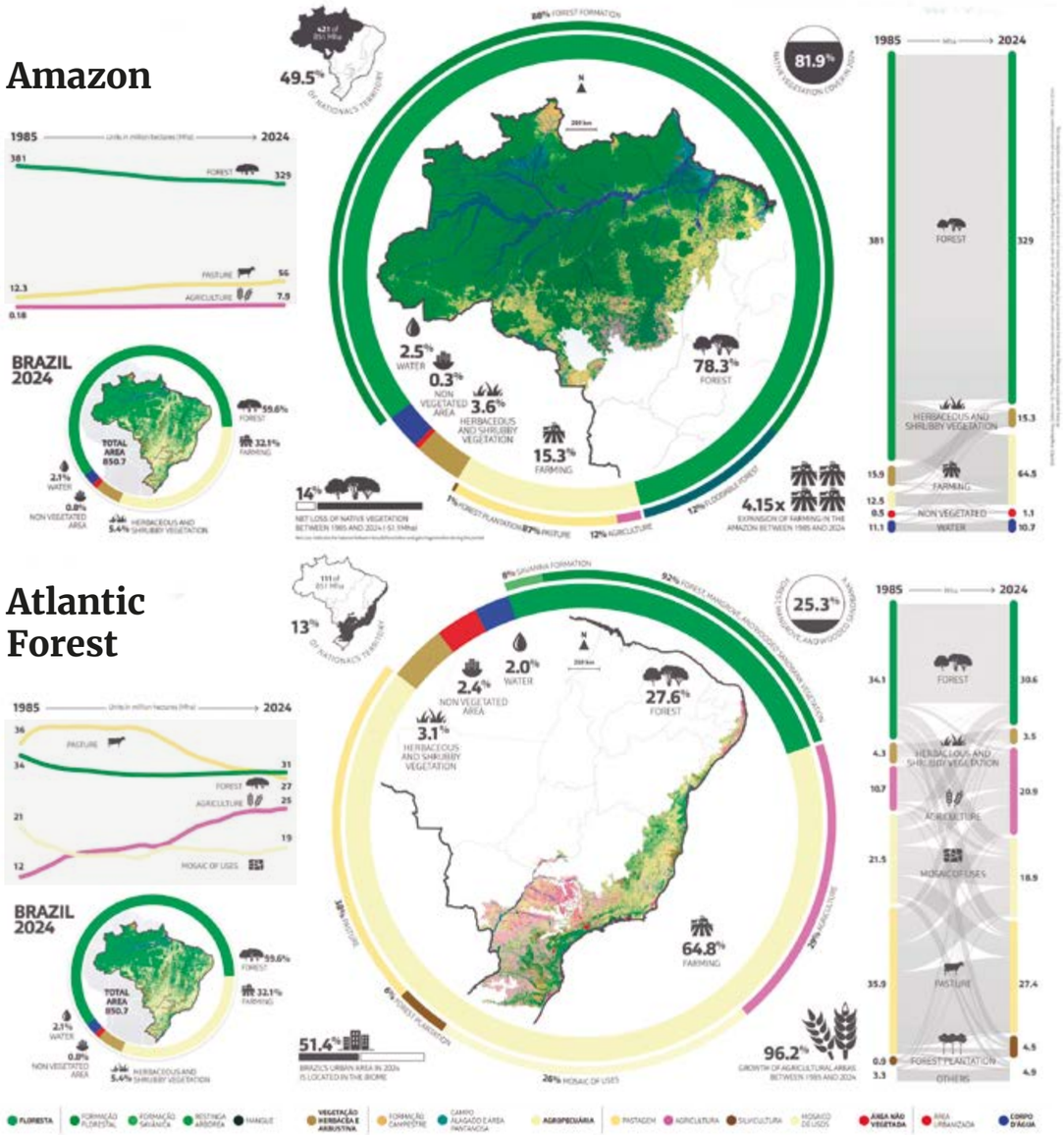
MapBiomas is an internationally recognized multi-institutional initiative that brings together NGOs, universities, think tanks, and technology companies with the mission of mapping changes in land cover and use in Brazilian biomes. To this end, it uses official and georeferencing data. Since 2019, MapBiomas has prepared more than 420,000 reports that support direct action against illegal deforestation practices[2].

THE FORESTS OF BRAZIL

In 2024, Brazil had 506 million hectares of forests, technically divided into five categories: forest formations, properly speaking, savannahs, mangroves, floodable forests and wooded sandbank vegetation. Forest formations total 70%, characterized by a predominance of trees with canopies that connect into a dense vegetation cover. The following map, prepared by MapBiomas, indicates the distribution of different types of forests in Brazil in 2024.

CLIMATE POTENTIAL OF NATURAL FORESTS

Evolution of forest cover and land use – Amazon and Atlantic Forest



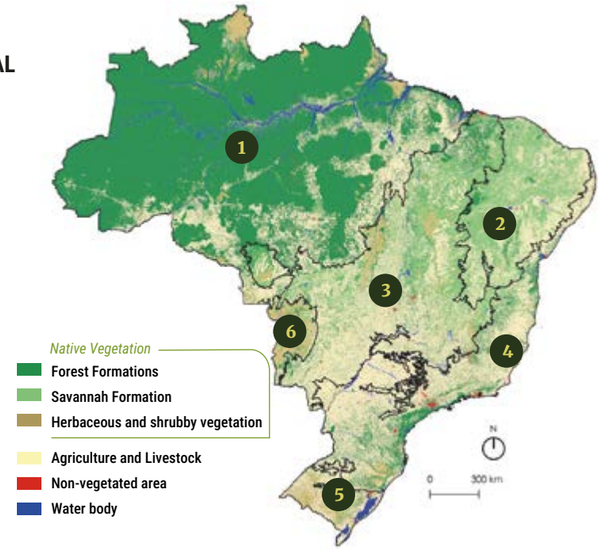
Source: MapBiomas

HISTORY OF PLANT COVER AND LOSS OF NATURAL AREAS IN BRAZILIAN BIOMES

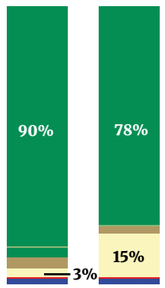
The **Amazon** and the **Cerrado** (Brazilian scrubland) are the biomes that have lost native vegetation the most

The **Cerrado** and the **Pampa** (Brazilian prairie) are the biomes that have lost native vegetation proportionally the most

The **Amazon** and the **Pantanal** (Brazilian wetland) are the biomes with the largest proportion of native vegetation (80%)

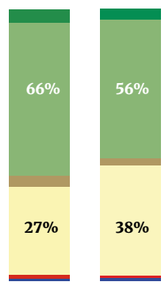


1. AMAZON



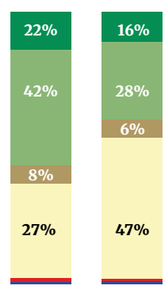
13% (52.1Mha) of loss of native vegetation 1985 - 2024

2. CAATINGA (BRAZILIAN WOODLAND)



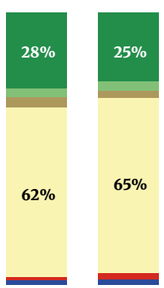
15% (9.2Mha) of loss of native vegetation 1985 - 2024

3. CERRADO (BRAZILIAN SCRUBLAND)



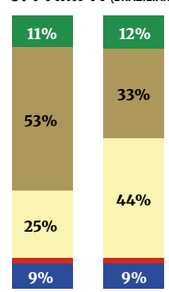
28% (40.5Mha) of loss of native vegetation 1985 - 2024

4. ATLANTIC FOREST



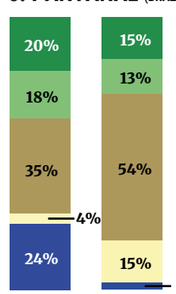
11% (4.41Mha) of loss of native vegetation 1985 - 2024

5. PAMPA (BRAZILIAN PRAIRIE)



30% (3.8Mha) of loss of native vegetation 1985 - 2024

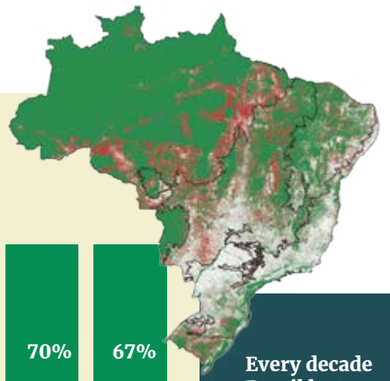
6. PANTANAL (BRAZILIAN WETLAND)



12%* (1.7Mha) of loss of native vegetation 1985 - 2024

*Conversion of native vegetation and water bodies for human use

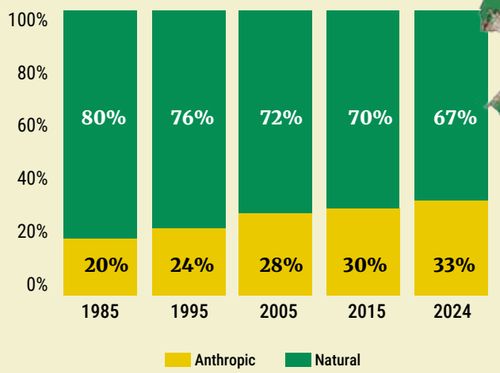
Source: MapBiomas – Coleção 10.



LOSS OF NATURAL AREAS IN BRAZIL (1985-2014)

279.5Mha
are anthropic areas* (33%) in Brazil in 2024

Reduction of 111.7Mha
of natural areas* (16%) in Brazil in 40 years – on average, 2.9 million hectares of natural areas per year



Every decade Brazil lost, on average, 28 Mha of natural areas

The greatest loss of natural areas occurred in the first two decades (69.1 Mha)

Source: MapBiomas

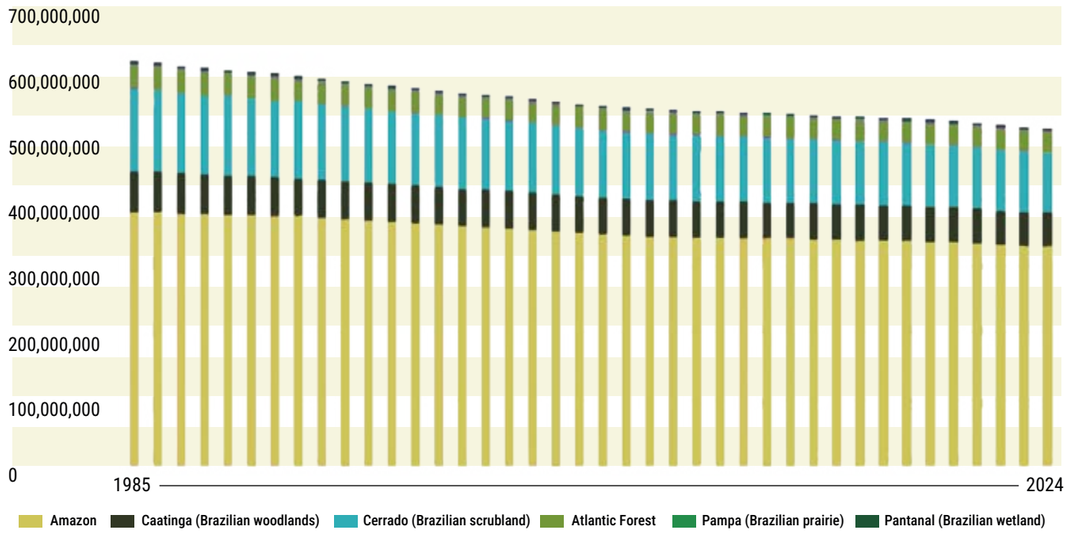
EVOLUTION OF FOREST COVER, A THERMOMETER OF CHALLENGES

Apesar das perdas ao longo da História, a vegetação Despite the losses throughout history, the native vegetation that remains preserved – in addition to that which is being recovered – represents a strategic asset for Brazil. Forest cover makes up 73.2% of the Amazon's area – around 367 million hectares, almost one-third of all of Europe – and plays a fundamental role in mitigating climate change. There are around 400 billion trees (around 16,000 tree species) that store carbon and work as a water pump for the rains that irrigate agricultural crops and supply cities in the Mid-South region of Brazil.

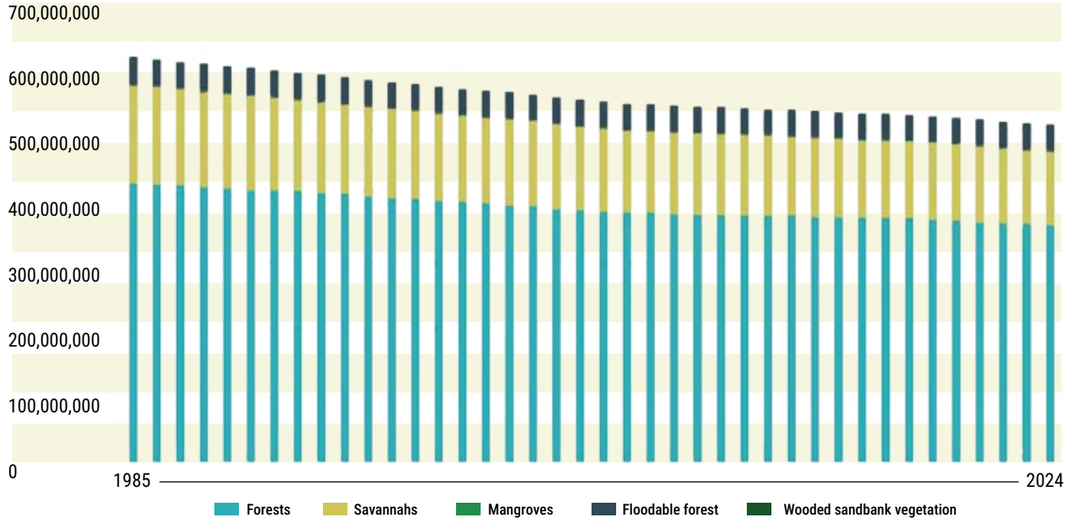
Due to human actions, between 1985 and 2024, 52 million hectares (13%) of native vegetation area were lost, which brings the Amazon biome closer to a possible point of no return predicted by science, after which the forest can no longer sustain itself. During this period, the surface area covered by water shrank 2.6 million hectares: eight of the ten driest years were recorded in the last decade.

In Brazil, the loss of native vegetation reached 108.4 million hectares between 1985 and 2024, around 47% in the Amazon, in a more significant manner before the federal inspection and control policies that reduced deforestation after 2005. As a result of this process, around 33% of the Brazilian territory corresponds to areas that have already been changed by human interference.

EVOLUTION OF THE TOTAL FOREST AREA IN BRAZIL – PER BIOME



EVOLUTION OF THE TOTAL FOREST AREA IN BRAZIL – PER FOREST TYPE



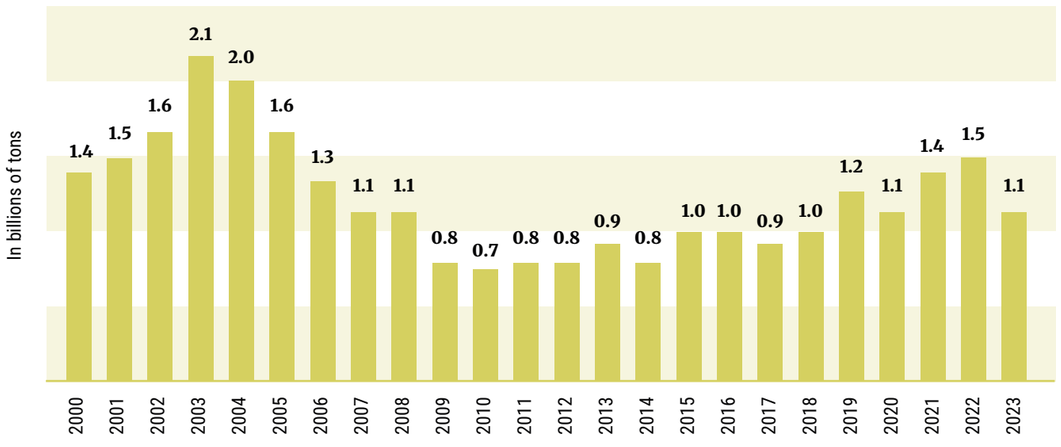
Source: MapBiomas

DYNAMICS OF GREENHOUSE GAS EMISSIONS IN THE AMAZON

By being home to the largest tropical forest on the planet, the Amazon holds a significant carbon stock in its trees and soil, which is essential for tackling the planet's climate change. At the same time, the greatness of the retention capacity of forest cover makes the consequences of losing it also disproportionately large.

AMAZON'S CARBON EMISSIONS

The Brazilian Amazon contributes with a little less than 9% of the Brazil's GDP, but accounts for approximately 50% of greenhouse gas (GHG) emissions



Source: Fatos da Amazônia – edição COP 30, com base em dados do Seeg

Changes in land use, due to deforestation, are the main sources of greenhouse gas emissions in Brazil. Containing the loss of native vegetation and promoting the sustainable use of the forest and its assets is a Brazilian climate priority as Nature-based Solutions (NbS). Together with forest conservation, restoring deforested areas, removing carbon from the atmosphere for plant growth, has been expanding as NbS, accounting for around 30% of the potential for mitigating greenhouse gases, according to the Intergovernmental Panel on Climate Change (IPCC).

In 2023, around 1.1 billion metric ton (1.1 gigaton) of CO_2e was emitted in the Legal Amazon region, which represents 48% of Brazil's emissions that year, according to the Greenhouse Gas Emissions and Removals Estimating System (Seeg). At the same time, the region contributes just under 9% of Brazil's GDP.

The Intergovernmental Panel on Climate Change (IPCC) estimates that around 850 million metric tons of CO_2e, or 3.111 million tons of CO_2e, including carbon in the soil, are stored in forests on the planet[3]. Of this total, 65% are found in tropical forests, with around 45% in the Amazon and the Atlantic Forest (Source: MapBiomas). In Brazil, the Amazon biome accounts for 85% of the total forest carbon stock. According to the IPCC, 440 to 730 tCO_2/ha is the estimated carbon stock for mature tropical forests, depending on forest typology.

PUBLIC COMMAND AND CONTROL POLICIES

The following graph shows that deforestation rates respond to public policies to fight it. The Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm), created in 2004, was essential for the sharp reduction of forest destruction between 2004 and 2012. The initiative undertook control measures, satellite monitoring and inspection, and the creation of more than 50 million hectares of Conservation Units, the largest conservation effort ever undertaken in the tropical world. However, deforestation increased significantly again in 2016. Revoked in 2020, the PPCDAm was resumed and expanded by the federal government in 2023, which enabled a new trend of reduction in rates, with challenges of maintaining the goal of zero deforestation by 2030.

GENERATING INCOME AND PROSPERITY

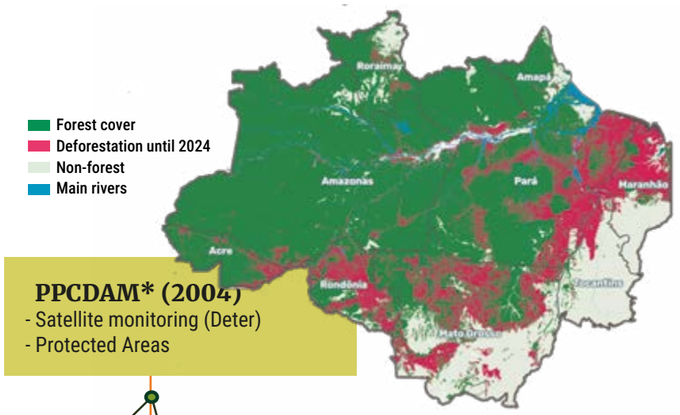
Along with intensified control, the strategy includes partnerships with municipalities, strengthening and protection of indigenous lands, and search for ways to generate income and prosperity that reconcile the use of natural resources with forest conservation.

An Amazon 2030 study shows that curbing forest destruction and implementing territorial planning involves social and economic issues to beyond environmental issues, with repercussions for tackling illegality, violence, and inefficiency that erode the region's economic environment and are significant obstacles to its sustainable development.

The rate of primary forest deforestation in the Legal Amazon fell from 13,038 km² in 2021 to 6,518 km² in 2024, according to the National Institute of Space Research (INPE). The accumulated total reached

DEFORESTATION CURVE

Deforestation rates respond to public policies to fight them

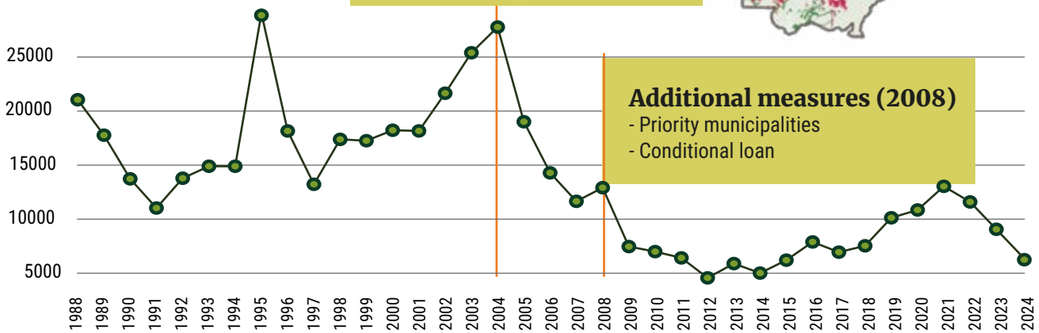


PPCDAM* (2004)
- Satellite monitoring (Deter)
- Protected Areas

Additional measures (2008)
- Priority municipalities
- Conditional loan

POLICIES TO FIGHT DEFORESTATION IN THE AMAZON

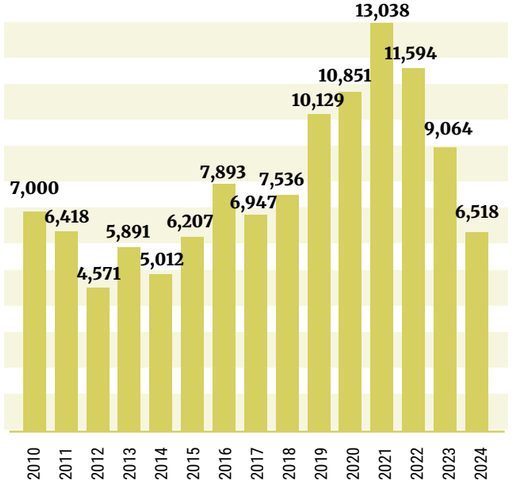
Deforestation rate (km²/year)



*Action Plan for the Prevention and Control of Deforestation in the Legal Amazon region
Source: Projeto Prodes Inpe, CPI/PUC-RJ

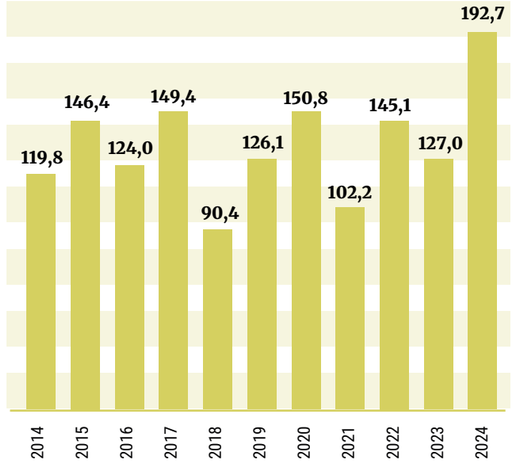
DEFORESTATION AND HOTSPOTS IN RECENT YEARS

Deforestation (in km²) in the Legal Amazon region – 2010-2024



Source: based on data from Inpe.

Number of hotspots (in thousands) in the Legal Amazon region – 2014-2024



Source: based on data from BDQueimadas, Inpe.

857,339 km² by 2024 – that is, an accumulated loss of 20.6% of the original forest cover. The state of Pará lost 26% of its forests, and the state of Mato Grosso, 35%. In 2024, hotspots reached a record number in ten years in the Amazon, with environmental and social, and economic impacts, which has raised the alert for measures to combat and adapt to climate change.

Deforestation has kept the Amazon trapped in a vicious cycle of environmental crisis, low-productivity economy, and high poverty rates. Its effects also affect Brazil's international reputation, inhibiting quality investments in the region. The environment of illegality and environmental degradation hinders business competitiveness, which mobilizes the search for solutions so as to combat deforestation and at the same time improve the Amazon economy. This frontier of opportunities lies in the extensive deforested regions that, currently degraded and with no productive use, far exceed the area necessary to increase economic activities in land use.

A FOREST THAT REGENERATES ITSELF

According to MapBiomas, secondary plant cover – that is, the area that was previously deforested and is in the process of natural regeneration – totals 6.9 million hectares in the Amazon, 2% of the region's native cover, in the past decade. Most of it occupies areas with low agricultural potential, without competing with the cultivation of grains and other foods, and represents opportunities for forest conservation and restoration. The potential for natural regeneration of an area is a function of its history of use (local resilience) and the conditions of the landscape, particularly of the native vegetation cover of the landscape in which it is located (landscape resilience). This characteristic allows for forest recovery at a lower cost, with comparative advantages in the context of climate mitigation and economic development. It is estimated that, on average, these forests have around 60% of the carbon stock of primary forests (MapBiomas). The potential for carbon removal through the conservation of these areas, with specific protection measures, is quite significant and may represent business opportunities in the carbon market.

A FOREST THAT REGENERATES ITSELF

Natural regeneration in the Amazon biome – 1987-2021 (Million hectares)

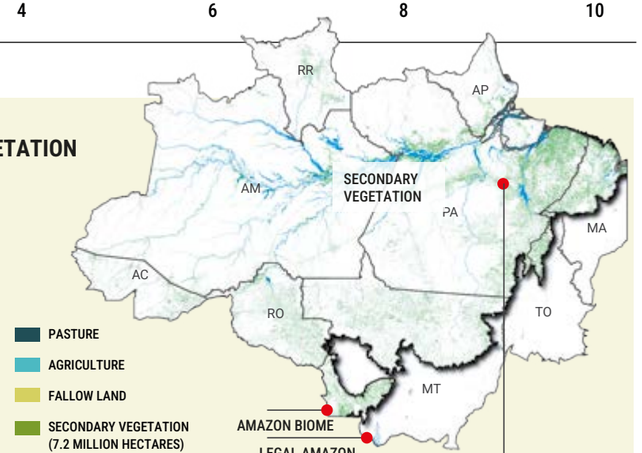
Source: MapBiomas

OPPORTUNITIES WITH SECONDARY VEGETATION

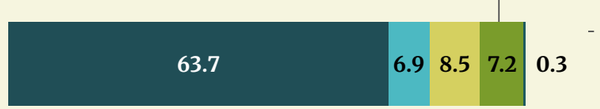
(in millions of hectares)

Of the entire deforested area today, around 7.2 million hectares are secondary vegetation, over six years old.

This area is distributed throughout the Amazon and can generate carbon credits for the rural landowners.



The area of secondary vegetation is equivalent to Ireland



Source: MapBiomas

Territorial situation of Brazil

FOREST CODE, AN INSTRUMENT THAT COMBINES PRODUCTION AND CONSERVATION

The Brazilian Forest Code is Brazil's main legal framework that regulates land use on private rural properties. It determines the conservation of native vegetation through two main mechanisms: Legal Reserves (RL), which require that 80% of land in the Amazon and 20% in other biomes remain covered by native vegetation; and Permanent Preservation Areas (APP), which are aimed at preserving water resources and preventing soil erosion.

This instrument has impacts on the large-scale climate solution. There are around 115 million hectares of conservation and planted forests on rural properties (private farms, therefore not including rural settlements, quilombola lands and unregistered public lands) that make up one of the largest food production systems on the planet. However, only 3.3% of the analyses of the Rural Environmental Registration File (CAR) had been completed in 2024, according to a Climate Policy Initiative (CPI) report of the Pontifical Catholic University of Rio de Janeiro (PUC-Rio).

CAR is one of the key instruments for implementing the Forest Code, with the recovery of native plant cover liabilities on properties. This instrument allows for the identification of liabilities and areas in compliance, serving as a basis for Environmental Regularization Programs (PRA) and monitoring and transparency policies. It is essential that Brazil accelerates the validation of the CAR because only after this step will it be possible to advance in the adherence to the PRA and, consequently, scale up the restoration actions.

The delay in validation has been a major obstacle, as most rural landowners prefer to wait for this process to be handled by the government before making commitments, particularly because restoration implies direct costs. Therefore, alignment with instruments such as the Payment for Environmental Services (PES) becomes strategic, as it demonstrates that the recovery of RL and APP does not need to fall exclusively on the producer, but can even generate economic benefits.

Despite the political, economic, environmental and social challenges to its effective implementation, the Forest Code brings opportunities around the maintenance of native vegetation and restoration of liabilities as fronts for business and social and economic development in Brazil. With the enforcement of this law, which is essential for Brazil to meet its climate targets under the Paris Agreement, the prospect is for greater integration of these forests into the different land use mosaics.

Data on the land situation in Brazil, due to the fragility of land tenure particularly in the Northern region, vary according to the assumptions used by the different organizations that prepare studies. This document chose to use as a source the Cartas da Terra *(Letters from Earth)* initiative[4], composed of Forest and Agricultural Stewardship and Certification Institute (Imaflora) , the Public Policy group of Esalq-USP and the Intelligence Center for Land Governance and Sustainable Development.

The table below shows that around 32% of the national territory is private rural properties, with 95% having a declared CAR. This indicates adherence to the Forest Code, although most of it has not yet been validated, as mentioned before. Areas corresponding to 27% of the national territory (known by the acronym ASRFG, for "Areas with no georeferenced land tenure registration") still lack land tenure registration, which shows the major land challenges in Brazil.

LAND TENURE SITUATION IN BRAZIL

	AREA IN HECTARES			
Class	**With no CAR (ha)**	**With CAR (ha)**	**Total (ha)**	**Area (%)**
Homologated Indigenous Land	98,038,455	888,856	98,927,311	11.62
Non-Homologated Indigenous Land	1,745,185	2,416,370	4,161,555	0.49
Military Areas	2,627,852	155,222	2,783,074	0.33
Public Lands	5,757,746	16,174,945	21,932,691	2.58
Public Lands – Non-Allocated Public Forests (FPND)	15,608,543	29,764,180	45,372,723	5.33
Declared Quilombola Community Territory	95,946	1,066,626	1,162,573	0.14
Undeclared Quilombola Community Territory	136,895	321,788	458,683	0.05
Private Rural Property	11,601,962	257,231,280	268,833,243	31.57
Settlement-A	1,091,973	27,390,986	28,482,959	3.34
Settlement-B	228,572	10,896,947	11,125,519	1.31
UCUS (RDS, FLONA and RESEX)	15,013,810	34,409,582	49,423,392	5.80
UCPI (Contains REFAU and RPPN)	30,866,871	8,205,344	39,072,215	4.59
Overlapping zones				
Private Rural Property and UCPI	840,195	5,397,353	6,237,548	0.73
Homologated Indigenous Land and UCPI	3,675,339	4,418	3,679,758	0.43
Non-Homologated Indigenous Land and UCUS	651,747	277,806	929,553	0.11
Non-Homologated Indigenous Land and UCPI	1,793,563	313,527	2,107,091	0.25
Private Rural Property and UCUS	89,830	2,591,731	2,681,201	0.31
Other overlaps	5,243,332	4,219,353	9,462,685	1.11
Other ASRFG territories				
ASRFG	71,289,552	161,707,419	232,996,971	27.36
Bodies of water	12,361,719	4,438,803	16,800,521	1.97
Urban Areas	4,298,761	646,673	4,945,434	0.58

RDS (Sustainable Development Reserves), Flona (National Forests) and ResEx (Extractive Reserves). UCPI (Strictly Protected Conservation Units), Refau (Fauna Reserves) and RPPN (Private Natural Heritage Reserves)
Source: Cartas da Terra. Nota Técnica Malha Fundiária Matricial do Brasil 2025 (Letters from Earth. Technical Note on Land Tenure Matrix Grid of Brazil 2025)

CONSERVATION UNITS PROTECT ALMOST 20% OF THE CONTINENTAL AREA

Creating and consolidating protected forest areas, promoting sustainable use, is a key strategy for reducing degradation and multiplying climate solutions.

The National System of Conservation Units (Snuc), established in 2000, brings together criteria and standards for the creation, implementation and management of these areas according to different management categories. There are 3,119 federal, state and municipal conservation units, totaling 260,000 hectares in the six biomes and in the Brazilian marine environment. Classified into different categories according to their purposes and uses, they protect 19.16% of the continental area and 26.58% of the marine area. The full protection category, such as national parks and biological reserves, covers 32% of the Conservation Units. Those for sustainable use, with the presence of populations that derive their livelihood from biodiversity, represent 68.1%.

ARPA PROGRAM: THE LARGEST TROPICAL FOREST CONSERVATION INITIATIVE ON THE PLANET

Created in 2002, the Amazon Protected Areas (Arpa) program exceeded its objective of supporting the conservation and sustainable use of at least 60 million hectares, equivalent to 15% of the entire region. Currently, the initiative has a total of 120 Conservation Units, with 62.5 million hectares of preserved forest. Around 43% of the planted areas are already consolidated, with benefits for biodiversity and climate mitigation. It is estimated that between 2008 and 2020, the supported areas reduced deforestation by 264,000 hectares, equivalent to 104 million metric tons of carbon in avoided emissions.

TERRITORIAL STATUS OF THE LEGAL AMAZON

Around 42% of the Legal Amazon are in protected areas – Conservation Units, Indigenous Lands and Quilombola Community Lands. Private properties account for 26% of the area and rural settlements, for 8%, whereas Public Forests account for 20%. At the same time, around 71% of the Legal Amazon has some land allocation – that is, it has legally assigned uses as public or private land. The remaining 29% that have no designated area are continually exposed to land grabbing, conflicts and deforestation that prevent the region's development.

The challenge of the land planning is among the main factors linked to land grabbing and deforestation in the Amazon. There are perverse incentives present in federal and state land regulations, generated by legal loopholes or vacuums, such as laws that allow the continued occupation of public land and do not prohibit the titling of illegally deforested areas or predominantly forested areas. Despite current government efforts to find solutions for land planning, there are still several gaps and challenges regarding this matter in the Amazon.

In the Brazilian land-tenure scenario, the protection and sustainable use of biodiversity in Conservation Units, Indigenous Lands and mandatory native vegetation areas in rural properties, according to the Forest Code, are key for carbon capture and storage and climate mitigation and offer social and economic opportunities.

TERRITORIAL STATUS OF THE LEGAL AMAZON REGION		Area (km2)	%
Protected areas	Indigenous Lands	1.151.920,5	23
	Conservation Units[1]	925.433,8	18,5
	Quilombola Community Lands	9.692,1	0[2]
Rural settlements		392.196,0	8
Private properties		1.053.247,0	21
Military area		26.693,6	0,5
Public Forest		20.390,4	0,5
Total areas not designated or with no information on designation[3]		1.436.495,0	28,5
Total designated areas (eliminating overlaps)		3.578.573,4	71,5
Legal Amazon total area		5.018.063,4	100

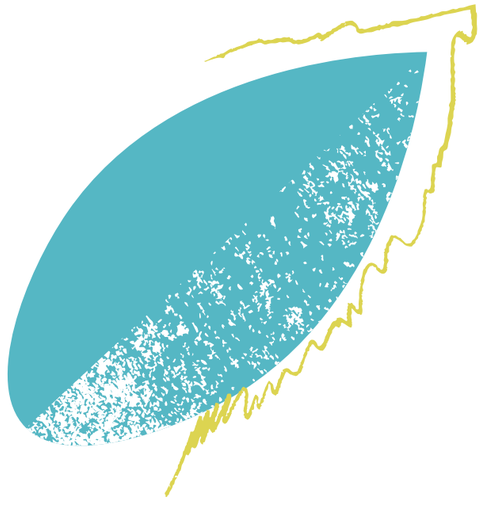
1. Does not include Environmental Protection Areas.
2. Percentage lower than 0.2%
3. Land tenure uncertainty affects 29% of the Legal Amazon. The areas that are not assigned or have no assigned use information refer to the result of excluding the total area of already assigned areas from the total area of the Legal Amazon. More information can be found in Appendix 1 of Brito, B. et al. (2021).

Source: based on data from ISA, Incra, Sicar and IBGE

ECONOMIC USES OF THE PRESERVED FOREST

Along with biodiversity conservation, Brazilian forests have high potential as a source of carbon credits, as infrastructure for environmental services, and as generators of bioeconomy based on the sustainable use of natural resources.

The expansion of bioeconomy represents one of the priority areas in the climate agenda – both through the production of bioresources to replace fossil fuels in the energy transition, and through the innovation and valuation of the many sociobiodiversity production chains as a vector of income, quality of life, and the maintenance of standing forests.



R$ 12 billion
is the current GDP of bioeconomy in the Amazon

R$ 38.6 billion
is the potential GDP of bioeconomy by 2050 with investments

Source: UFPA/WRI

Brazil has been making progress in public policies in the bioeconomy agenda as a national development strategy. The topic is included in the new PPCDAm as an economic axis in the fight against deforestation. Meanwhile, the National Bioeconomy Strategy, launched in 2024, brings together a set of policies aimed at developing the sector, providing a National Plan with effective actions and financial instruments.

Bioeconomy may benefit from the global inflow of funds in the context of climate change and biodiversity. Studies show that keeping the forest standing is not a threat to development – on the contrary, it is an opportunity for qualified and inclusive growth for Brazil, driving the decarbonization of the entire Brazilian economy.

In Pará, the Amazonian state with the largest economy and population, a WRI survey published in 2025 identified between R$ 1.7 billion and R$ 1.8 billion in investments already negotiated or with potential for being raised over the next five years aimed at climate actions. Of this total, approximately R$ 400 million has the potential to fund productive activities in bioeconomy, along with R$ 320 million in stimulus via the National School Feeding Program (PNAE). These investments have the potential to result in an injection of R$ 816 million into the state's GDP through bioeconomy, with 6,500 jobs created in five years.

Within the frontiers of the Amazonian bioeconomy, Agroforestry Systems (SAF), in their different categories, are gaining momentum due to their characteristic of combining food production, bioinput extraction and forest restoration with carbon mitigation. Expanding the model strengthens local economies as an alternative to activities that increase deforestation.

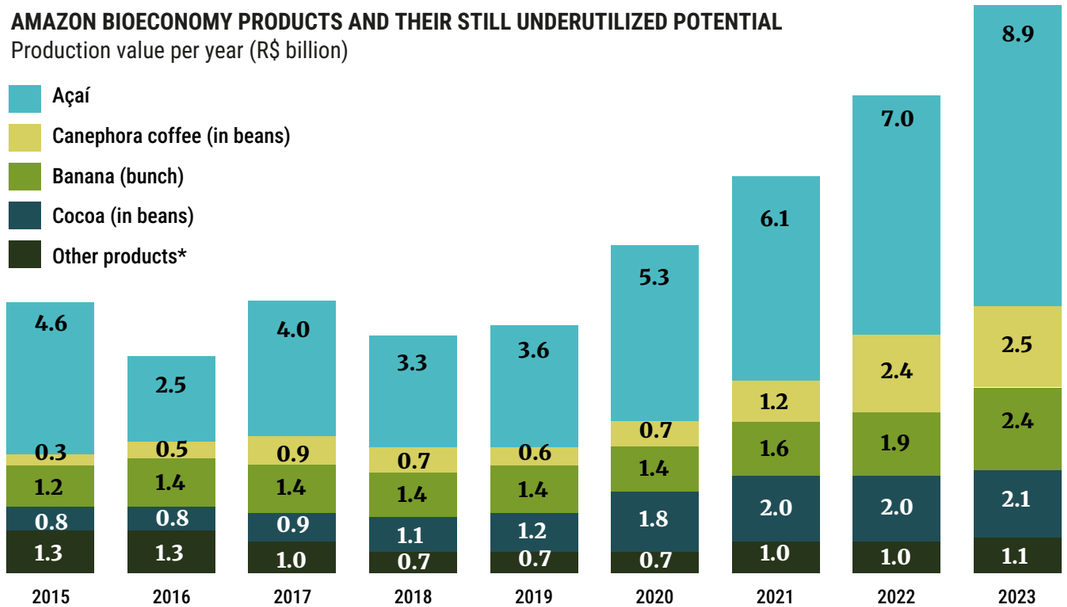
FRAMEWORK FOR BIOECONOMY IN THE AMAZON (SUMMARIZED VERSION)

	Sociobioeconomy (based on sociobiodiversity)	**Forest-based bioeconomy** (based on forest management)	**Agrobioeconomy** (based on commodity production)
Current predominant activities	• Extractivism • Non-extractivism • Subistence farming • Fishing	• Forestry of native species	• Planted forests • Commercial agriculture
Degree of anthropization and volume of physical production	Low	Medium	High
Relationship with biodiversity	High dependence and high contribution to its maintenance	Medium dependence	Low dependence on biodiversity; monoculture-based plantations contributing little, if not threatening, to biodiversity
Relationship with climate change	• Production method compatible with the maintenance of CO_2 stock • High resistance to the effects of climate change	Production method compatible with the maintenance of CO_2 stock	• Replacing fossil-based fuels and materials potentially reduces emissions, but large-scale production puts pressure on forest conversion (e.g., açaí can also be a driver of deforestation), as well as on other resources (water, for example). • Low resilience to the effects of climate change
Actions to encourage bioeconomy businesses	• Consolidation of protected areas and land rights • Strengthening associations and cooperatives (integrating agents in the chains) • Professional training (Senai and Sebrae; Rainforest Social Business School (UEA); Federal Institutes; federal and state universities and public and private research institutes, such as Cetam and Ifam) • Creation of a network of phytosanitary and water quality laboratories • Creation of the Amazon Commodities Exchange (to overcome information asymmetry) • Inspection and standardization of products, with a geographical indication of origin system • Strengthening and expanding the human resources base and laboratory infrastructure for advanced research in synthetic biology, genomics and biomaterials. Ex: Amazon Creative Laboratories and the Alto Solimões Scientific and Technologic Park • Business development for supplying inputs to industry (B2B)	• Inspection to eliminate illegality • Consolidation of protected areas • Adjustment to forest concession legislation • Expansion of forest concession areas • Review of legal frameworks and rules that prevent the development of agroforestry • Greater intersectoral policy coordination • Communication and dissemination of knowledge • Having "benchmark" projects • Investments in ST&I, including certified seed banks and nurseries	• Adoption of environmentally and socially sustainable practices to reduce negative externalities • Adjustment to credit programs to include environmental and social criteria as conditions • Reestablishment of the Sugarcane Agroecological Zoning • Diversification of production aiming at food security • Development of technologies for large-scale production of commodities from Amazonian biodiversity • Technical Assistance and Rural Extension
	• Increased investments in R&D (basic and applied research) • Innovation in Ecological Economic Zoning incorporating bioeconomy • Infrastructure (stable energy supply, logistics, connectivity) • Development of bioindustries • Development of technology-based and Bio-ICT startups • Strengthening governance structures for directing resources • Payment policies for environmental services • Coordination of actions between public and private sectors (systemic challenge)		

Source: Uma Concertação pela Amazônia

AMAZON BIOECONOMY PRODUCTS AND THEIR STILL UNDERUTILIZED POTENTIAL

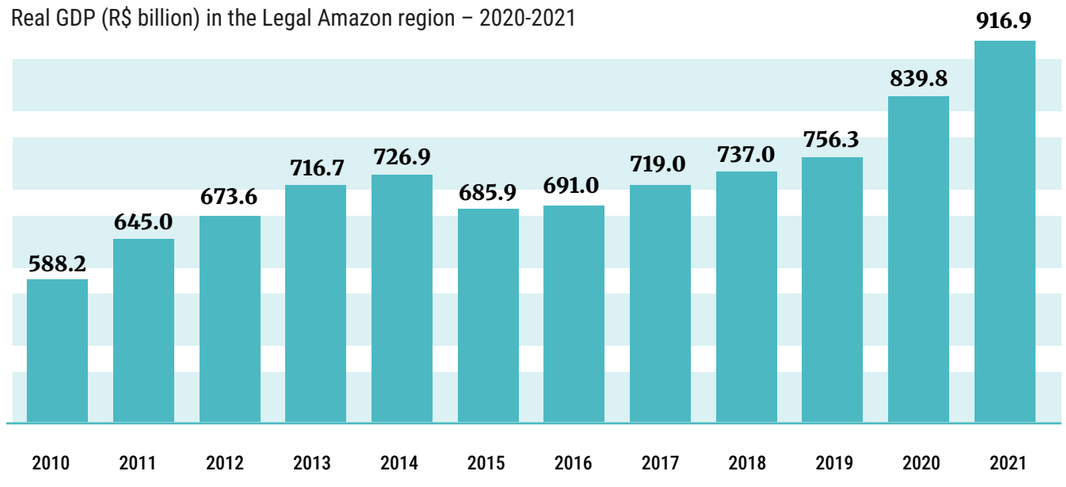
Production value per year (R$ billion)



Source: Fatos da Amazônia – edição COP30

THE AMAZON ECONOMY

Real GDP (R$ billion) in the Legal Amazon region – 2020-2021



Source: based on the nominal GDP of municipalities, IBGE. Real values deflated by IPCA, BCB.

A POTENTIAL STILL LITTLE USED

The WRI study mentioned above indicates that if the Amazon development model based on deforestation is maintained, the region's carbon emissions in 2050 will be five times higher than Brazil's climate targets under the Paris Agreement due to the destruction of large areas of forest. At the same time, the region's GDP corresponds to 10% of Brazil's GDP – a small share, even considering that national accounts do not include natural capital values.

Amazon's social and economic indicators are well below the national average. There is a lot of exploitation and little profit, but a thriving local economy of biodiversity products, with greater appreciation of preserved or restored forests, can be a strategic vector for reducing social inequalities and informal employment, in a scenario of better professional qualification and higher income. The share of the Brazilian Amazon is only 0.2% of the global tropical products market, which indicates a fragile production model, but also a potential for development, with an ample room for opportunities.

TIMBER PRODUCTION IN DECLINE

Timber production in the Amazon has undergone major transformations in recent decades. After reaching its peak in the late 1990's, with around 28 million cubic meters of logs per year, the sector has experienced a significant reduction, reaching between 10 and 20 million cubic meters per year in the last decade (11-14.8 million m³ per year, according to WRI and FAO). This represents the lowest level of production since 2010, according to data from the Timberflow platform, based on official records (DOF, Forest Guide).

Reduced demand and high inventories in the domestic market, which absorbs 92% of production, add to the negative image of native wood due to fears of involvement in deforestation and illegality, which currently affects more than a third of the timber harvested area in the Amazon, according to indicators from the System for Monitoring Timber Harvesting platform (Simex), an Amazon monitoring tool based on satellite images.

In addition, competition from substitutes in the civil construction industry and other sectors is growing, meaning that cheaper raw materials are gaining ground in the market. The scenario lacks an integrated sector strategy between the government and the private sector, including the appreciation for sustainable exploitation and forest concessions. There is also the need to promote the domestic market and encourage the use of lesser-known and more diverse timber species, in addition to modernizing the forest-based industry in the Amazon, aiming at developing new products and adding value.

The contribution of planted forests to reducing the demand for native wood should also be noted *(learn more in the Forestry section on page 107)*.

THE POTENTIAL OF FOREST CONCESSIONS

Brazil currently has 1.7 million hectares under forest concession for sustainable timber exploitation, in accordance with the Public Forest Management Law (Law No. 11,284/2006), in addition to another 600,000 hectares of state concessions in the states of Amapá and Pará. By increasing the managed area to 20 million hectares, Brazil could produce around 10 million cubic meters of legal timber – the equivalent of the entire timber production in the Amazon, eliminating illegal logging, according to data from Imaflora.

A study by the National Forum on Forest-based Activities (FNBF) estimates that expanding forest management to 20 million hectares would lead to a GDP increase of R$ 3.3 billion, in addition to raising R$ 250 million in taxes. To boost the forestry sector in the Amazon and enable it to contribute to a new economy in the region, it is important to consider actions to encourage the sector, going beyond simply combating illegal exploitation.

The concessions currently produce 200,000 cubic meters of logs per year and have already mobilized around R$ 200 million in private investment since 2010, creating up to two direct jobs per thousand hectares managed. Along with the economic benefits, management is capable of maintaining

FOREST MANAGEMENT AND CONCESSIONS
Timber production in the Amazon

From 28 million to 10–12 million
cubic meters was the reduction in timber production in the Amazon since the 90's

2.3 million
hectares under concession on public land

310 million
hectares is the total area of Brazilian public forests

10 million
hectares is the sustainable management target in the Climate Plan

20 million
hectares in concessions would represent the current total production of the Amazon region, but with guaranteed legal compliance

R$ 250 million
in taxes could be generated and 130,000 new jobs could be created

1.2 tCO_2e
avoided per cubic meter of legalized timber is the estimated carbon removal compared to illegal logging

THE SCALE OF THE ILLEGALITY

35%
of the total area of logging corresponds to illegal production

Source: Imaflora/Rede Simex 2024, SFB, MMA, WWF

MAIN FOREST CONSERVATION LAWS AND PROGRAMS

National and international references for sustainable forest management.

NATIONAL:

- Forest Code
- Public Forests Management Law (Law No. 11,184/2006)
- Annual Forest Concession Plan (PAOF)
- Climate Plan (2023-2030)
- Planaveg (2025-2028)
- National Policy on Payment for Environmental Services (Law No. 14,119/2021)
- State concession programs (Pará, Acre, Amapá)
- National System Conservation Units (SNUC)
- Brazilian Greenhouse Gas Emissions Trading System
- National Bioeconomy Strategy
- Action Plan for the Prevention and Control of Deforestation in the Legal Amazon region (PPCDAm)
- National Policy on Climate Change (PNMC)

INTERNATIONAL:

- Initiative 20x20
- The Bonn Challenge
- The Global Alliance for Buildings and Construction
- Convention on Biological Diversity (CBD)

the forest's conservation in terms of carbon levels, biodiversity and provision of ecosystem services in unexplored areas.

This activity avoids carbon emissions from illegal deforestation – around 1.2 tCO2 avoided per m³ – with potential to access carbon credit markets. Recently, Brazil has launched a new forest restoration concession model *(learn more in the Restoration section on page 81)*. In this model, the State grants degraded areas on public lands, with the concessionary company being responsible for carrying out forest restoration and having the right to explore some economic activities, including the generation and sale of carbon credits captured in the atmosphere.

MOST OF THE POPULATION IS URBAN

The Legal Amazon is home to 28.3 million inhabitants, 73% of whom live in urban areas of the region's capitals and large cities. Since 1970, the region's population has quadrupled, but it continues to show low in population density (5.3 inhabitants per km² in 2022). It's a young population, mostly concentrated between the ages of 10 and 34, a group that plays an important role in the future of the Amazon.

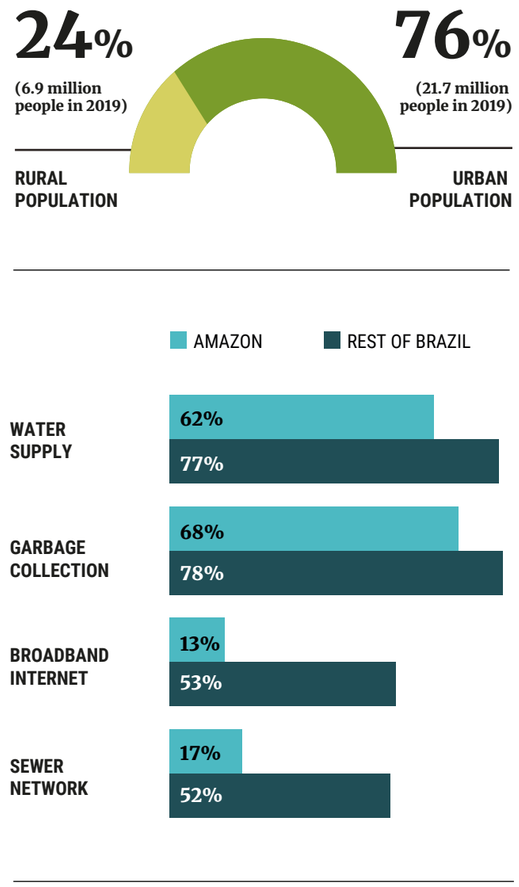
It is estimated that the region will experience a demographic dividend by 2030. This means that it will have a higher proportion of economically active people (those aged between 18 and 64) compared to children and the elderly. However, in the current lack of opportunities, the advantage could become a problem. Currently, around 40% of the population between 25 and 29 years of age in the region is out of the job market. In addition, violence has been steadily increasing in the region since the early 2000's. In 2019, the homicide rate was already 70% higher than in the rest of Brazil.

At the same time, poverty affects around 10 million people in the Legal Amazon (36% of the population), according Single Registry for Social Programs (CadÚnico) records of 2024. The combination of deforestation and population growth without urban planning results in a scenario of environmental destruction, low quality of life, and a weakened economy with extremely high carbon emissions. Unattractive cities, with few jobs and services that improve living conditions, encourage increased pressure on the forest.

This situation hinders the arrival of new opportunities in the Amazon, which reinforces the perverse cycle of poverty, violence and low economic growth. On the other hand, with quality education, internet access, technology, and job opportunities, young people in the Amazon can be the driving force behind sustainable development. In this scenario, the areas that have already been deforested throughout history, combined with the remaining forest, represent opportunities. These regions should mobilize greater economic dynamism, in a scenario of restoration, better land use and, possibly, lower carbon emissions.

URBAN AMAZON

Most of the Amazon population lives in cities and suffers with services that are worse than in the rest of Brazil.



Source: AMZ2030 with data from CadÚnico (2022), Anatel (2022) and PNAD-C IBGE (2021)

The end of deforestation is just the beginning

WHILE PUBLIC COMMAND AND CONTROL POLICIES MUST BE EFFECTIVE IN COMBATING DEFORESTATION AND ILLEGAL ACTIVITIES, VIEWING THE FOREST AS AN ECONOMIC ASSET AND SOCIAL AND ECONOMIC INCLUSION WILL BE ESSENTIAL FOR ITS CONSERVATION

Any conservation policy will only be effective if it fights deforestation. With deforestation, the Amazon is now the largest source of greenhouse gases in Brazil and could unbalance the Earth's climate. On the other hand, forest conservation is one of the cheapest and most efficient ways to offset carbon emissions.

If Brazil does not achieve near-zero deforestation by 2030, the world risks losing one of the most important systems for storing carbon on a large scale. The Amazon is especially important in this equation because it represents half of the world's tropical forests.

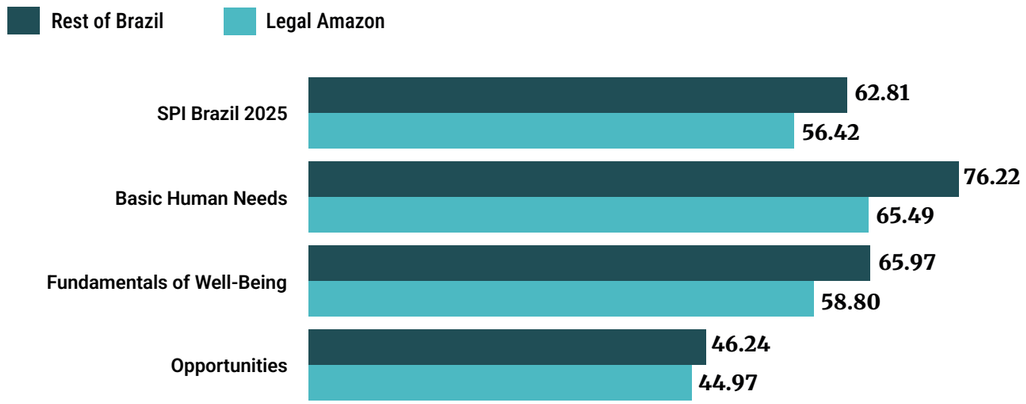
While public command and control policies must be effective in combating deforestation and illegal activities, viewing the forest as an economic asset will be essential for its conservation. This presupposes a new financial model for forests, based on two payment systems: the first, to reward regions for avoiding emissions resulting from deforestation and degradation and promoting natural regeneration and, the other, to reward the protection of existing forests and restoration of degraded areas in the biome.

The first includes carbon credit mechanisms, generated, for example, through Reducing Emissions from Deforestation and Forest Degradation (REDD) projects, whereas the second provides for innovative financing formats such as the Tropical Forests Forever Fund (TFFF), conceived by Brazil during COP 28, to be officially launched at COP 30, and which could mobilize significant resources for forest protection in Brazil and in the world.

Additionally, there is the development of a bioeconomy of forest products, which creates jobs and generates income in the forests, alongside a framework of public policies that improve the social and economic indicators of the population and fight organized crime in regions such as the Amazon. Another potential to be developed is related to the Payment for Environmental Services (PES), based in Brazil on Law No. 14,119/21, which still needs to be regulated.

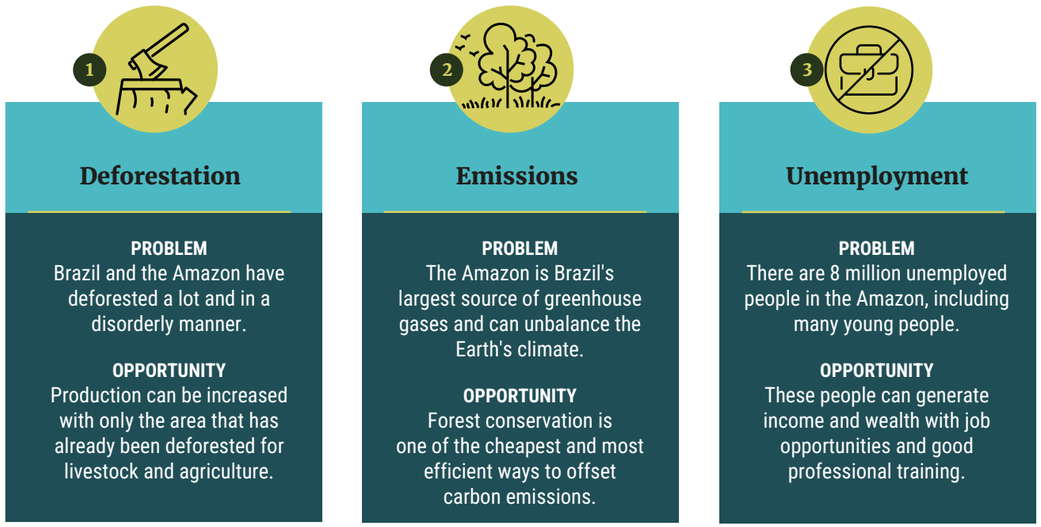
Finally, forest restoration, the topic of the next chapter, provides for the restoration of degraded areas with native species, generating carbon credits from forest removal.

SOCIAL CHALLENGES IN THE AMAZON
Social Progress Index in Brazil and in the Legal Amazon region (2025)



Source: Fatos da Amazônia – edição COP 30.

WHEN PROBLEMS CREATE OPPORTUNITIES



Source: The Amazon Paradox

LOW INSTITUTIONAL CONTROL

As mentioned before, one of the main obstacles to fighting deforestation in the Amazon is the land problem. The lack of definition regarding land allocation is a backdrop that generates uncertainty and prevents the proper operation of public policies and private activity.

In the Amazon, 29% of the territory has an undefined land status – an area larger than Spain, France and Germany combined. The other 71% are already defined: they are Indigenous Lands, Conservation Units and private lands. About 20 years ago, half of the land in the Amazon was undefined – so there has been progress, but the situation still needs to be fully resolved because property right is one of the first steps towards conservation.

In this scenario of weak institutional control, illegal activities – such as mining and land grabbing – and low productivity, as is the case with livestock activity, proliferate. This is compounded by the region's historical lag in terms of infrastructure and public services offered to the population – the Amazon region has lower indicators than the rest of Brazil, which ultimately leads part of the population to resort to informality and illegality.

The Amazon has a lower score on the Social Progress Index (SPI), which measures the environmental and social performance of territories across all regions (countries, states, municipalities, and communities). Social Progress is defined as "the ability of society to satisfy basic human needs, establish structures that ensure quality of life for citizens, and provide opportunities for all individuals to reach their full potential."

Therefore, the development of the Amazon, which presupposes the elimination of deforestation and the flourishing of a forest-based and low-carbon economy, depends on the well-being and human development of its population. There are, for example, around 8 million unemployed people in the Amazon, including many young people, who could generate income and wealth if they had job opportunities, access to good professional training, and opportunities to contribute to an inclusive, low-carbon economy.

However, social protection challenges persist in conservation-related activities. Applying labor law standards in urban and large city contexts is completely different from applying them in more remote areas, where informality prevails. In the labor relations in extractivism, there is a lack of recognition and acceptance of cultural differences, particularly when it comes to forest peoples. Meanwhile, companies certified by the Forest Stewardship Council (FSC) have greater oversight of standards and their implementation in social and labor aspects.

AMONG PROMISING OPPORTUNITIES, REDD+ JURISDICTIONAL AND TFFF

One of the opportunities that combine income and forest protection, as mentioned before, are projects that generate carbon credits through conservation. Two examples are Race to Belém and the LEAF Coalition (or Lowering Emissions by Accelerating Forest Finance), which offer payment for reducing emissions from deforestation and forest degradation (REDD+) at the national and subnational levels – this is known as Jurisdictional REDD+.

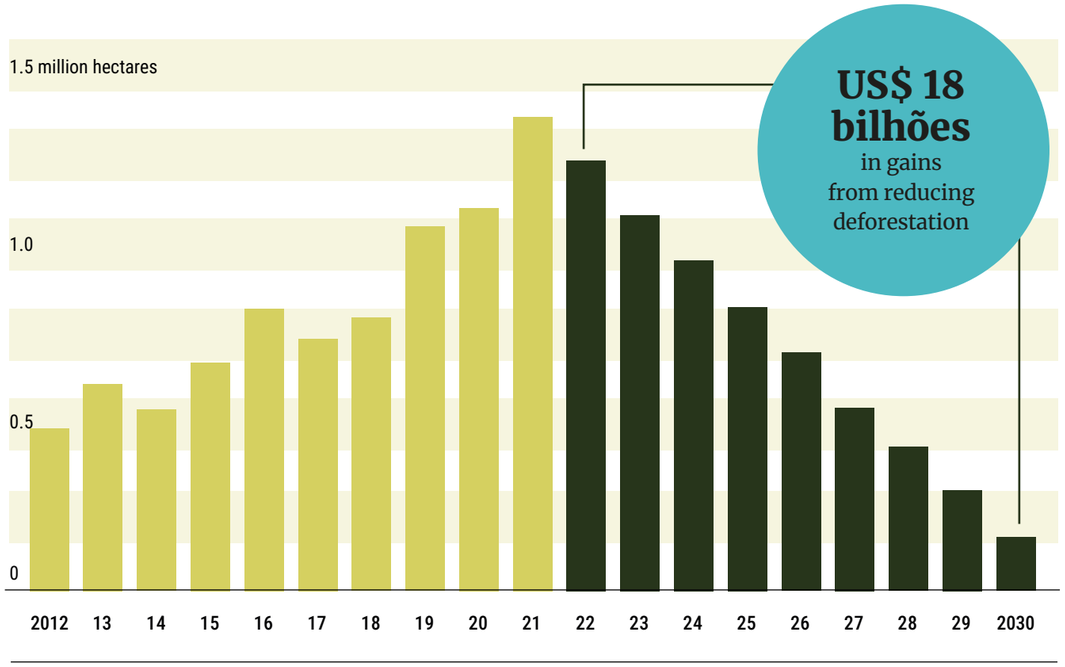
In the scope of carbon markets, jurisdiction is the territorial basis on which deforestation reduction targets and carbon projects are established. The mechanism is the result of an improvement of the REDD+ concept for subnational levels, that is, aimed at states and municipalities – the central idea is that the resources generated via carbon credit projects subsidize public policies to fight deforestation and sustainable development (Brazil's Climate and Nature Solutions, 2nd edition, 2025).

The Jurisdictional REDD+ has entered the radar of Amazonian states, which are structuring policies aimed at the mechanism so that the resources generated from the sale of carbon credits subsidize initiatives to fight deforestation and promote sustainable development and bioeconomy. Today, eight states in the Legal Amazon, as well as Piauí, are at different stages of policy development, with Tocantins and Pará leading the way, with negotiations already completed. (Brazil's Climate and Nature Solutions, 2nd edition, 2025).

In the jurisdictional system built according to the certification rules, all changes in resources are recorded on a public and transparent website, and the fund is independent of the State. In other words, the money from the sale of the credit is entirely traceable until it reaches the social players.

Race To Belém is an initiative launched by the Silvania fund, in partnership with Conservation International (CI) and The Nature Conservancy (TNC), with Mercuria, one of the largest global organizations operating in the independent energy and environmental products market, as one of its main financiers.

PROJECTED REVENUE GENERATION FROM REDUCED DEFORESTATION IN THE AMAZON
Considering a minimum price of US$10 per metric ton of carbon to be paid by the LEAF Coalition



Source: AMZ2030, based on data from Inpe (2022)

The LEAF Coalition is a public-private partnership that is aimed at contributing to reduce deforestation in tropical countries by 2030. It is coordinated by the non-profit organization Emergent, which is responsible for raising, managing and distributing financial resources, structuring contracts, obtaining certification and monitoring. This coalition has the support of countries that are traditional partners of Brazil, such as Norway and the United Kingdom.

According to LEAF, eliminating deforestation in the Brazilian Amazon by the end of this decade could generate US$18.2 billion (through carbon markets at a minimum price of US$10 per metric ton of CO2, which is considered quite conservative). If prices rise to US$15 per metric ton of CO_2, this could reach US$26 billion. (The Amazon Paradox, 2022).

The price of carbon in the market, according to some analyses, can play a decisive role in forest conservation. According to the document Carbon and the Fate of the Amazon *(Amazon 2030)*, prices above US$20 per metric ton of CO_2 can prevent deforestation and stimulate forest regeneration and capture 16 Gt of CO_2, over the next three decades.

In this scenario, the Amazon would go from being a net source of emissions to a significant carbon sink. This is because a large part of the areas previously used for livestock activity would be directed towards the natural recovery of the forest. The total effect compared to the baseline scenario is of 48 Gt CO2, also considering the 32 Gt CO2 of emission reduction associated with avoided deforestation. Revenue from the sale of carbon credits would total US$320 billion in 30 years *(learn more on carbon markets in the box)*.

Regarding the reward for protecting existing forests, the most emblematic example is the TFFF, as mentioned before. This is a global investment fund, to be officially launched during COP 30, which pays its investors while allocating part of the proceeds to countries that preserve their tropical forests.

CARBON FOR THE LIVING FOREST

According to the World Bank, the world currently has 113 carbon pricing initiatives, divided into compliance instruments and voluntary mechanisms. The first group includes emissions trading systems (ETS) and carbon taxes that together generated revenue of US$102.2 billion in 2024 and covered 28% of global greenhouse gas emissions.

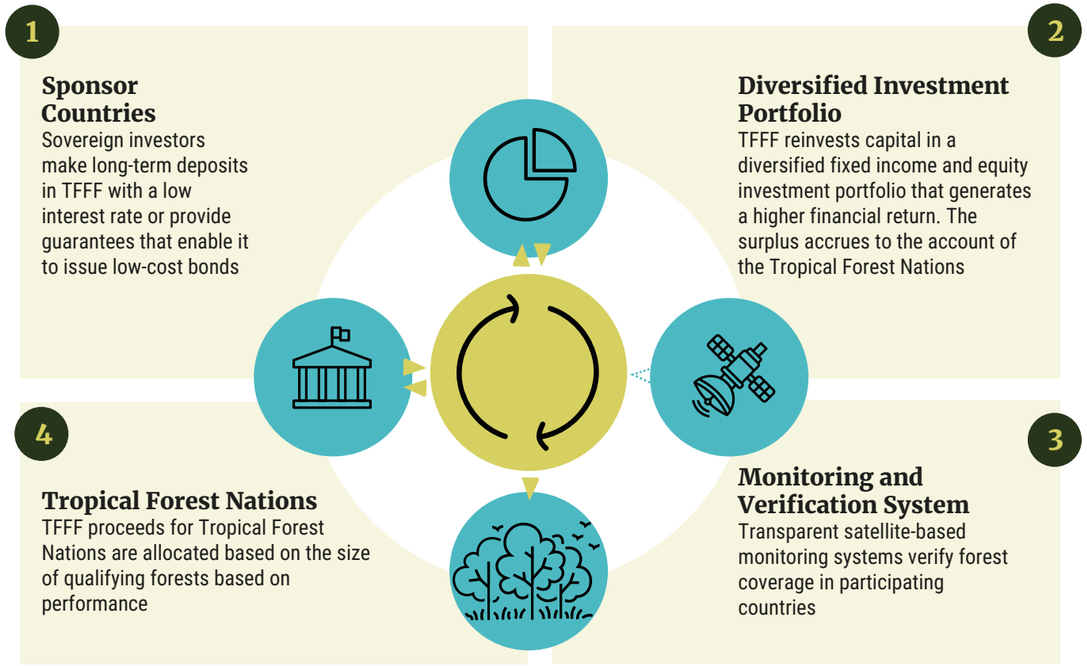
On the other hand, the voluntary carbon market mechanisms were simultaneously created – and inspired by the regulated market. In the voluntary market, companies and subnational governments can trade carbon credits in a bilateral relationship that is not subject to regulation. It is based on the acquisition of carbon credits without any legal obligations to reduce emissions, with entities voluntarily committing to offset the greenhouse gases released into the atmosphere.

Brazil is a leading player in the voluntary carbon market in South America, accounting for 40% of total projects and 25.6% of annual emission reductions. Most of the initiatives are from REDD+.

The amount handled in the voluntary carbon market in 2024 was around US$1.4 billion, accompanied by a demand of over 180 million $MtCO_2e$ for the third consecutive year. Bloomberg forecasts suggest a potential market value of US$500 billion to US$1 trillion per year, depending on credit integrity.

Source: Brazil's Climate and Nature Solutions, 2nd edition, 2025.

OVERVIEW OF THE TROPICAL FORESTS FOREVER FUND (TFFF)



Source: The Tropical Forests Forever Facility: A Proposed Multilateral Investment Fund to Reward Tropical Forest Conservation and Restoration

The TFFF proposes annual payments to countries per hectare of preserved forest. The proposed compensation is US$4 per hectare per year, with severe penalties for any deforestation, which could cover 1.1 billion hectares of tropical forests spread across 73 developing countries, according to the Brazilian government. Although the model is not linked to carbon credits, the logic is simple: reward responsible management and penalize forest loss[5].

According to a study by the Ministry of Environment and Climate Change (MMA), the two funding instruments – TFFF and Jurisdictional REDD+ (JREDD+) – could together cover half of the US$15.8 billion required annually to finance tropical forest conservation by 2030[6].

Based on data from the United Nations Environment Programme (UNEP), the survey calculates that the TFFF has the potential to mobilize US$4 billion, whereas JREDD+ could handle US$4.5 billion. The MMA emphasizes that, as these are two complementary mechanisms, there is no double accounting of carbon credits and additionality is guaranteed.

/2

Forest Restoration

A new and promising frontier

IN ADDITION TO BEING A HUB FOR ATTRACTING DOMESTIC AND INTERNATIONAL CAPITAL, FOREST RESTORATION IS ONE OF THE STRATEGIC PILLARS FOR ACHIEVING BRAZIL'S CLIMATE, BIODIVERSITY AND SUSTAINABLE DEVELOPMENT TARGETS

Forest restoration is emerging as a new and promising frontier for the Brazilian economy. In addition to being a hub for attracting domestic and international capital, it is one of the strategic pillars for achieving Brazil's climate, biodiversity, and sustainable development targets. And with comparative advantages: Brazil has vast areas that are suitable for forest recovery, accumulated technical capacity, and growing public and private engagement, although it still needs to solve critical points to scale up. Demands from the carbon market, food production, and timber supply drive opportunities.

The sector already operates large-scale projects in the voluntary carbon market, prioritizing production and ecological diversity, with environmental and social co-benefits and the generation of high-integrity credits that attract important financial and business players. This is a capital-intensive agenda, with a strong territorial impact and a long-term vision, with the perspective of planting today to deliver robust results from 2030 onwards.

The restoration of private land, complementary to public conservation policies, can be an essential lever for the ecological transition – and, with the Climate COP 30 in Belém, the opportunity grows for Brazil to consolidate its global leading position in Nature-Based Solutions (NbS).

Expansion depends above all on financing appropriate to the characteristics of the sector, regulatory and tax improvements, access to land and strengthening of the supply chain, in addition to greater integration with sector policies that border the issue. In conservation, the aim is to appreciate standing forests as a means of protecting them from competition with degrading activities; meanwhile, deforested areas are appreciated by restoring their uses and functions, with economic, environmental and social contributions.

The economic data relating to the Restoration front – which in this document addresses native species – are not yet fully consolidated, as this is an emerging sector. Therefore, it was decided here not to disclose data such as investments, revenue, taxes, and labor regarding this sector.

TERRITORIAL DIMENSION OF THE FOREST CODE

The Restoration and Reforestation Observatory (ORR) has already mapped approximately 160,000 hectares of restoration in Brazil. This is a segment with future targets that exceed millions of hectares, based on recent business projects announced in the context of the carbon market.

The areas of rural properties that need to be recovered to comply with the Forest Code *(as mentioned in the Conservation section on page 51)*, and the large extension of degraded pastures and already deforested land make up a promising scenario for the planting of new forests. They are combined in different models and purposes in light of the concept of "forest continuum" and its different shades of green in Brazilian landscapes.

Added to this is the high natural regeneration capacity of native vegetation, the implementation of new public policies, the expertise of academia, and the expansion of collectives and alliances that bring together various segments with restoration targets for the coming decades in the biomes. This combination of factors signals the capillarity and expressive size of the horizon that opens up to the forestry economy as a vector of development in Brazil.

Currently, Brazil has more than 115 million hectares of pastures with some level of degradation that could bring economic, environmental and social benefits if they are restored by forests of native species (Pasture Atlas – Lapig, 2023).

STRENGTHENING THE RESTORATION PRODUCTION CHAIN

The restoration production chain is made up of several links, connected at all stages, from planting to product marketing, with the main ones being:

Nursery people
Responsible for the production and supply of seedlings;

Producers
Plant trees on rural properties;

Reforestation and forest management companies
Carry out cultivation, sustainable management, harvesting and maintenance of arable areas;

Government and regulatory bodies
Responsible for public policies, incentives, environmental regulations and certifications;

Research institutions and universities
Develop studies that improve planting techniques, sustainable management and technological innovation;

Non-governmental organizations (NGOs) and sector associations
Promote training, sustainability and value-added actions for the chain.

THE SIZE OF THE POTENTIAL PASTURE AREA IN BRAZIL

107.6 Mha

Low and medium strength pasture areas

88.6 Mha

Areas in rural properties registered in the Rural Environmental Registration File (CAR)

87.8 Mha

Areas in CAR-registered properties without overlapping with restricted areas* (eligible properties)

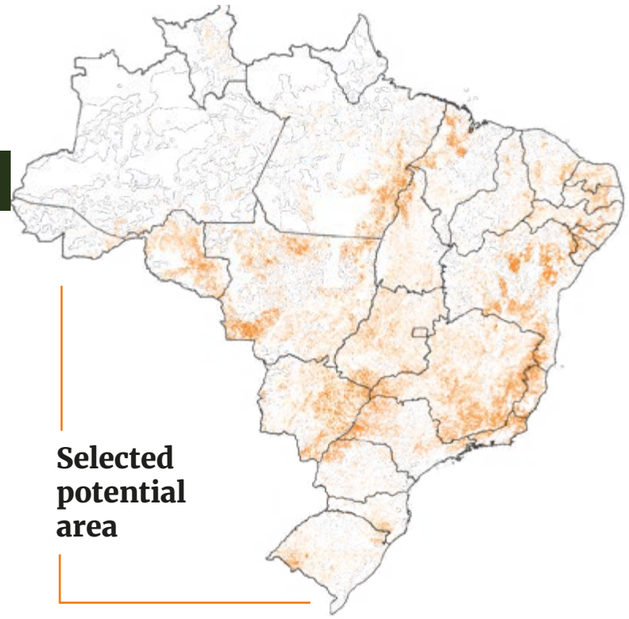
40.7 Mha

Areas of eligible properties with no deforestation after 2008

27.7 Mha

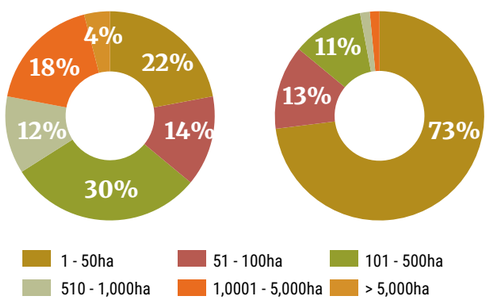
Potential area

Area that meets the previous biophysical and infrastructure criteria



POTENTIAL AREA BY PROPERTY SIZE

PERCENTAGE OF PROPERTIES WITH POTENTIAL AREA, ACCORDING TO SIZE CLASSIFICATION

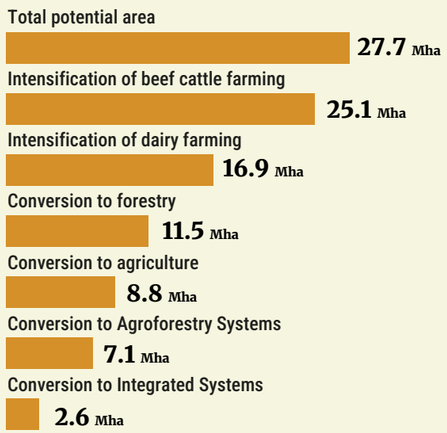


*Restricted areas are Fully Protected Conservation Units, Indigenous Lands or Military Areas.

Source: Lapig (2022), Prodes (2022), Cartas da Terra (2024) – Agroicone

Potential area for conversion into each agricultural and forestry system

Potential areas on rural properties can be classified into multiple systems, and there may be an overlap between them. Therefore, the sum exceeds 27.7 Mha.



RESTORATION PLAYERS

Initial efforts to record and report data on restoration show that Brazil is still far from reaching its potential for developing this activity

AMAZON

1528 players

392 initiatives

1136 organizations

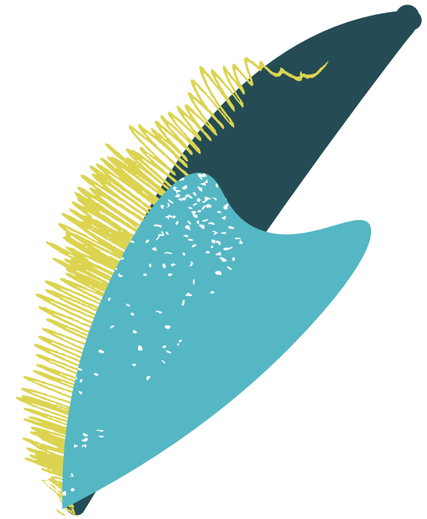
113,000 hectares

Source: Aliança pela Restauração na Amazônia/2025.

BRAZIL

153,000 hectares

Source: Restoration Observatory/2025

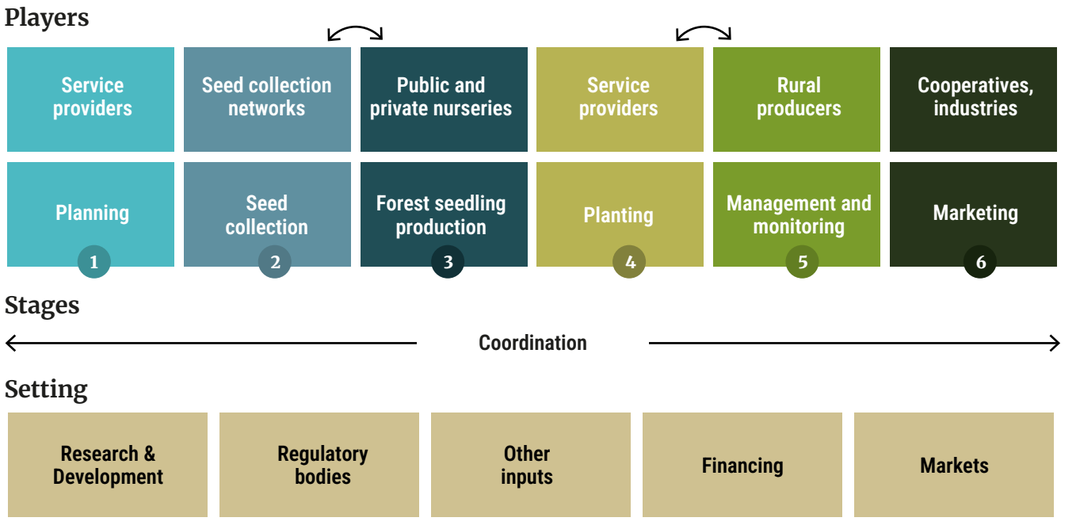


Restoration preserves and recovers forests, rivers, and lakes, reestablishing ecosystems and promoting the diversity of wild fauna and flora. However, it is important to note that restoration is not just about planting seedlings or seeds. It is also about promoting a new economy based on businesses that accelerate the sustainable transition. The social impacts include the following:

Creation of local jobs: Afforestation, Reforestation and Revegetation (ARR) projects transform areas of extensive livestock activity – which employs very little workers per hectare – into hubs of economic activity requiring skilled and diversified labor. The restoration chain creates jobs in multiple stages: seed collection, nursery management, seedling production, logistics, planting, monitoring with drones and technology, wildfire prevention services, meliponiculture, and sustainable forest management.

Education and training: The training programs promoted by restoration go beyond planting techniques – they strengthen local suppliers such as seed collectors, nursery people, and firefighters, while also providing skills in entrepreneurship, administrative management, and environmental practices. Thus, they encourage professional and personal development, expanding career horizons in the regions where we operate.

RESTORATION CHAIN
Links and steps



Source: WWF-Brazil

Community inclusion and training: Restoration projects often involve traditional populations, indigenous peoples, and local communities, recognizing and valuing their knowledge as an essential part of ecosystem management. At the same time, they offer new training programs and opportunities, with a focus on gender equity and youth inclusion, ensuring that women and new generations play a central role in the future of bioeconomy.

Sustainable livelihoods: In addition to carbon credits, the projects pave the way for the diversification of local income. From non-timber forest products (food, fibers, rubber, honey) they increase food security, increase agricultural productivity and generate stable income for rural communities.

Local businesses: Restoration in scale mobilizes a network of small service businesses such as seed collection, seedling production, logistics, wildfire monitoring and prevention. These jobs strengthen regional productive chains, drive circulation of income and stimulate the creation of new ventures related to bioeconomy.

RESTORATION TYPES
In the forest continuum concept, there are areas for forests of different characteristics and purposes, and the approach also applies to restoration types. They include:

- Corporate productive restoration for timber and other forest assets
- Agroforestry systems for agrifood production, combining agricultural commodities from perennial crops such as coffee and cocoa
- Restoration with priority in ecosystem services, such as carbon, water and biodiversity
- Productive restoration with a strong social bias, with the inclusion of small properties in food systems, forest products and carbon

LAND BOTTLENECK PERSISTS

The land tenure issue has historically been one of the greatest obstacles to activities related to land use in Brazil. In the restoration agenda, it is not different: without clarity regarding the land tenure network, it becomes difficult to plan where and how to restore, offer legal security to landowners and investors, and transparently monitor the achievement of national targets.

This bottleneck directly compromises the materialization of the commitment to restore 12 million hectares by 2030, undertaken in the National Plan for the Recovery of Native Vegetation (Planaveg) and reinforced in several international commitments *(learn more on page 51 of the Introduction)*, in addition to compromising the development of carbon credit generation projects due to the difficulty in identifying areas with regular documentation. Therefore, it is essential to advance land regularization with a focus on priority areas for restoration.

LAND CATEGORY

Private areas	Public areas	Collective and traditional territories
Concentrate most of the Forest Code liabilities, also embargoed areas, and include everything from large properties to small rural properties.	Conservation Units, agrarian reform settlements, non-designated public areas.	Indigenous and Quilombola Community Lands, where restoration is associated with social and economic resilience and the strengthening of sociobiodiversity chains.

POTENTIAL FOR EXPANSION IN DEGRADED AREAS

Forest restoration is one of the paths to new opportunities for economic activities that can transform the region's challenges into solutions for sustainable development

15 million hectares
of the Amazon rainforest are currently deforested and abandoned, without any agricultural use.

Of that total, there are
7.2 million hectares
with over six years undergoing a process of natural regeneration

4.8 million hectares
is Brazil's target for restoration in the Amazon biome by 2030 (Planaveg).

Source: The Amazon Paradox/Amazon 2030

DIFFERENT PROJECT APPROACHES

There are two major conceptual strands in relation to restoration projects, which influence carbon credit models and overlap each other:

ARR Projects (Afforestation, Reforestation and Revegetation): Planting or vegetation regeneration activities to increase carbon sequestration from the atmosphere, through reforestation, revegetation or creation of new forests. These projects generate carbon removal credits and can cover from production systems to initiatives that are exclusively focused on environmental recovery. ARR is a broad category that includes different approaches, including forest restoration and native forestry.

Ecological Restoration Projects: The Society for Ecological Restoration (SER) defines ecological restoration as the process of assisting in the recovery of an ecosystem that has been degraded, damaged, or destroyed. Restoration can be promoted through the direct cultivation of native seedlings or seeds and through natural regeneration (assisted or spontaneous). These are projects aimed at recovering native ecosystems by reestablishing biodiversity and ecological functions in degraded areas. In the voluntary carbon market, the main focus is to generate high-integrity credits, promoting social and biodiversity co-benefits.

The restoration of degraded areas has become an economic opportunity with the carbon market through forest removal projects. This applies to areas that have eligibility, additionality criteria and land tenure security. Currently, the price is higher on credits from projects that remove carbon from the atmosphere and store it in natural carbon reservoirs. On average, removal credits were three times more expensive than conservation credits in 2024, reaching US$20.4 (unit value of the credit) – a 19% increase compared to 2023, according to the State of the Voluntary Carbon Market 2025. There are also projects with with values 3 to 4 times higher.

The trend is towards greater appreciation for the so-called high-integrity carbon credits, which encompass environmental and social safeguards in operations that are highly integrated with biodiversity, in addition to governance/transparency and other additionality criteria, permanence, and third-party verification.

CARBON METRICS

Native plantations work as carbon sinks, with the potential to remove millions of metric tons of CO_2 from the atmosphere.

- 12.5 tCO_2e/ha/year is the average removal in restoration (in the table on page 37, the value of 15 tCO2e/ha/year was used)
- 6.7 tCO_2e/ha/year is the removal in Agroforestry Systems (SAF) according to studies by the Brazilian Coalition on Climate, Forest and Agriculture and the World Resources Institute (WRI).

CARBON STOCK

442.8 tCO_2eq/ha
for preserved areas*

*According to Ibá's inventory.

CARBON REMOVAL

12.5 tCO_2eq/ha/year
is the average removal in restoration*

6.7 tCO_2eq/ha/year
in Agroforestry Systems (SAF)

*In the table on page 37, the value of 15 tCO_2e/ha/year was used

Note: Studies vary from 440 to 480 tCO2e/ha, depending on the different sources consulted.

JOB POTENTIAL

0.42 jobs per restored hectare
could be generated

12 million restored hectares
is Brazil's target

1 to 2.5 million direct jobs
is the expected outcome if the target is met

Source: Bracalion et al., 2022.

STRENGTHENING ECOSYSTEM SERVICES

The process of recovering degraded areas, through the planting of native species or through nature's regeneration itself, helps recover ecosystem services, such as improving air quality, springs, and soils, in addition to capturing carbon from the atmosphere – an essential environmental service in times of climate emergency. The renewal of forest functions makes it possible to obtain environmental, economic and social benefits, such as:

- Water regulation
- Biodiversity conservation
- Habitat connectivity
- Pollination
- Erosion reduction
- Climate resilience
- Strengthening sociobiodiversity chains
- Biological control
- Effluent treatment
- Productive use that would be prevented in eroded and worn-out soil

ECONOMIC VALUE OF FOREST ASSETS

Including ecosystem services, incentive instruments and carbon credits, diversified forest production along with social and cultural benefits, and the reduction of environmental risks

R$ 200 to R$ 6000/ha/year
is the average compensation paid by the main Payment for Environmental Services (PES) programs

US$8-15/$tCO_2e$ to US$20-25/$tCO_2e$
are the average prices of carbon credits in the international voluntary market

US$100 to US$300/ha/year
is the gross carbon revenue potential, estimated for agroforestry systems (AFS) and native-species forestry, respectively, depending on the regions and production models

R$ 2000 to R$ 6000/ha/year
can be generated in agroforestry systems with coffee, cocoa, bananas, oils, resins, and wood from native species

US$141 billion
can be generated in Brazil until 2050 by restoration involving carbon, food, biomaterials, and bioenergy

R$ 228 billion
need to be invested in restoring degraded areas for Brazil to meet its target of recovering 12 million hectares by 2030. This investment could generate the production of 1 million m^3 of timber and R$ 776.5 billion in net revenue

Source: Brazilian Coalition on Climate, Forests and Agriculture; WRI Brazil and Instituto Escolhas

NATIVE SPECIES FORESTRY

In the context of climate mitigation, a new and promising front of solutions is emerging that combines meeting the growing global demand for timber, restoring degraded areas, and carbon-market initiatives. In native species forestry (SEN), a change in the pattern of timber production is expected, offering alternatives with less dependence on the product extracted from natural forests – often at the cost of deforestation and degradation.

In forestry, large-scale plantations of native species employ genetic improvement and management methods for economic purposes and the recovery of ecosystem services. In addition to its potential as a development frontier, the activity is considered strategic for Brazil to meet its climate, biodiversity and bioeconomy targets.

Sustainable wood plays a key role in decarbonizing the economy, with comparative advantages over materials whose production is greenhouse gas-intensive, such as steel, cement and plastics used in civil construction, an industry that is responsible for 41% of global emissions, according to the Food and Agriculture Organization of the United Nations (FAO).

Brazil is a world champion in forestry engineering, with scientific knowledge largely dominated by universities and companies that have improved exotic species (such as pine and eucalyptus) like few others in the world and are now using this base as technological platforms for native species.

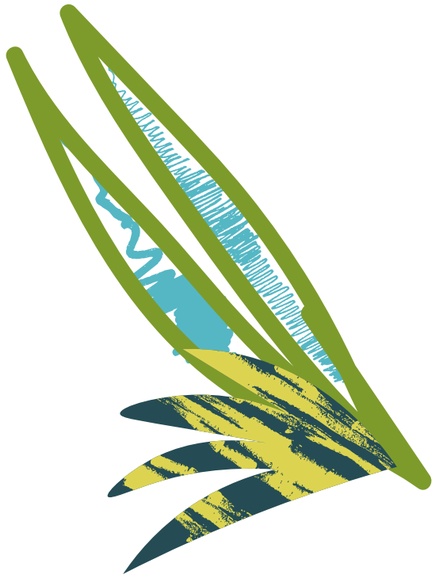
There are large expanses of degraded areas that are suitable for native forestry, climatic conditions,

GOVERNMENT PROGRAMS RELATED TO FOREST RESTORATION

- Native Vegetation Protection Law (Forest Code)
- Brazilian Greenhouse Gas Emissions Trading System (SBCE) Law
- Public Forest Management Law (LGFP - Forest Concessions)
- Licensing Law
- National Productive Forests Program (MDA/MMA)
- National Plan for the Development of Planted Forests (PNDF)
- National Program for the Conversion of Degraded Pastures (PNCPD)
- ABC Plan (Low Carbon Agriculture)
- Climate Plan
- National Inventory of GHG Emissions and Removals
- Nationally Determined Contribution (NDC)
- National Bioeconomy Strategy (ENBio)
- Forest+ Program (National Bank for Economic and Social Development (BNDES) and Petrobras)
- National Plan for the Recovery of Native Vegetation (Planaveg)
- Fine Conversion Program
- National Policy on Payment for Environmental Services
- National Productive Forests Program
- National Plan for the Development of Planted Forests (PNDF)
- Living Forest – BNDES
- Action Plan for Forest Recovery and Management – More Sustainable Forest Plan
- National Bioeconomy Strategy

INTERNATIONAL PROGRAMS RELATED TO FOREST RESTORATION

- Paris Agreement
- UN Decade on Restoration
- The Bonn Challenge
- Kunming–Montreal Global Biodiversity Framework
- Initiative 20x20



accumulated knowledge, experience in dialogue between players and market demand for timber (international and domestic), which are sufficient for establishing a new forest economy in Brazil, in co-ordination with the restoration agenda and climate and biodiversity targets.

According to the Brazilian Coalition on Climate, Forests and Agriculture, approximately 1.7 million hectares of native species plantations would be enough for Brazil to initially meet the growing demand of the international market for tropical timber. This would have the potential to capture approximately 20 million metric tons of CO_2 from the atmosphere per year.

The industry is in a pre-competitive stage, comparable to the industry of trees planted with exotic species of the 1970's and 1980's. The Native Species Forestry Research and Development Program (PPED-SEN) is underway. This is a national initiative aimed at developing scientific and technological solutions for genetic management and improvement aimed at productivity and profitability so as to drive the activity.

Large-scale businesses must drive the formation of hubs to include small and medium-sized producers and traditional and rural communities, and regulatory frameworks are expected to encourage producers, investors, companies, and financial institutions to invest in this activity, with mechanisms that are appropriate to the long-term cycle that characterizes it.

The SEN concept was included by the Brazilian government in the National Plan for the Recovery of Native Vegetation (Planaveg) as one of the models for implementing national restoration targets. It is also part of the National Program for the Conversion of Degraded Pastures in the challenge of attracting investment and business partnerships in a scenario of climate opportunities.

SEARCHING FOR A NEW STANDARD FOR NATIVE WOOD

The Verena project (Economic Valuation of Reforestation with Native Species), launched in 2015 under the coordination of WRI, represented a milestone for the development of this industry in Brazil. This initiate has mobilized players to bridge gaps in research, subsidize risk analyses and measure business potential, including the agroforestry systems model. Over 30 projects have been carried out and shaped through the Verena Investment Tool.

The movement gained momentum with the creation of a task force on the topic within the Brazilian Coalition on Climate, Forests and Agriculture to design a pre-competitive Research & Development program – the PPED-SEN. The initiative received US$2.5 million from the Bezos Earth Fund for the initial studies in 2023, with reference hubs in the states of Pará, Bahia and Espírito Santo. In 2025, the National Bank for Economic and Social Development (BNDES) approved non-reimbursable development funding with which the research structure will be expanded to advance the scale of the planting of native species in Brazil as a economic development model.

The plan is to show in the field, on a larger scale, the role of native forestry in forest conservation and the economy, with positive impacts on climate mitigation. In the genetic improvement work, the objective is to increase productivity and wood quality in the long term. One of the main points is to subsidize the production of high-quality seeds and seedlings, with genetic diversity, adaptation to different biomes, traceability, and large-scale supply. Accordingly, the aim is to achieve the standard necessary to supply the timber market with a legal, high-value-added product, with the consolidation of a new restoration front – and climate solutions for Brazil.

TIMBER PRODUCTION VOLUMES AND DEMAND

11-14.8 million m³
per year is the production of raw timber from native species, which could double through sustainable management in natural areas

43 million m³
represent the projected domestic demand for raw timber and 15 million m³ for sawn wood by 2050

2.7 billion de m³
of wood correspond to global timber production per year every year, with great opportunity in the transition to a low-carbon economy

49%
is the projected increase in global demand for raw timber by 2050. Between 2024 and 2025, it will increase from US$992 billion to US$1 trillion

1.5 million hectares
of native forestry in Brazil could supply this market

Sources: WRI and FAO

ECONOMIC VALUE

9.5% to 28.4%
is the annual financial return range in 32 production models analyzed

Source: Verena/WRI Project

WOOD USE CONNECTIONS

Native Forestry Projects seek the sustainable cultivation and management of native species for economic purposes, such as the production of timber, oils or seeds, associating financial return with forest conservation – an opportunity to produce timber without deforestation. The steps are similar to those of ecological restoration: they involve land selection and preparation, forestry operations, and different certifications for generating carbon credits and selling timber. The main difference lies in the long-term production objective, with forest management and planned harvesting, requiring a distinct technical and economic model, particularly with regard to species selection, planting density and cutting planning.

The use of wood from forest restoration generates benefits in series, starting with increased land value. Proper land management can not only recover degraded areas but also use those that are underutilized and ensure the supply of clean water and soil stability.

Furthermore, a restored forest can generate credits linked to carbon and biodiversity, and also evolve into an agroforest, resulting in products such as high value-added timber, fruits, oils, and nuts. In the synergy between crops, the more diverse the activity of an agroforest, the greater the risk diversification, the resilience, and the potential for gains in multiple markets over time.

There are estimates that the return on investments can reach acceptable return rates. A coordinated agreement between the private and public sectors, which are responsible for defining the legal and fiscal framework, and advances in scientific research on production techniques can have a highly positive impact, such as in the case of the development of exotic species, like eucalyptus, which is essential for the success of this market.

Native forestry intends to follow, albeit belatedly, the same path as exotic species that currently place Brazil at the top of the global pulp and paper production. The consolidation of the segment will be crucial to ensure a firm supply of timber on a large scale and, therefore, provide predictability of its use in civil construction. To ensure that there are sufficient raw materials, the work needs to start now, connecting the dots between supply and demand.

INTEGRATION WITH OTHER PRODUCTION MODELS

Commercial plantations of Brazilian trees also contribute to national ecosystem restoration targets, including in Integrated Crop-Livestock-Forestry (ICLF) projects, in the context of low-carbon farming. They are also capable of integrating small farmers and communities through Agroforestry Systems (SAF). There is a possibility of creating production hubs in priority territories, promoting income and productive inclusion, since the activity strengthens sociobiodiversity chains and generates green jobs.

BUSINESS INITIATIVES TOWARDS LARGE SCALE

In a scenario of favorable public policies, availability of land, market demands concerning the climate and nature topic and announcements of development resources by large banks and multilateral organizations, Brazilian companies gather expertise accumulated by the forestry industry and make progress in large-scale restoration projects.

In different models and levels of intervention with native species, the initiatives associate the environmental footprint with economic strategies, mainly timber production and carbon credits. The movement has been attracting major global players, such as big techs, with decarbonization strategies via Nature-Based Solutions (NbS).

This is an emerging development sector that is being built in synergy with multiplayer movements, gathering different ecological and productive approaches, such as the Atlantic Restoration Pact and other regional restoration collectives, and the Brazilian Coalition on Climate, Forests and Agriculture. In this scenario, it is worth noting the position of the Forest Restoration Observatory in the challenge of collecting indicators and monitoring the expansion of this new frontier as a subsidy for decision-making by governments, academia, civil society organizations, and companies.

MAJOR BUSINESS INITIATIVES ACCELERATE THE INDUSTRY'S LEARNING CURVE

Biomes and Carbon2Nature: In July 2025, companies and Carbon2Nature announced an unprecedented partnership to recover 1,200 hectares of native forests in areas owned by Veracel Celulose, in the south of the state of Bahia. The Muçununga Project involves the planting of 2 million seedlings by 2027. There will be more than 70 species, all native, such as araçá, copaíba, guapuruvu, yellow ipê, jacarandá-da-bahia and jatobá. Over the course of 40 years of monitoring and caring for the forest, the project will remove approximately 500,000 metric tons of carbon from the atmosphere, generating high-integrity credits. This initiative will contribute to climate change mitigation and social transformation in the region: more than 80 direct jobs will be created and 15 communities will be involved.

re.green: It has nine projects in progress, distributed across the Amazon and the Atlantic Forest biomes, covering an area of more than 30,000 hectares. Since 2021, the company has already cultivated 6 million seedlings in the states of Bahia, Pará, Maranhão and Mato Grosso, with the collaboration of 29 local nurseries. It entered into a partnership with Nestlé to restore 2,000 hectares of Atlantic Forest in southern state of Bahia. The agreement provides for the planting of 3.31 million native trees and removal of thousands of metric tons of carbon from the atmosphere, generating around 888,000 high-integrity CO_2 credits over 30 years. This initiative is part of Nestlé's Global Reforestation Program, with a priority focus on cocoa and coffee-producing regions, particularly in the state of Bahia, one of the most important locations for both fruit production and biodiversity conservation. Its main client is Microsoft. In 2025, re.green has nine projects in progress, distributed across the Amazon and the Atlantic Forest biomes, covering an area of more than 30,000 hectares. Since 2021, the company has already cultivated 6 million seedlings in the states of Bahia, Pará, Maranhão and Mato Grosso, with the collaboration of 29 local nurseries.

Mombak: In 2025, it became one of the first companies to receive resources from the New Climate Fund of BNDES (National Bank for Economic and Social Development) to restore degraded areas in the Amazon, and has a partnership with the Union Square Ventures fund, with the participation of names such as Kaszek Ventures, Bain Capital, AXA IM Alts, Lowercarbon Capital and Copa Investimentos. Mombak counts Microsoft and Google among its clients.

Symbiosis: It places itself as a benchmark in native forestry associated with timber production, biodiversity restoration and the carbon market in south of the state of Bahia, and has Apple as a business partner. After a pilot work on 1,500 hectares, the planting area was expanded to 5,000 hectares, on five farms taken up by degraded pastures in the Atlantic Forest. The main business revolves around native wood for noble uses in civil construction and other segments, and has carbon as a strategy to accelerate investments in initial plantings. In the 5,000 hectares planned in this partnership, the capture of one million metric tons of carbon is expected in 30 years.

Belterra: It is starting its sixth year of operation, after an initial period of tests and validation, with the first plantations consolidated in the past three and a half years, and the cocoa harvest of which begins now. Its business model is productive restoration based on agroforestry systems, structured based on an anchor species—such as cocoa, which combines high market demand and scaling potential—and complemented by seven to eight native and productive species per hectare, such as banana, cassava, açaí, and cupuaçu, which guarantee short-term income and ecological services. It operates in four states and maintains around 4,000 hectares under contract at different stages of implementation and more than 300 contracts in effect with producers. In order to facilitate expansion, three partnership models have been developed: leasing, rural partnership, and integration, which allow producers to receive recovered land and co-invest and share revenue, all under long-term contracts. This strategy places Belterra as a benchmark in reconciling forest restoration, agricultural income generation, and carbon credits in scale.

BTG Pactual Timberland Investment Group (TIG): Through its Brazilian subsidiary, TTG Brasil Investimentos Florestais, it conducts one of the largest forest restoration and plantation projects in Brazil, combining the commercial planting of exotic forest species with the conservation and restoration of native vegetation in the Cerrado (Brazilian scrubland) biome. Conservation and restoration activities are aimed at improving the ecosystem services of the local environment and the connectivity and resilience of the landscape, as well as generating high-integrity and high-quality carbon credits. The model integrates passive, assisted regeneration and active planting, prioritizing the creation of ecological corridors, the protection of river basins and the connectivity of forest fragments.

It has Conservation International as an impact advisor, providing technical and scientific support, and maintains partnerships with universities. As a result, it develops and applies innovative processes, tools, and techniques, produces research on the topic, and carries out work involving local communities, such as the collection of seeds of native species.

Initiatives from Patria Investimentos, Grupo Leste and Systemica were also announced.

Source: Movimento Floraz

On the way to soundness

MORE THAN JUST AN IDEA, NATIVE SPECIES RESTORATION IS ALREADY A REALITY, MADE UP OF SOLID COMPANIES AND SHAREHOLDERS, FINANCIAL SUPPORT, AND ACCESS TO LARGE CLIENTS AND INVESTORS, AND SHOULD GAIN A CONSISTENCY THAT IS SIMILAR TO THAT OF EXOTIC FORESTRY

The long-term expectation is that the forest restoration segment – which in this document refers to native species – will gain soundness that is similar to that which exists today in the exotic forestry market *(more on page 107)*, a sector in which Brazilian competitiveness is highly recognized.

The Brazilian forest restoration sector is ready to face the obstacles that lie ahead. More than just an idea, the restoration activity is already a reality, made up of solid companies and shareholders, financial support, and access to major clients and investors. Large-scale private restoration, in operation since 2022, is already delivering concrete results. It can therefore be affirmed that the activity is in a clear process of maturation towards a scale of one million hectares by 2030.

This soundness is related to the fact that forest restoration is considered an element of natural capital infrastructure – a concept that is rapidly consolidating around the world. This means that forests, whether preserved or restored, play a key role in infrastructure, particularly in relation to climate adaptation, resilience, and provision of conditions for optimizing land use in Brazil, ensuring ecosystem services that are essential to productive activity throughout the forest continuum.

Complementary to public conservation policies, forest restoration is proving to be an essential lever for Brazil's ecological transition, which has the opportunity to consolidate its global leading position in Nature-Based Solutions. Brazil is ready to place the ecological restoration of native species as a new hub for attracting domestic and international capital.

Private restoration is already planting today to deliver concrete results as of 2030, while the sector already operates large-scale projects in the voluntary carbon market, prioritizing high integrity, ecological diversity, and the generation of environmental and social co-benefits.

The restoration activity directly benefits from Brazil's mega-biodiversity status, in a two-way street. While the recovery of ecosystems and the rich interaction between the variety of species strengthen biodiversity, biodiversity contributes to the success of restoration, providing resistance and resilience to the process. For example, in restoration projects, more than 20% of new specimens found were not planted by humans, but resulted from biodiverse nature itself in action, including birds, insects, and other animals[1].

Private forest restoration and native forestry should be part of the government's broader strategy to lead new investments as a lever for a strong and resilient Brazilian economy that is aimed at encompassing degraded ecosystems and forests.

MAIN CHALLENGES AND HOW TO FACE THEM

But to get there, there are a number of challenges involved in its main pillars: technological, marketing, financial, access to land, and social, as described below.

TECHNOLOGY AND RESEARCH, DEVELOPMENT & INNOVATION (RD&I)

The cultivated tree sector in Brazil is strongly consolidated in a technological platform of exotic species, in which this country is a global reference. The mastery of this technology is being relatively transferred to the production of tropical species, but along this way there are a number of bottlenecks to unlock.

A recent study by the Brazilian Coalition on Climate, Forests and Agriculture (2023) notes that Brazil needs a long-term scientific infrastructure capable of generating public knowledge and technologies applicable to tropical restoration. Most of the experiments that are currently available are fragmented, occasional, and small-scale, which limits their ability to offer solutions that are replicable and adaptable to the diversity of Brazilian soil and climate contexts.

Among the main factors limiting large-scale restoration with native species are bottlenecks related to seedling and seed production, planting and management techniques, monitoring, and economic valuation. Seedling and seed production is affected by the lack of genetic standardization, low diversity available in nurseries, and difficulties in traceability and certification, which compromises both the quality and scale of projects (Brancalion & Holl, 2020). The low survival rate of plantations stems from techniques that are still poorly adapted to soil and climate conditions and field pressures, resulting in high mortality rates and high costs. Monitoring, which is largely incipient, is characterized by occasional and unsystematic assessments, without the integration of cutting-edge technologies such as environmental DNA (eDNA), remote sensing, drones, and artificial intelligence. Added to this is the lack of robust protocols for planting, fertilization, pest and invasive species control, in particular in highly degraded soils and difficult-to-access areas (Vieira et al., 2022).

Another important obstacle is the insufficient economic valuation of biodiversity and ecosystem services, which are not yet consistently incorporated into markets and public policies. This limitation prevents restoration from being properly recognized as a vector of economic development, restricting the mobilization of private capital and the engagement of local players (WWF-Brazil, 2022).

In this context, the deployment of large-scale experimental fields — with, for example, 5,000 hectares of restoration areas under real conditions — becomes essential. Unlike small, short-term plots, such areas would work as true living laboratories, capable of testing and comparing planting methods, evaluating new technologies, quantifying above- and below-ground carbon, measuring biodiversity, and monitoring ecosystem services over decades. These experiments, conducted in an operational scale, would also have the advantage of generating direct collateral benefits in these areas, such as the dynamization of local seed and seedling chains, the training of skilled labor, and the creation of community production arrangements.

A comprehensive and structured RD&I agenda should also include the creation of large-scale experimental fields in priority biomes, associated with cutting-edge technological infrastructure, including seeding drones, multispectral, hyperspectral, and LiDAR sensors, as well as data analysis platforms based on artificial intelligence and predictive modeling. This structure will enable the generation of replicable, robust, and applicable scientific knowledge in multiple contexts, serving as a basis for public policies, climate financing mechanisms, and biodiversity credit instruments.

Part of this agenda is already being implemented, driven by initiatives that seek to make large-scale restoration viable through new technical and financial models. Ongoing projects have incorporated advanced technologies associated with production in high-capacity nurseries, capable of supplying millions of native seedlings per year.

MARKETS

Assuming that restoration will be productive (targeting products such as timber and food), but also ecological (providing ecosystem services, such as carbon, water, biodiversity, etc.), the products and services in this sector should be based on markets, such as the carbon market. One of the major challenges is how to properly consider forest removal activities within carbon regulation systems, whether in the voluntary or regulated market, in Brazil or abroad.

Article 6.4 of the Paris Agreement is still establishing rules on how carbon removals will be considered in the mechanism and there are concerns about the inclusion of forest removals in these debates. Article

6.2, which regulates carbon credit transactions between countries, known as ITMOs, now depends on domestic regulation, and Article 6 of the Paris Agreement must be recognized as an international capital attraction mechanism.

The decisive lever for unlocking scale is expanded access to international carbon markets. Authorization for Corresponding Adjustments under Article 6 of the Paris Agreement (a mechanism to avoid double counting of mitigation results, requiring the selling country to increase its ambition after selling carbon credits) and access to markets such as CORSIA (emissions reduction scheme for international aviation) would allow for diversification of buyers, increase long-term predictability, and attract international capital in scale, consolidating Brazil as a global reference in high-integrity forest removal credits. These multilateral mechanisms should be seen as central instruments for monetizing more costly environmental outcomes and directing strategic revenue to the selling country, within a market logic that complements, but is not dependent on, public restoration policies.

Still in the field of new markets related to ecosystem services, the major challenges lie in characterizing the services and the methodologies used for this characterization. A convergence of metrics and valuation systems and in the marketing of these services is necessary, particularly those linked to biodiversity. Brazil dominates technological frontiers related to satellite monitoring, ground-based systems and sensors, etc., but there is a whole new world to explore in fronts related to digital gene sequencing and use of Artificial Intelligence applied to Natural Capital.

Meanwhile, the development of timber markets depends on the end of illegal exploitation of tropical timber, so that it can take up the space of a reliable product in domestic and international markets – which essentially depends on public command and control policies.

There are also markets to be explored that result from the combination of forest production with food production, through Integrated Crop- Livestock-Forestry (ICLF) and Agroforestry (SAF) systems – for example: cocoa from a restoration project may have a higher value than cocoa planted in full sun, as it adds environmental and social attributes to the product. It is necessary to work on the recognition and promotion of Brazilian forest restoration products, both in domestic and international markets.

This makes the tropicalization of certification systems important, causing tropical production models to be incorporated into international systems. Furthermore, technical training for national auditors, financing for the development phase and dialogue with certification bodies should be promoted, as well as the consolidation of ways of auditing all these attributes with independence and transparency. Another front is the development of commercial contracts that ensure greater balance between the parties involved. Designing and building a value chain is essential for this to happen in the future.

ENABLING ELEMENTS (FINANCE, LICENSES, TAX ISSUES)

Finance, operating licenses, and tax issues are enabling elements of restoration activity, and they are based on the consolidation of forest restoration as an asset class. Asset classes are sets of financial instruments that have similar characteristics and behave similarly in the market. Assets of the same class are inserted in similar institutional environments. They operate with equivalent game rules, particularly legal and regulatory rules or even informal and cultural practices. In general, they have risks and returns with convergent predictabilities. Their costs and prices are influenced by the same factors and temporalities[2].

How can ecosystem services – the main product of natural capital – be classified as an asset class? Carbon and water and mineral resources are relatively measurable, although global standards are still lacking. But measuring investment risks is a much more challenging task when it comes to assets linked to biodiversity, as it is extremely sophisticated and complex, with different hierarchies and levels of approach.

Thus, technology is of great importance in transforming natural capital into an asset class, as it contributes to processes of ecosystem products and services characterization. Technologies aimed at genetic sequencing of all living species of the planet are already accessible. Biological diversity is the result of the expression of genetic materials, and their sequencing allows access to a library of data that, when correlated with databases on the environment in which they live, opens up a complex and fascinating field. By combining biotechnology, big data, and artificial intelligence, it is possible to better know the investment subject matter.

The transformation into an asset class also depends on the monitoring and management of the group of risks of the restoration activity, which includes at least nine fronts, as shown in the table below.

Guarantee systems must also be improved to facilitate access to capital. The restoration activity is highly demanding in terms of debt, not just equity (investment in shares in companies). The lack of real guarantees, combined with the intangible nature of carbon assets and price volatility, drives

NINE FINANCIAL RISKS

1. Knowledge gap
Because it is a new business model, there are gaps of information on how restoration operations are carried out. For example, databases on pest control and/or water management could be shared in a systematic way to reduce business risks.

2. Effects of climate change
Exposure to wildfires, water scarcity and excessive rainfall is inherent to any field use activity, and needs to be mapped and mitigated. By gathering a lot of experience in wildfire control, in particular, the Brazilian forestry sector highlights its ability to deal with climate adaptation.

3. Land protection
Brazil still has problems with the quality of land titling and protection against invasion. Therefore, the sector must ensure quality in the land management of its areas.

4. Regulatory environment
As already highlighted in the Markets pillar, there is a need to reduce regulatory uncertainties, particularly in the carbon market, in addition to promoting the development of ecosystem services markets.

Additionally, there are regulatory obstacles that hinder the expansion of the restoration activity. Normative Instruction No. 17/2017 of the Ministry of Agriculture, Livestock and Supply (Mapa) imposes strict requirements for the production and sale of seeds and seedlings, which limits the activities of small producers and reduces the genetic diversity available. It is necessary to create mechanisms to encourage the network of regional nurseries, expand access to quality seedlings and harmonize rules with scale targets in restoration and forestry (Coalition, Technical Note IN17/2017, 2025). In addition, the National System for the Control of the Origin of Forest Products (Sinaflor) does not adequately differentiate between plantations of native and exotic species. When transporting timber, planted native species are subject to the same timber control as forest management in natural areas. Changes are needed to create specific categories for Native Species Forestry, ensure transparent registration and monitoring, and allow the inclusion of data in official carbon and biodiversity reports (Coalition, Contributions to the Sinaflor review, 2024).

5. Commercial contracts
There are weaknesses in commercial contracts, which are poorly balanced in terms of the responsibilities and duties of the parties involved, both bidders and contracting parties – particularly in the carbon market.

6. Market
There are obstacles to the consolidation of the carbon, ecosystem services, timber and non-timber product markets, which face unfair competition. Illegalities need to be fought through public policies.

7. Leakage
Restoration promoted in a given place can cause deforestation in another place, leading to what is called, in the carbon market, leakage. Avoiding it is essential in the credit trading environment.

8. Valuation of ecosystem services
There are still many uncertainties in how to value these services. The restoration sector intends to advance in more sophisticated methodologies, metrics and monitoring systems.

9. Reputational risks
There are internal conflicts within the sector and questions about the monetization of nature that need to be considered.

Source: Movimento Floraz

traditional financial institutions away. To enable scale, it is essential to treat it as a emergent infrastructure sector, requiring specific lines of credit, insurance, and financial instruments adapted to its risk and return reality. This requires innovation in the field of guarantees, but also a more favorable action from development banks, accepting the current level of maturity of this sector so that it can finance itself adequately.

In addition to financial risks, there are fiscal and tax challenges. A wood product, for example, is one of the most taxed in the civil construction industry – more so than carbon-intensive products such as concrete and steel. Therefore, there must be fiscal and tax equality that ensures fair competition for products originating from restoration projects. Tax equality for wood in relation to other products used in civil construction, such as steel and concrete, is a tangible incentive alternative. The increased use of certified planted wood products in civil construction, particularly in affordable housing programs, which spreads the positive impacts of a low-carbon economy across the lives of the entire population, is an important measure to accelerate the maturation of the forestry production chain, both native and exotic.

Financing policies and tax incentives for Restoration can be inspired by the mechanisms of the National Development Plans of the 1980's, which were important for structuring segments such as pulp (*learn more in the Forestry section on page 107).*

USE OF ENGINEERED WOOD IN CIVIL CONSTRUCTION – A PROMISING FIELD FOR NATIVE SPECIES IN THE LONG TERM

Given the emergence of climate change mitigation and adaptation agendas, wood has entered the list of so-called New Building Materials, although its use in construction dates back millennia. Recovering the use of wood in the structures and large elements of a building is an important step towards securing large volumes of carbon sequestered by trees. Considering that the concrete and steel industries are carbon-intensive, the civil construction industry will hardly be able to reduce or eliminate its emissions without the widespread use of wood. The construction industry today accounts for 37% of energy-related emissions globally and 21% of total emissions. The number of buildings worldwide is estimated to double by 2050, adding up to 70 Gt of carbon to the atmosphere, if traditional construction methods, based on concrete and steel, are used[3].

Harvest licensing systems also need to be improved to make them simpler and more predictable. There is complexity in the regulation for harvesting planted forests of native species, which is dependent on authorizations and results in unpredictable deadlines and costs in fees. As a solution, it is suggested to change the rules of the National System for the Control of the Origin of Forest Products (Sinaflor) and create a specific registration file for trees from planted native forests with the issuance of the Forest Origin Document (DOF+) based on prior communication of exploitation, with the waiver, for example, of authorizations.

Another challenging aspect is the relationship between the restoration sector and the insurance industry. In view of the risks pointed here, there is still a gap between the restoration activity and insurance companies. However, due to its infrastructure characteristic, that is, of positively contributing to land resilience, this sector has the capacity to reduce risks of environmental disasters, which has a positive interacts with the insurance field. The trend, therefore, is for there to be increasing harmonization and positive coexistence between forest restoration and insurance.

ACCESS TO LAND

Forest restoration is a highly land-intensive sector, which can be accessed under three categories: land purchase, public land concessions, and partnerships with landholders. Land purchase involves challenges of titling, price and economic viability.

Under the public area concession category, the vision of the future is that the system will be more functional, developed and consolidated. Brazil has approximately 310 million hectares of public forests (SPU/SFB, 2023). Of these, 34 million are classified as “national and state forests eligible for concession.”

To enable the environmental and social and economic benefits of large-scale forest restoration through dedicated forest concessions, it is essential to establish models of partnership between the public and private sectors that balance risk management and offer attractive incentives to investors.

The third way to access land is through partnerships with agribusiness, which refers to compliance with the Forest Code and the elimination of environmental liabilities, through the recovery of Permanent Preservation Areas (APP) and Legal Reserves – both recoveries generate carbon credits for rural producers, without competing with the productive activity. Another way is to use forest restoration in areas of alternative use, which are not suitable for food production due to their physical or market characteristics, and finally Agroforestry Systems (SAF) and Integrated Crop-Livestock-Forestry (ICLF) systems.

CHALLENGES AND SOLUTIONS IN ACCESSING LAND THROUGH FOREST CONCESSION

1 Credit longevity

Forest restoration concessions must provide longevity of at least 100 years for the carbon credits generated.

2 Portfolio of areas

Areas must be selected so as to avoid legal risks, in particular with regard to legal disputes over ownership.

3 Prudential modeling

The economic modeling of the call notices must adequately reflect the costs to be incurred in restoration projects.

4 Areas with full conditions for use

Areas must be handed over to the concessionaire free and clear (without human occupation, buildings, movable property or any physical or legal impediments).

5 Division of responsibilities and investments

Areas should be selected so as to prioritize those with the largest volume of areas suitable for restoration and the smallest possible volume of standing forest areas. Attention must be paid to the costs of protecting large standing forest areas where it is not possible to develop a carbon removal project.

6 Division of risks

Forest concession contracts for restoration must balance the risks between the concessionaire and the concession authority, not transferring to the concessionaire obligations inherent in the exercise of police power, including but not limited to, illegal occupation of the concession area, illegal logging, and the occurrence of arson or accidental wildfire, maintaining in all cases the duty of the public authority to continue to provide public safety, environmental inspection, firefighting and the like.

Source: Ibá

NATIVE SPECIES NURSERIES: BOTTLENECKS AND SOLUTIONS

Native species nurseries are essential infrastructure in the large-scale restoration supply chain, forming a strategic link in the sector, ensuring the availability and diversity of native seedlings needed to restore degraded ecosystems and strengthen biodiversity. Although its importance is indisputable, this sector is still marked by structural, productive, management, technological, and capital challenges that limit its expansion and efficiency.

A diagnosis made by specialized organizations estimates that there are around 2,000 native species nurseries in Brazil, with an installed capacity of nearly 200 million seedlings per year and production of approximately 800 native species, but whose effective production, although growing, already shows regional situations of scarcity.

To face this situation, it will be necessary not only to adapt existing nurseries but also to prepare the production base for a significant expansion, as national demand for seedlings tends to exceed supply in the near future. Strengthening this productive base requires consistent public policies, advances in infrastructure, standardization of practices, traceability, workforce training, use of technologies from related sectors, dedicated credit for the sector, and incentives for the adoption of good practices. These are fundamental conditions for consolidating nurseries as a central engine of forest restoration in Brazil, making it viable, scalable, and aligned with global climate and biodiversity targets.

These three categories depend on contracts with producers, that is, with landowners, through long-term contracts. This is a challenge because long-term contracts are not part of the agribusiness culture, which generally operates in shorter cycles, whether in the production of grains or forestry products from exotic species.

Designing these new contracts is a significant challenge, but the trend is for the restoration agenda to be much closer to agribusiness than it is today, favoring agribusiness and optimizing land use, with productivity and environmental protection.

SOCIAL

No less important is the social component of restoration. This is an activity that generally takes place in areas with social vulnerabilities. As a result, the activity can make an important contribution to creating jobs and generating income in communities, and increasing the value of community conservation activities. Restoration is a labor-intensive activity that requires adjustment to formal working conditions and labor laws. There are opportunities for involving communities in their own seedling production, maintenance and planting services, and production through agroforestry systems that combine planting with food production. There are forest restoration models that coordinate environmental recovery with productive activities of small farmers, such as agroforestry systems, strengthening the economic base of families and communities.

/3

Forestry

More production, less carbon in the atmosphere

WHEN INTEGRATED WITH AGROFORESTRY SYSTEMS, LIVESTOCK, AND OTHER CROPS, FORESTRY ALLOWS FOR THE COMBINATION OF PRODUCTION, CONSERVATION, THERMAL REGULATION, SOIL AND WATER PROTECTION, LANDSCAPE CONNECTIVITY, AND FOOD SECURITY, WHILE PROMOTING CARBON REMOVAL AND STORAGE

The planted forest sector is one of the few that, with practices anchored in sustainability, has a positive effect on the climate and a regenerative effect on the environment. Its environmental and social results can go far beyond the ambitions of most productive activities, which need to operate in the field of reducing and compensating impacts.

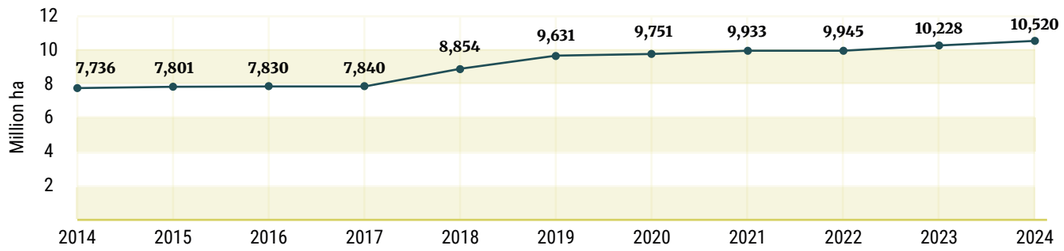
In forestry activities involving exotic species, which in Brazil uses mostly eucalyptus and pine, the cycle of beneficial effects begins with the removal of carbon from the atmosphere, which is accentuated in young, rapidly growing forests. It continues to store carbon at many levels, in roots, soil, and aboveground forest biomass, and advances with the long-term retention of carbon in end products as diverse as books, flooring, poles, furniture, plywood, lumber for construction, and biochar—the latter an increasingly important input for other agribusiness sectors to protect the soil efficiently, operate in a sustainable manner, and be perceived as such in the global market.

The planted forest sector offers one of the most comprehensive Nature-based Solutions (NbS) models. Planting can be integrated into agroforestry systems, livestock activity and other crops, adapting to the social, productive and environmental needs of each area. These arrangements allow for the combination of production, conservation, thermal regulation, soil and water protection, landscape connectivity, and food security, while simultaneously promoting increased carbon stocks.

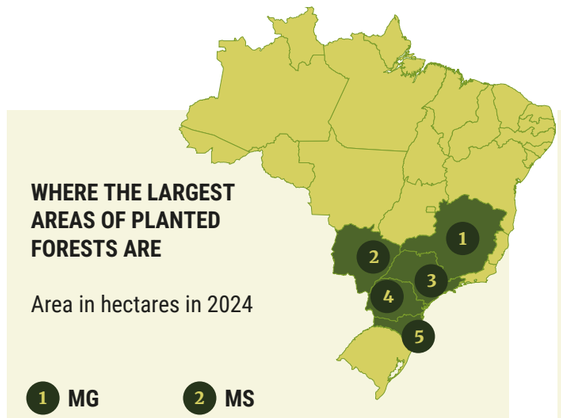
In this context, forestry stands out for bringing together attributes that few sectors can deliver simultaneously: CO_2 removal, provision of ecosystem services, forest conservation, sustainable production, job creation, value creation in the short, medium, and long term, and the strengthening of local climate resilience.

PLANTED FORESTS GROW CONTINUOUSLY

Evolution of the planted area in Brazil



Source: Ibá



WHERE THE LARGEST AREAS OF PLANTED FORESTS ARE

Area in hectares in 2024

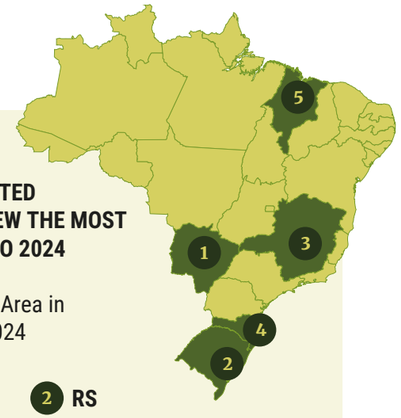
1 MG
2.28 million hectares

2 MS
1.56 million hectares

3 SP
1.28 million hectares

4 PR
1.16 million hectares

5 SC
1.04 million hectares



WHERE PLANTED FORESTS GREW THE MOST FROM 2014 TO 2024

Growth in % / Area in hectares in 2024

1 MS
88%
1,569,931 hectares

2 RS
66%
990,470 hectares

3 MG
58%
2,283,284 hectares

4 SC
58%
1,044,172 hectares

5 MA
46%
308,809 hectares

Source: Ibá

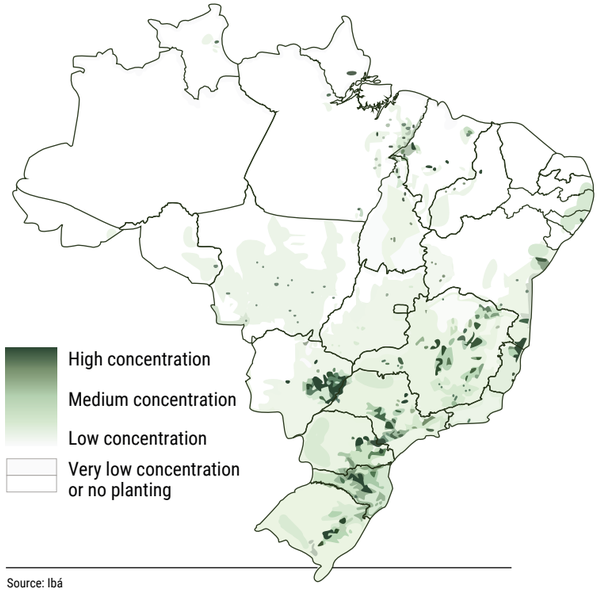
The scale of the environmental, social, and economic effects is proportional to the relevance of the sector, which currently defines land use in 2% of the national territory and accounts for 16% of the area of permanent plantations. Most of the area covered by eucalyptus and pine is located in the Mid-South of Brazil. The states with the greatest expansion of these forests in 2024 are distributed across the Southern, Southeastern, Northeastern and Mid-Western regions. The total expansion of the planted forests area in Brazil was 2.8% in 2024 and 41% from 2014 to 2024, with most of it occurring in degraded pastures.

The presence of the activity in different regions, in a variety of biomes, land tenure situations, economic realities and degrees of impact of human action on the environment makes the application of the forest continuum strategy more valuable – that is, finding the most appropriate approach to the local reality, aiming at the possible degree of recovery and enrichment of the ecosystem *(learn more on the concept of forest continuum in the Introduction, on page 35)*.

HIGH-TECH TREES

The sector's potential as a provider of environmental services, for Brazil and the world, is leveraged by the high forest productivity achieved in Brazil. Like the technology of other sectors of tropical agriculture, the technology of planted forests needed to be developed or adapted to Brazilian conditions, which vary between the regions of Brazil and, to a certain extent, are different from those known in temperate climate countries, where techniques for producing trees for industrial purposes originated.

DISTRIBUTION OF THE PLANTED AREA IN 2024

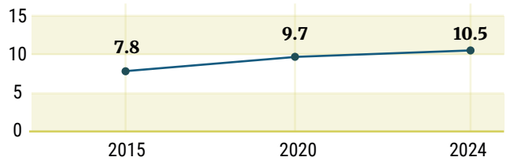


Source: Ibá

A STORY OF HIGH PRODUCTIVITY

Evolution of the planted area and pulp production

In millions of ha planted

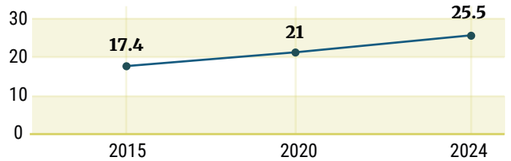


Source: Prévia do Relatório Ibá 2025

35%

was the expansion of the planted area from 2015 to 2024

In millions of metric tons produced



Source: Relatório Ibá 2015-2016

46%

was the increase in the production of pulp in the same period

The European Institute of Planted Forest (IEFC) defines "fast-growing trees" as those with a Mean Annual Increase (MAI) of biomass of 10 cubic meters or more per hectare per year (m3/ha/year). The average MAI in planted forests in Brazil is 31 m3/ha/year, in the case of pine, and more than 34 m3/ha/year, in the case of eucalyptus. This is an extraordinary difference compared to the rate found in other parts of the world for these two genera of trees.

Among other large global producers, MAI is in the range of 10 to 15 m3/ha/year in the United States, of 5 m3/ha/year in Scandinavia, and of 3 of 5 m3/ha/year in Canada. Given the variety of biomes in Brazil, the country's average advantage over other producers could occur thanks to an extraordinary performance concentrated in a single state or region. That is not the case. The lowest yields found in Brazil also far exceed those recorded in other parts of the world.

Brazil is also competitive in rotation, the time required for the tree to grow to the ideal cutting point. The time in Brazil is 5 to 7 years for eucalyptus and 15 to 21 years for pine. The rotation in other major timber producers is approximately 25 years (for both species) in the United States, 30 and 75 years, respectively in Scandinavia, and 35 and 70 years, respectively in Canada[1].

This equation includes the sector's expertise in fields such as the introduction and adaptation of exotic species, genetic improvement, mechanization, integrated pest management (IPM), and forest management in general, as well as Brazil's strong tradition in high-productivity tropical agriculture.

This story began to be told in the 19th century, when the first eucalyptus seedlings were planted in Brazil – different reports place this fact in the state of Rio Grande do Sul or in the state of Rio de Janeiro, on different dates between 1825 and 1868. The Companhia Paulista de Estradas de Ferro (São Paulo Railroad Company) was the first major buyer of eucalyptus wood – to be used as firewood and in the manufacture of sleepers, poles and fence posts – and contributed to the consolidation of planting as a large-scale activity by 1930. There is record of experimental production of pulp and paper in 1925 and of hybridization and genetic improvement efforts before 1960[2].

Maintaining the technological edge built over decades requires constant commitment. In 2024, companies in the sector invested R$ 372 million in research, development and innovation (RD&I), a growth of 28% compared to the previous year. A quarter of this total was dedicated to the genetic improvement of planted species. The effort resulted in more than 1,200 initiatives to increase the sector's competitiveness. A total of 97 new cultivars with genetic improvement were approved. Innovation will be one of the fundamental factors for Brazil to fulfill its commitments to carbon mitigation and maintenance or expansion of forest cover.

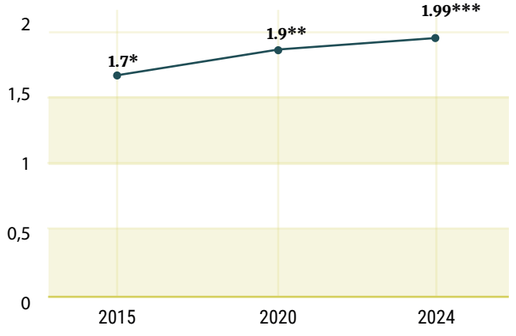
CARBON REMOVALS

There is a global race underway in research on carbon removal and storage using best practices in agribusiness, appropriate metrics, and standardization of this data for comparisons across countries and crops. Knowledge gaps persist, but there is immense potential for plant production in Brazil[3] to gain global prominence as a carbon sink.

In 2022, the Brazilian Agriculture and Livestock Company (Embrapa) concluded that preparing degraded soil at the beginning of the process of forest planting causes an average loss of only 5% of stored carbon in Brazil. This initial loss is more than offset in the following years, with the growth of the forest and the formation of a new surface organic layer.

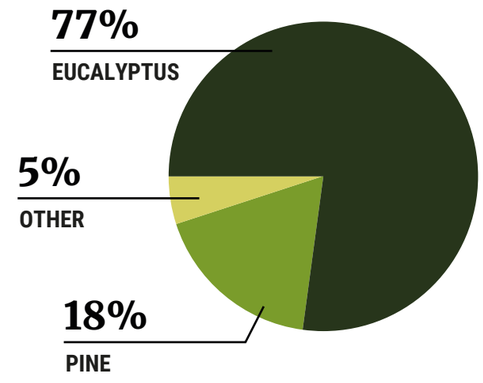
The estimated average carbon stock in the biomass of planted forests alone in Brazil is approximately 189 tCO_2e per hectare, with a total result of 1.99 GtCO2e in the 10.52 million hectares planted. Research by Embrapa has already estimated that the carbon stock in eucalyptus forests is substantially greater if storage in the soil is also considered[4].

CARBON STOCK
How much planted forests store
In billions of metric tons



Source: Ibá [*Relatório Ibá 2015/2016, **Relatório Ibá 2020/2021, ***Prévia do Relatório Ibá 2025]

FOREST BASE
What the most cultivated species in Brazil are



Source: Ibá

CARBON STOCK
How much forest products store
In % of carbon in the mass

BOOKS	45%
MILK PACKAGING	45%
WOODEN TABLES	47%
LAMINATE FLOORING	47%
CHARCOAL	75%
BIOCHAR	80–85%

SUPPLYING THE NEW CARBON MARKET

The generation of carbon credits as an option for creating value and generating remuneration for forestry cultivation has been taking clearer shape. Since December 2024, with the creation of the Brazilian Greenhouse Gas Emissions Trading System (SBCE)[5], the market has been preparing to deal with this new reality. Forest removals may be considered in both the carbon balance of companies that will be regulated and have integration with forests in their production processes, and the sale of carbon credits generated outside the regulated system (e.g., voluntary market, Article 6.4, etc.) to offset emissions from regulated companies. The sector's carbon removal potential remains high, simply due to the expectation of expansion to supply the market with pulp and other products.

BEYOND CARBON

The environmental benefits generated by this activity go beyond carbon removal. They also occur in other ways: the raw materials produced offer an alternative to fossil fuels and materials whose manufacture generates greenhouse gases; the planting contributes to the thermal regulation of its surroundings; the tree barrier protects communities in the area against extreme weather events, such as storms. Furthermore, when converting degraded pastures into commercial forests, the roots promote soil decompaction and the tree canopy offers protection against rain erosion and the silting of nearby springs. With proper management, the roots of cultivated forests maintain moisture and facilitate water infiltration into the soil, replenishing underground deposits.

When considering the spread of the forest mosaic technique, which alternates planting areas for industrial production with conservation areas, the environmental services provided by the sector multiply. They now include protection and recovery of biodiversity, creation of ecological corridors – necessary for the genetic safety of animal populations – shelter for fauna, regulation of water flow, containment of pests and insect vectors of diseases *(learn more in the sections on Conservation and Restoration, on pages 51 and 81).*

INTERRELATIONSHIPS WITH OTHER SYSTEMS

When combined with other production systems such as agriculture and livestock, planted forests potentiate the reconciliation of environmental sustainability with productivity. In addition to promoting significant productive gains, Integrated Crop-Livestock-Forestry (ICLF) contributes to mitigating greenhouse gas emissions, improves soil nutritional value, promotes the recovery of degraded areas, and generates greater resilience to climate variations.

This innovative approach to soil management totaled 65,700 hectares in 2024, with 73% of the total ICLF area corresponding to Integrated Forestry-Livestock (IFL) systems. With a consolidated agricultural infrastructure, the state of Mato Grosso do Sul has 27,000 hectares of IFL – or 56% of Brazil's IFL area – and is considered a national benchmark in the development and application of the technique.

In two years (2022-2024), the ICLF project area increased 80%. The significant progress may be linked to the strengthening of institutional support and the growing recognition, by producers, of the benefits provided by the system, which favors product diversity and sustainability in the production of food, fibers and energy.

ECONOMIC GIANT

The cultivated tree industry plays a significant role in Brazil's economic growth, in addition to strong international competitiveness. Its strategic role in national and global sustainable development is highlighted by the combination of economic competitiveness with the generation of positive environmental effects. The economic size creates a high potential to scale up environmental solutions being developed in this activity.

The 10.4% growth rate in the value of the planted forest production chain in 2024 exceeds the performance of national GDP, which grew 3.4% in the same period. Combining forestry and industry, forestry recorded a 1% share of last year's GDP, placing the sector in fifth place among Brazil's 34 economic activities.

Currently, the cultivated tree industry generates 2.8 million direct and indirect jobs, equivalent to 5.8% of the 48 million formal jobs with signed contracts registered in Brazil. This share, higher than its share of GDP, indicates that it is an activity that is intensive in formal employment, despite high mechanization. Between 2024 and 2028, it is estimated that there will be around R$ 105.6 billion in new investments in industrial plants – with a consequent demand for planted trees.

As a result of public development policies to make the pulp and metallurgy industries viable in Brazil, forestry of planted species has enabled globally competitive activities, in particular eucalyptus pulp. Brazil is the world's largest producer and exporter of eucalyptus pulp, as well as the largest producer of charcoal from eucalyptus, and is the second largest producer of pulp in the world, behind only the United States and ahead of China Of the planted area, 74% of the total amount corresponds to industries' own land, which represents stability, predictability and better long-term production planning.

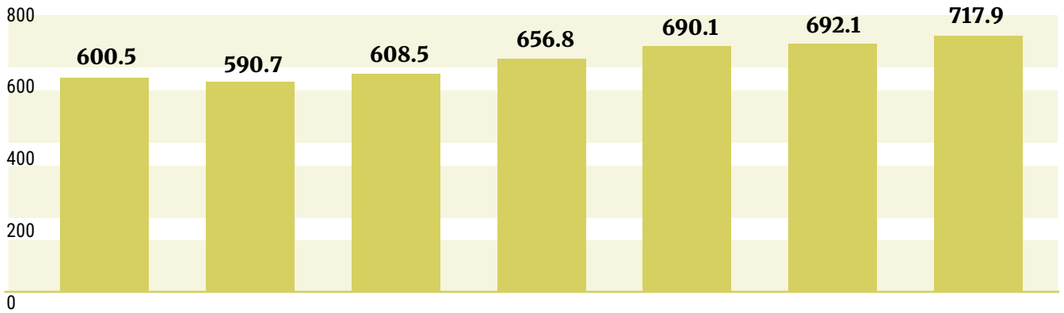
In 2024, the sector generated R$ 240 billion and exported approximately US$15.7 billion. It generated a trade surplus of around 9 to 1 in the ratio of exports and imports. Brazil is a solid global leader in pulp exports, totaling US$10.6 billion in 2024. This represents a 34.2% increase compared to the previous year, when it was already the leading exporter of the product, ahead of the United States, Canada, Sweden, Finland, and Chile.

MAIN ACTIONS FOR WATER RESOURCES CONSERVATION (%)

Source: Ibá

FORESTS THAT CREATE JOBS

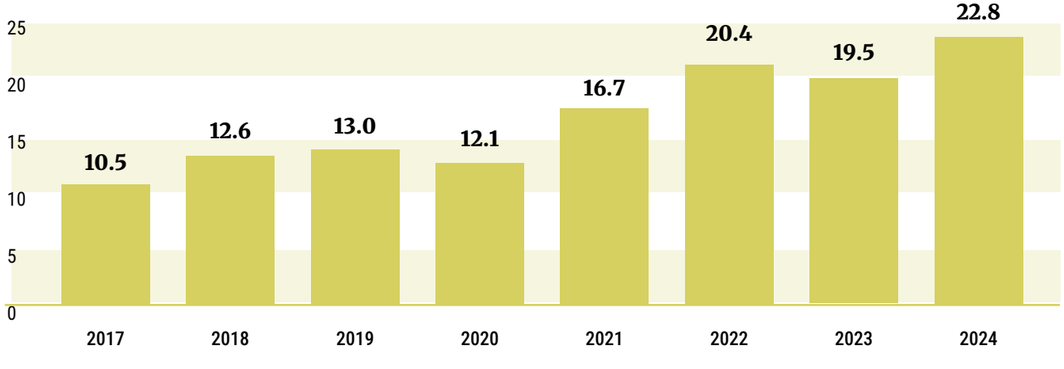
Evolution of the number of direct jobs in the planted tree sector (in thousands of employees)



Sources: RAIS and ESG Tech

FORESTS THAT MOVE THE ECONOMY

Evolution of the sector's total payments in federal taxes (in billions of R$)



Sources: Federal Revenue Service and Ibá

Versatility is a characteristic of this industry. In addition to pulp, Brazil manufactures and exports a wide variety of forestry products, including paper, flooring and panels, wood for furniture, wood chips, charcoal, plywood and lumber. It is important to remember that this activity, although it produces raw materials, has a strong technological base and innovative products. Brazil has mastered technologies for applying fibers from planted forests for many uses and industries, which places it in a prominent position worldwide.

The global demand for renewable-based products, combined with the expansion of national production and the capacity to supply domestic and foreign markets, shows the fundamental role of the planted forest chain in the transition to a low-carbon economy. This asset strengthens Brazil's leading role in the international bioeconomy and sustainability arena.

Brazil is actively involved in the technological development of other applications, such as fibers and fabrics, like viscose produced from eucalyptus, biomaterials capable of replacing petroleum by-products, and biofuels, such as second-generation ethanol, which can also be obtained from forestry waste.

Among Brazilian production chains, the planted forests sector is the one that has been making the most progress towards circular bioeconomy – capable of generating multiple renewable, low-impact products, benefiting both the private sector and society. The potential for expansion of the Brazilian forest-based industry is significant.

IMPACTS ON THE AREAS

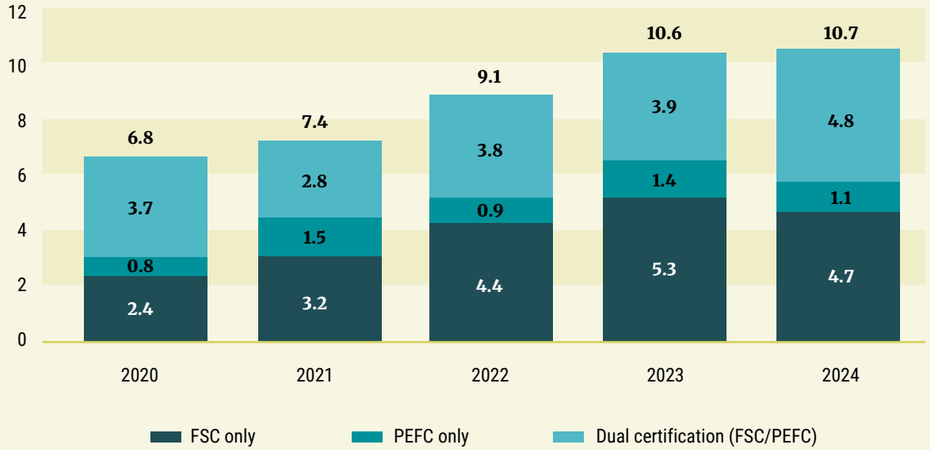
There are several indicators that measure the positive social and economic impact on areas that are home to forestry. Per capita GDP of the municipalities that are part of the planted tree production chain was 29% higher than the national average in the past ten years. Still in 2024, the performance of these municipalities exceeded the national average by 10% in the Basic Education Development Index (Ideb) and by 7.5% in the Sustainable Development Index of Cities (IDSC), which considers the 17 Sustainable Development Goals (SDGs).

A total of 297 environmental and social projects received R$ 115.2 million from companies from the sector last year. Around 389,000 people benefited from initiatives covering education, childhood and adolescence, infrastructure and equipment, the environment and environmental education, certification, health and well-being, rural development and family farming, economic development, culture, sports, and leisure.

In 2025, an Ibá survey with its members, the vast majority of companies stated that they: carry out some type of training and/or campaign on human rights; implemented some type of internal initiative related to diversity and inclusion in 2024, such as training, capacity building, diversity groups, and selection processes that take this factor into account; adopt these actions at the operational, managerial, and management levels; and have diverse groups (including women, Indigenous people, black people, people with disabilities, among others) in leadership positions.

CERTIFICATION ON THE RISE

Dual Forest Stewardship Council (FSC) and Programme for the Endorsement of Forest Certification (PEFC) certification gains ground in Brazil



Sources: FSC, PEFC and Ibá survey. Preparation: ESG Tech

The certifications indicate the companies' commitment to good environmental, social, and economic practices in the management and traceability of the wood that supplies their factories. The area planted with forest certifications grew 110% from 2020 to 2024, from 3.7 million to 7.8 million hectares. The standards regulate everything, from planting to harvesting, considering the prevention and mitigation of potential impacts on the environment, neighboring communities, and the safety and health of workers.

Such organizations are annually verified in the field by independent entities.

In Brazil, the most commonly used certifications are the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC), and dual certification is possible. There is currently a consolidation of the use of multiple certifications as a strategy to meet different market requirements in global supply chains.

How to multiply experience

THE KNOWLEDGE ACCUMULATED OVER DECADES IN PLANTING AND MANAGEMENT TECHNOLOGY MUST BE CONVEYED TO THE EMERGING NATIVE FOREST RESTORATION ACTIVITY SO THAT THIS TOO BECOMES AN ASSET CLASS

Brazil, one of the countries with the largest area of planted forests and the most competitive, has successfully incorporated the use of exotic species for industrial purposes in forestry. This position makes Brazil especially attractive to Timber Investment Management Organizations (TIMOs) – companies dedicated to managing forests as financial assets that can attract global capital and institutional investors to the sector.

Currently, planted forests form an asset class, as they have their own standardization, return prospects and risk management. Their set of planting and maintenance technologies, as well as their consolidated management experience, can also be applied to the activity of restoring native forests – which, by becoming an asset class, generating predictable returns, will have the potential to attract domestic and international investments *(learn more in the Restoration section on page 81)*.

The sustainable expansion route for forestry has concrete evidence, in addition challenges to be overcome. At least three government programs establish targets that allow us to envisage the future of the sector:

- Mitigation and Adaptation to Climate Change for the Consolidation of a Low-Carbon Economy in Agriculture (**ABC+ Plan**): provides for the expansion of 4 million hectares of planted forests by 2030, the expansion of 10 million hectares in Integrated Crop-Livestock-Forestry (ICLF) by 2030 and the recovery of 30 million hectares of degraded pastures (including forestry) in five years.

- National Plan for the Development of Planted Forests (**PNDF**): provides for the expansion of the planted forest base in an orderly and environmentally responsible manner; the integration of plantations with other agricultural and livestock activities, such as in ICLF systems; the incentive of research, innovation, and use of new technologies; the appreciation of the ecosystem services provided by cultivated forests; the strengthening of governance and forest financing and insurance instruments; the promotion of land planning of the forestry activity; the promotion of sustainable production chains; and the expansion of Brazil's presence in foreign markets of forest-based products.

- National Program for the Conversion of Degraded Pastures (**PNCPD**) – according to the program, Brazil has 11.5 million hectares of degraded pastures with potential for forestry. The Northern region, with little relevance in the segment currently, emerges as a promising frontier. The federal government has defined an area of 23.1 million hectares distributed across nine states as a priority in this effort. Converting this area to different "sustainable systems" (including forestry, SAF, and ICLF) would result in carbon removal corresponding to up to 10.4% of gross agricultural and livestock emissions in 2023.

ROWTH SCENARIOS AND RELATED CHALLENGES

Between 2000 and 2024, exports of the main by-products of pine and eucalyptus grew at an average rate of 4.8% per year. Sustaining this performance in the long term would require the forest base to grow in advance and in the same proportion, which means incorporating the equivalent of 620,000 hectares per year – a significant challenge. This is a scenario of strong acceleration. The benefits would be exponential for the environment, the economy, and the communities involved, as already demonstrated by the positive impacts generated by the current forest base.

Alternatively to the strong acceleration scenario (6.2 million hectares in 10 years), the conservative scenario – which is the most probable – would be of an organic growth. If the forestry growth rate recorded between 2010 and 2024 (3.8% per year) is maintained, there would be an additional 4 million hectares in 10 years. Making this scenario viable would require an investment of around R$ 64 billion.

For the planted forest sector to expand its contribution to Brazil's environmental, social, and economic development in the long term, it will be essential to implement the following set of strategic actions:

- **Structure new forestry-industrial clusters**, prioritizing regions with degraded areas and high demand for social and economic development, promoting productive inclusion, job creation and attracting investments.

- **Implement Industry 5.0** to serve emerging markets of high value-added products such as biochemicals, biopolymers, nanocellulose, transparent wood, biotextiles, technical fibers, and advanced bioenergy (second-generation biofuels and low-carbon hydrogen), aligning the sector with the demands of global bioeconomy.

- **Increase the participation of forest plantations in the carbon credit market**, enabling the obtainment of additional revenue to finance the expansion of the forest base and accelerate carbon capture, particularly through fast-growing exotic species.

- **Maximize the use of wood** through advanced production technologies and processes, reducing losses, increasing efficiency and adding value to the production chain.

- **Diversify forest species**, enabling value chains with native species with high market potential, promoting innovation and commercial advantage.

- **Adapt to climate change** by developing more adaptable cultivars with greater tolerance to water deficit and cultivating forests with less need for replanting, pesticides, and fertilizers. The leap in the share of investment dedicated to genetic improvement in eucalyptus and pine plantations, from 9% in 2023 to 26% in 2024, already signals a trend in the sector to intensify innovation efforts in light of the increasing frequency of extreme weather events.

For these measures to be effectively implemented, the joint mobilization of governments, the productive sector, financial institutions, representative entities, academia, and civil society will be essential. Only with this coordinated commitment will it be possible to transform strategies into concrete results, resuming growth on sustainable bases.

Progresses made, future to conquer, and final considerations

BRAZIL COULD, WITHIN 10 YEARS, HALT THE LOSS OF FOREST STOCK AND BEGIN TO REVERSE THE DEFORESTATION CURVE.FOR THIS FUTURE TO BE ACHIEVED, A SYSTEM FOR MONITORING CARBON EVOLUTION AND THE CONDITIONS THAT ENABLE THIS SCENARIO IS NECESSARY. THEREFORE, IT IS PROPOSED THAT BRAZIL SHOULD HAVE AN INTEGRATED FOREST MONITORING SYSTEM THAT COVERS THE ENTIRE FOREST CONTINUUM

In a time where natural capital is gaining increasing value, forests are a powerful asset. Key to the survival of humanity and all forms of life on Earth, forests are gaining prominence in the global agenda. In this context, Brazil is one of the most relevant players, as it is home to the world's largest tropical forests and develops some of the most sophisticated knowledge, technology, policies, and business initiatives.

Brazil brings together a mosaic of forest solutions, ranging from conservation and restoration to forestry, that go far beyond addressing the climate crisis. More than just removing and storing carbon, Brazilian forests maintain megabiodiversity, promote social integration with forest peoples, provide support to a wide variety of economic activities, and allow the development of cutting-edge technologies and new markets.

With an innate calling, Brazil's forestry industry ranges from responsible extractivism under sociobio-economy to the participation of industrial operators and key players in the financial market, enabling the development of innovative structures such as capital markets for exotic forests, alternative equity and debt models for forest restoration and agroforestry systems, and mechanisms for recognizing the value of the preserved forest.

In the backdrop of this innovative agenda is the recognition that the Conservation, Restoration, and Forestry fronts are complementary and interdependent, forming a mosaic along the forest continuum that makes them more resilient.

The study of scenarios on carbon emissions and removals through forests in Brazil, shown in charts in the Executive Summary *(on page 23)*, indicates that the projections considered for 2035 are achievable, given the proper operation of elements such as carbon market regulation, investments, financing systems, risk and insurance, and research and development (R&D). With this combined with deforestation control, Brazil could, within 10 years, halt the forest stock loss and begin to reverse the curve, as some Northern European countries have already done.

For these targets to be achieved, it is important to have a monitoring system that tracks not only the evolution of carbon emissions but also the improvement of the conditions that enable this scenario. Therefore, it is proposed that Brazil should have an integrated forest monitoring system that covers the entire forest continuum. It is suggested that, over the course of 2026, this study be revisited and instruments be established so that this monitoring can be done in advance for COP 31. As a result, after a systematic study of the many fronts in this document, a second edition will be presented at COP 31 incorporating this refinement and the suggestion of an integrated monitoring system.

With this document, the players in the Brazilian forestry agenda acknowledge the achievements already obtained, looking ahead to an even more forested future, in which the expansion of vegetation areas brings even more benefits to people, economies, and well-being on Earth.

Conservation

PROGRESSES ALREADY MADE:

- Protection defined by law: the National System of Conservation Units covers 42% of Brazilian territory, along with Indigenous Lands. Conservation Units and Indigenous Lands have the lowest deforestation rates in Brazil
- Advanced technological apparatus for monitoring and inspecting deforestation using satellite imagery, territorial intelligence, and inspection
- Consolidated legal framework. Of particular note is the Forest Code, which protects a significant portion of forest (although the implementation of the Rural Environmental Registration File (CAR) is necessary to enable restoration projects)
- Institutional capacity to fight deforestation through public command and control policies

FUTURE TO CONQUER:

- Illegal deforestation must be eliminated and incentives have to be created to bring legal deforestation close to zero, considering that the expansion of the agricultural and livestock frontier can occur in already deforested and degraded areas.
- If Brazil does not achieve near-zero deforestation by 2030, the country and the world risk losing one of the most important systems for absorbing carbon on a large scale. The Amazon is especially important in this equation because it represents half of the world's tropical forests.
- Therefore, the development of the Amazon, which presupposes the elimination of deforestation and the flourishing of a forest-based and low-carbon economy, depends on the well-being and human development of its population.
- Viewing the forest as an economic asset will be essential for to its conservation. This presupposes a new financial model, based on two systems: one to reward regions for avoiding emissions resulting from deforestation and degradation (Jurisdictional REDD+) and reward the protection of existing forests (such as TFFF and REDD), and, the other, to ensure the forest restoration of degraded areas, either through natural regeneration or the planting of native trees.
- Expansion of legal timber management, forest bioeconomy, and biobusinesses associated with innovative agroforestry systems that are beginning to be developed in the Amazon.

Restoration

PROGRESSES ALREADY MADE:

- The legal framework is expanding, notably through the National Plan for the Recovery of Native Vegetation (Planaveg) and the National Program for the Conversion of Degraded Pastures (PNCPD), aimed at recovering 40 million hectares by 2030, including forest restoration, formation of productive pastures, and planting of grains
- Forestry companies are attracting investments from global corporations in carbon credits to restore large-scale degraded areas in the Amazon and Atlantic Forest
- This sector is already operating projects in the voluntary carbon market, prioritizing high integrity of credits, ecological diversity, and generation of environmental and social co-benefits
- Consolidation of regional collectives, networks, and alliances to support the demand for restoration and monitoring of the areas
- Launch of a pre-competitive Native Species Forestry program to boost the sector with timber production and carbon credits

FUTURE TO CONQUER:

- The future outlook is that the forest restoration segment using native species will gain similar strength to that which exists today in the exotic species forestry market
- New resources to promote forest restoration have been announced by major financial institutions
- There are a number of challenges to overcome in the segment's main pillars: technological, market, financial, titled land access, and social development
- The activity is in a process of maturation towards a scale of one million hectares by 2035. Private restoration companies are already planting today to deliver concrete results as of the next decade
- Restoration of private areas, complementary public conservation policies, can be an essential lever for ecological transition, enabling Brazil to consolidate its global leading position in Nature-based Solutions (NbS)
- Regulation of national and international mechanisms for access to the international carbon market, such as corresponding adjustments and international transfers of credits

Forestry

PROGRESSES ALREADY MADE:

- Planted forests in Brazil already form an asset class with their own standardization, return prospects and risk management, counting on significant participation from international and domestic investors via TIMOs (timber investment management organizations)
- Advanced planting techniques. The mosaic system, which alternates areas of trees cultivated for industrial purposes with conservation areas, offers a double benefit: greater productivity in the planted area and protection for the preserved area, with the resulting environmental services
- This sector is one of the most adapted in Brazil to extreme weather events, although there is room for improvement. Genetic improvement of species (important for crops to achieve high productivity in all regions of Brazil) increases resilience to climate change and its consequences, such as water deficit
- The use of digital technology and robotics in forestry enables the early detection of risks that could affect the productivity and production of forest plantations. Examples include machinery specifically designed for tree cultivation areas, the use of UAVs (unmanned aerial vehicles), online monitoring of wildfire outbreaks, digital measurement of timber volume, and real-time monitoring of field activities
- The sector supplies more than 5,000 bioproducts, which include timber items and a range of non-timber products

FUTURE TO CONQUER:

- Appropriate public policies on land tenure, logistics, water use, and science and technology issues that contribute to the sustainable expansion of the activity, its climate adaptation, and its coexistence with communities and other sectors.
- Production of second-generation ethanol, which can be obtained from forest waste such as tree trimmings, wood, and sawdust. The expansion of the ethanol production base is part of a broader context: the consolidation of Brazil as a global leader in the use of biofuels, with the benefits of these value chains being well distributed throughout Brazil's territory.
- Diversification of the forestry economy in Brazil. With the application of the concepts of forest mosaic and forest continuum, contiguous areas – each with adequate forest cover and mutually reinforced protection structure – can be dedicated to different purposes, such as food, oil and fiber production, livestock activity (through Integrated Livestock-Forestry), extractivism and ecotourism.
- Generating carbon credits as an essential and integrated activity within the industry's processes, based on clear rules within Brazil's carbon legal framework and capable of stimulating this practice, in order to maximize the environmental services provided by tree cultivation.

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