

The leading role of Brazilian forests in the global climate agenda



AN OVERVIEW FOCUSING ON THE LARGEST FOREST BIOMES AND ON FORESTRY

EXECUTION



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This document is the result of a compilation of different views, and does not necessarily represent the opinion of all contributors and sources. The forest sector encompasses multiple understandings, and, to the extent possible, the report sought to show the contradictions and ambiguities when presenting the information.

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EXECUTION



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, around 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.

Additionally, Brazil has a legal framework that is a world reference – the Forest Code – which defines criteria for the conservation of native vegetation in all biomes, encompassing areas surrounding rivers and waterways, on hills and mountains, Permanent Preservation Areas (APPs), and Legal Reserve areas that cover a portion of each possession or property according to each biome. 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.

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LETTER FROM THE COP 30 PRESIDENCY

HAVING PLAYED A HISTORICALLY VITAL ROLE IN ADDRESSING MAJOR GLOBAL ISSUES, THE UNITED NATIONS CLIMATE CHANGE CONFERENCES, OR COPS, HAVE SEEN AN EVER-GROWING ACTION AGENDA FOCUSED ON IMPLEMENTATION.

The consensus-based decisions required in multi-lateral forums often do not proceed with the speed or ambition necessary to respond to environmental emergencies, such as climate change. This increases the relevance of complementary initiatives that – until COP 30 – were seen as alternative proposals to consensus-based negotiation, but with the potential to contribute to climate change mitigation and adaptation, and potentially also to strengthen the outcomes of future conferences. Starting with COP 30, the Action Agenda has become the central instrument for implementing the decisions that have accumulated over time.

In this context of implementing what has already been negotiated and agreed upon by consensus, the COP 30 Presidency has developed Roadmaps that “run” parallel to the path of diplomatic decisions. One of them is the Roadmap for Halting and Reversing Deforestation and Forest Degradation by 2030. This is a strategic initiative aimed at proposing, on a global scale, a structured plan of actions to achieve the goal indicated in the 1st global review of the Paris Agreement (GST §§33-34) and reiterated in the

Pact for the Future (UN General Assembly Resolution 79/1 §28).

This roadmap works as a guide connecting climate targets to concrete instruments – public policies, financing, technology, and international cooperation – recognizing the central role of forests in mitigating emissions and adapting to climate change.

More than a declaratory commitment, the Roadmap for Halting and Reversing Deforestation and Forest Degradation by 2030 seeks to transform ambition into coordinated performance between governments, the private sector, and civil society. This path is not trivial. There are major challenges in this journey, including aligning interests between countries, securing financing at scale, and integrating production with conservation, deforestation reduction, and restoration, considering the social dimension of the populations.

But there are also relevant opportunities contained in several important dimensions, including governance and land-use planning, which includes strengthening



real-time monitoring systems, land tenure regularization, combating illegal activities, and recognizing the role of indigenous peoples and traditional communities as guardians of the forests. Another dimension relates to financing and economic incentives, recognizing that halting and reversing deforestation requires mobilizing resources on a much larger scale than the current one. There is also the dimension that addresses the transformation of production chains, making use of instruments such as traceability, transparency, and shared responsibility between producers, companies, and consumers.

Finally, another dimension consists of a cross-cutting axis of implementation, cooperation, and scale, which coordinates international partnerships, South-South Cooperation, and multi-sectoral platforms to accelerate solutions. The establishment of intermediate goals by 2030 and monitoring mechanisms is proposed. It is also necessary to connect local initiatives to global funding and market flows.

In view of the foregoing, the COP 30 Action Agenda can make a decisive contribution to the implementation of the Roadmap guidelines by organizing and prioritizing concrete initiatives, mobilizing players and resources, and accelerating the transition from political commitments to effective actions at scale.

It is no coincidence that this roadmap is being coordinated during Brazil's Presidency of the COP climate summit. Brazil is a country with significant implementation capacity in the forest sector, which is in line with proposals such as those presented in this document. With content focused on very concrete practices in Conservation, Forest Restoration, and Forestry, *The Leading Role of Brazilian Forests in*

the Global Climate Agenda document meets the collective effort that guides the Roadmap for halting and reversing deforestation and forest degradation by 2030.

By bringing together a large and diversified group of contributors, this report also meets the proposal of *Mutirão* (collective effort), a concept adopted by COP 30, based on cooperation and shared responsibility, with many players moving forward towards a common purpose, and seeking progress through unity, rather than fragmentation.

It is with this collective effort spirit that the COP 30 Presidency offers this contribution to strengthening the forest agenda, which may continue at COP 31, to be led by Turkey and Australia starting at the end of this year. It is always worth remembering that forests are central to all three Rio Conventions – on Climate Change, on Biological Diversity, and to Combat Desertification. For all these agendas, forests offer solutions and point out ways, working as powerful connections between these fronts. Having the world's largest tropical rainforest is a defining trait of Brazil's international role. It is a source of national pride, coupled with our ongoing commitment to the conservation and restoration of these ecosystems, which are important to all of humanity.

Ambassador André Corrêa do Lago

President of COP 30

Ana Toni

Executive Director of COP 30

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 former 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 these 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 (tCO₂e).

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 or-



ganizations 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 CAN TRANSFORM CHALLENGES INTO CLIMATE AND ECONOMIC ASSETS.

Brazil faces two strategic challenges. The first is to turn its vast forest heritage into a driver of development, without compromising the ecological integrity that sustains the climate, biodiversity, and local livelihoods. The second is to meet a growing demand for timber – about 12 million m³ per year – through sustainable management.

Forest concessions emerge as a point of convergence between the State, the market, and society. They are an instrument capable of anchoring economic value in conservation and restoration. In this framework, public authorities provide legal security, scale, and governance, while also requiring strict environmental rules and concrete mechanisms for generating local benefits.

Between 2008 and 2025, 27 concession agreements were signed in nine National Forests, totaling 1.6 million hectares under sustainable management. More than contracts, this is a territorial management strategy: bidding, management plans, monitoring, and continu-

ous presence create economic incentives aligned with conservation, internalizing value in the standing forest and strengthening local production chains.

The impacts are tangible in the territories: job creation, attraction of private investments, decentralized transfers, and institutional presence that helps curb illegal activities. For every 1,000 hectares granted, 2.7 direct jobs and 5.4 indirect jobs are created – in regions that usually present a low HDI, where these effects make a real difference.

In recent years, the model has advanced. Ancillary obligations have begun directing resources toward conservation, wildfire fighting, restoration, research, and socio-productive inclusion. Free, prior, and informed consultations (FPIC) have made it possible to incorporate concrete mechanisms for benefit-sharing with Indigenous peoples, including allocating up to 30% of these resources to agreed initiatives, as well as incentives for hiring and purchasing inputs from these communities.



The legal change in 2024 opened a new chapter: the possibility of generating and selling carbon credits within concessions. This creates two complementary pathways – restoration with carbon sequestration (ARR) and sustainable management with REDD+ – expanding the economic viability of projects.

The emblematic case of this new generation is the Bom Futuro National Forest concession, in the state of Rondônia. An area that is historically marked by invasions and illegal activities is now being structured as a climate and economic asset. It comprises around 98,000 hectares, of which approximately 14,000 hectares require restoration.

Studies indicate a sequestration potential of around 6 million metric tons of CO₂ over the coming decades, with estimated gross revenue of R\$ 1.2 billion. More than just numbers, the project incorporates a central dimension of climate justice by establishing a long-term partnership with the Karitiana Indigenous people, built through prior consultation. The auction held in 2026, at B3, with the presence of Indigenous leaders and ICMBio, signals the maturity of this model, which is already beginning to be replicated in new projects.

In summary, Brazil is beginning to convert a historical problem – deforestation and land grabbing in public forests – into an agenda of institutional and financial innovation. The updated legal framework internalizes climate value within concessions, while the Bom Futuro experience shows its economic and social viability. To consolidate this path, three agendas are central:

1. recognizing and differentiating the private sector committed to sustainable use from those operating illegally;
2. structuring financial instruments that are compatible with the long-term cycle of the forestry sector;
3. investing in research and development to increase the market value of native species.

Standing forests must cease to be merely an ideal and become, consistently, a competitive economic asset.

Garo Batmanian

Director-General of the Brazilian Forest Service

Renato Rosenberg

Director of Concessions of the Brazilian Forest Service

FOREST RESTORATION: A CHALLENGE THAT MATCHES BRAZIL'S SCIENTIFIC, TECHNOLOGICAL, AND SOCIOECONOMIC CAPACITY.

Destroying forests is dangerously simple. It is no coincidence that they have been burned and cut down for about 10,000 years. More than half of the planet's original tropical forests have already disappeared, and almost all the remaining ones have suffered some kind of disturbance to a greater or lesser extent.

The consequences of this destruction never went unnoticed. However, it was only with the climate crisis and the understanding of biosphere instability that the forest agenda gained global centrality. The Intergovernmental Panel on Climate Change (IPCC), the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), and the Kunming-Montreal Global Biodiversity Framework all converge on the same diagnosis: we have already exceeded safe limits for climate and biodiversity. Preserving what remains is essential. Restoring part of what was lost as well.

This agenda has reached an unprecedented institutional scale. The United Nations has declared 2021-2030 as the Decade on Ecosystem Restoration, aiming at restoring more than 1 billion hectares of degraded land. In 2022, more than 190 countries adopted the

Kunming-Montreal Global Biodiversity Framework, which provides for the active restoration of at least 30% of degraded terrestrial and marine ecosystems by 2030. The European Union has approved a regulation to recover all ecosystems that need to be restored by 2050. In Brazil, the National Plan for the Recovery of Native Vegetation (Planaveg) proposes to recover 12 million hectares. At the same time, private initiatives are advancing in different parts of the world, driven by the possibility of remunerating ecosystem services through nature asset markets, such as carbon, biodiversity, and water.

However, we still have an unresolved problem: defining what we expect from restoration. Native forests are the result of ecological succession, biotic interactions, and unique historical trajectories. After a disturbance, the ecosystem does not return to its original state, nor does it converge on what would have occurred in the absence of the disturbance. Dependence on trajectory, soil legacies, seed banks, and landscape connectivity shape multiple and unpredictable successional pathways. In other words, the successional dynamics in forests are predictable in terms of general trends, but uncertain in terms of outcomes. Even though the goal is to have a forest as



close as possible to its original state, it is important to understand that there is no possibility of absolute control over the process. Forests emerge, they are not “engineered,” and the best we can do is promote this emergence.

Added to this ecological complexity are the human and economic dimensions. Except in the contexts of natural disasters, forest conversion processes are economically motivated. Deforestation stems from a logic that sees more value in activities or ventures that take the place of the forest, redefines land use, and changes the connection of communities with the landscape. Restoring a forest, therefore, requires transforming this value logic, rebuilding human relationships with the environment, and finding ways to generate wealth from this reconstruction.

The viability of restoration depends therefore on three simultaneous integrations. The first, and most complex, is ecological: each degraded area is unique, with its own history of disturbance, its soil condition, its connectivity with forest remnants, and its potential for natural regeneration. Diagnosing these conditions and designing the appropriate response – which can range from simple protection to intensive planting of selected species, including soil management, invasive species control, and enrichment of secondary forests (vegetation that emerges in previously deforested areas) – requires in-depth scientific knowledge, technical and operational expertise, and entrepreneurial capacity to perform on a large scale.

The second is social: restoring a forest means rebuilding the local community’s relationship with that landscape, without which any intervention

becomes fragile. The third is economic: the process needs to create enough value to sustain itself and expand. Restoring is not planting trees – it is orchestrating these three dimensions.

Brazil uniquely brings together the attributes necessary to lead this effort. It is home to the world’s largest rainforest and, at the same time, is the world’s largest exporter of agroforestry products – a clear tension, but one that has given rise to a unique technological and logistical platform. Brazil has accumulated scientific knowledge: some of the world’s major references in tropical forest restoration are Brazilian, with decades of research in succession, seeds, seedlings, and landscape ecology. It has robust legal instruments: the Forest Code is among the world’s most sophisticated environmental governance arrangements, and the regulated carbon market is under construction. It also brings together assumptions that favor scale: a large territory, favorable climatic conditions, and alignment of public policies – Planaveg’s goal of 12 million hectares already corresponds to one of the largest restoration programs conceived on the planet.

Restoring forests is one of the major scientific, technological, and socioeconomic challenges of our time. It’s not simple, it’s not easy, but it’s the ideal challenge for Brazil to show its capacity for mobilization and achievement.

Marcelo Medeiros

Co-founder and Chairman of the Board of re.green

Mariana Barbosa

Legal and Institutional Relations Director at re.green

EVERY LANDSCAPE IS, ABOVE ALL, AN ENCOUNTER. BETWEEN NATURE AND HUMAN PRESENCE. BETWEEN THE TIME THAT HAS PASSED AND THE TIME THAT IS DAWNING. BETWEEN WHAT REMAINS AND WHAT TRANSFORMS.

More than what is seen, landscape is what is lived. It is the territory as it is perceived, lived and signified – where forests, rivers, productive areas and cities coexist, shaped by natural processes and human choices, not always visible, but always present. Each landscape carries the marks of its history and, at the same time, holds the possibilities of its future.

It is in this living field of relationships that the concept of the forest continuum, adopted in this document, gains form and density. It proposes an essential shift in perspective: from the forest as a fragment to the forest as a system; from the forest as a boundary to the forest as a structure. Conserved, managed, restored, regenerating or planted forests are no longer understood as isolated realities and begin to be recognized as interdependent expressions of a single living network – a network that sustains the climate, regulates water cycles, shelters biodiversity and enables ways of life, economies and forms of inhabiting the territory.

Seen from the landscape standpoint, this continuity reveals what fragments often conceal: the forest as the thread that connects, sustains and gives coherence to the territory. It is not merely a matter of protecting delimited areas, but of recognizing and strengthening the relationships that keep the whole intact. The integrity of the territory is not an attribute of its isolated parts, but of the quality of the connections that unite them. The future, therefore, is not built from fragments, but from the continuity between them.

This continuity is also expressed in the way the territory is lived, understood and represented over time. In the cosmologies of Indigenous peoples, the forest is not an external landscape, but a condition of existence – a territory where inseparable relationships between life and knowledge are established. In traditional communities, this relationship is expressed in everyday life, in the ways of living, producing and transmitting knowledge between generations.



Over time, this presence has traversed the accounts of naturalists, scientific interpretations, literary narratives and the multiple artistic expressions that have sought to understand and translate Brazil. In each of these experiences, the forest is simultaneously lived and signified, inhabited and imagined, known and represented. More than a setting or a resource, it asserts itself as one of the deep matrices of the collective imagination and of Brazilian identity itself – a formative presence that connects experience, memory and possibility, and participates in the construction of shared perceptions of who we are and the futures that we are capable of conceiving.

Recognizing the forest continuum is, therefore, more than adopting a systemic approach: it is affirming a landscape approach. It means understanding the forest not only as an element of the environment, but as a structuring principle that articulates ecological, cultural, territorial and civilization dimensions. It means recognizing that conserving, restoring and

producing are not opposing paths, but complementary expressions of the same territorial intelligence. And, above all, it means recognizing that forests do not belong only to the past we have inherited, but to the possibilities of the future that we are capable of sustaining.

This recognition carries with it an inevitable responsibility. The future of Brazilian forest landscapes does not depend only on protecting what is left, but on sustaining, restoring and rebuilding the relationships that keep the territory alive. It is from this commitment that it becomes possible to imagine and build landscapes where nature and culture, memory and project, life and future cease to be separate dimensions and become a single shared horizon.

Fernanda Rennó

Executive Secretary of Uma Concertação pela Amazônia
(Amazon Concertation)

THERE ARE AT LEAST TWO MAJOR CHALLENGES TO EXPANDING SUSTAINABLE AGRICULTURAL PRODUCTION.

The first is to promote the sustainable use of natural resources, encouraging the conservation of native vegetation, its restoration, the recovery of degraded areas, and the maintenance and enhancement of soil fertility. The second is to adopt technologies that foster productivity gains, improve management practices, enable the adaptation of production systems, and generate mitigation gains. Both challenges count on global frameworks within the biodiversity and climate agendas.

The Kunming-Montreal Global Biodiversity Framework, approved in 2022, established global targets and the 2050 vision, encouraging that “biodiversity will be valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and providing essential benefits for all people.”

Within the climate change agenda, the impacts caused by rising temperatures, changes in precipitation patterns, the spread of pests, among others, enabled the consolidation of an understanding of the importance of strengthening different production

systems, favoring their long-term adaptation and resilience. Moreover, the possibility of reducing greenhouse gas emissions or promoting carbon capture in productive activities is inherent to certain technologies that combine productivity gains, maintenance of soil fertility, and improvement of management practices.

Promoting climate actions in agriculture with gains for food security is the focus of discussions within the United Nations Framework Convention on Climate Change, with the central challenge of supporting countries in implementing policies and actions based on cooperation, technology transfer, and climate finance.

In this context, the concept of a forest continuum, blending different land uses, conservation, and forest management, positions agriculture and livestock, and planted forests as highly relevant sectors for promoting sustainable development, strengthening climate and biodiversity gains in productive activities.



Recognizing and encouraging the contributions of agriculture and livestock, and planted forests as drivers of native vegetation conservation, and promoters of its sustainable use based on a win-win relationship between conservation and production, is of fundamental importance. The conservation of native vegetation under the Forest Code differentiates Brazilian agriculture and livestock by adding significant values in terms of biodiversity, carbon, and, more broadly, ecosystem services.

Data from the Environmental Regularization Panel of the Brazilian Forest Service, updated through February 2026, show that there are 193.8 million hectares of Legal Reserve (RL) areas and 28.36 million hectares of Permanent Preservation Areas (APP), as well as 19.4 million hectares of surplus vegetation. An APP deficit of 10.5 million hectares is estimated¹.

Data from the Forest Code Thermometer also show a vast area in the form of APP and RL, totaling 106.22 million hectares, liabilities amounting to 20.39

million hectares, and a surplus area covering 70 million hectares on rural properties².

These data are preliminary and depend on a Rural Environmental Registry (CAR) assessment to accurately determine the total vegetation in private areas. Additionally, the compensation of RL liabilities through the acquisition of Environmental Reserve Quotas (CRA) is a legal instrument that enables the conservation of surplus areas, which may be subject to conversion (except in the Atlantic Forest), through private agreements that assign tangible value to standing forests³.

Creating instruments to value forests in private areas, cover the opportunity cost of land, and create value for natural capital are opportunities to enhance the conservation of native vegetation associated with productive activities. Within the forest continuum scope, sustainable land use combined with the conservation of native vegetation in private areas creates a peculiar approach that distinguishes Brazilian tropical agriculture and livestock.

Far beyond being an obligation to conserve vegetation in private areas, the Permanent Preservation Areas (APP) and the Legal Reserves (RL) provide multiple co-benefits, such as improved soil fertility, water regulation, microclimate control, pollination and biological control, carbon capture and sequestration, and habitat for fauna and flora species – contributing to climate, biodiversity, and, more broadly, sustainable development goals.

COP 30 strengthened the multilateral debate on the role of forests and the challenges of eliminating deforestation. The Roadmap to eliminate deforestation, which is being developed by the COP 30 presidency and will be presented by COP 31, needs to create innovative ways to enhance forest conservation, including in private areas. It is essential that it integrates the sustainable use and conservation of forests by agriculture, livestock, and planted forests as solutions that can generate mitigation and adaptation gains, while also fulfilling biodiversity objectives and, in some cases, fighting desertification.

The progress of the Sharm El-Sheikh Joint Work on Agriculture and Food Security throughout 2026 should focus on connecting financial instruments to support the implementation of climate actions in agriculture and food security. The future of these actions is intrinsically linked to the evolution of the Baku-Belém roadmap toward the US\$ 1.3 trillion target and the Roadmap for halting deforestation. It is also important to mention the potential of the forest carbon market, including forest restoration.

Increasing the conservation of native vegetation areas – associated with the growth of forest restoration, recovery of degraded areas, elimination

of illegal deforestation, control and reduction of legal deforestation, valuing standing forests, and promoting agriculture, livestock, and planted forests as productive activities that foster the sustainable use of biodiversity – is an irreversible path when it comes to sustainable agricultural production.

Accordingly, valuing forests within a forest continuum involves sustainable use carried out by productive sectors, including the co-benefits generated by conserving native vegetation in private areas. This approach needs to be recognized at the multilateral level, aiming at strengthening the environmental assets inherent to productive areas, creating market access advantages and, more broadly, encouraging financing mechanisms that recognize native vegetation as a differentiating factor.

1. <https://app.powerbi.com/view?r=eyJrIjoizmRiM2QwZDQtYjUx-Zi00YWl0LWFjNGEtZTlxNjg1YWFKNmZlIiwidCI6ImViMjJmJjU4LWQ-0ZWQtNGZmMC04Y2Y2LTl4NmQ2Mjc3OTQ5ZS9J>
2. <https://termometroflorestal.org.br/plataforma>
3. The data cited here and throughout this document may vary depending on the sources used and their respective methodologies.

Rodrigo C. A. Lima

Partner-director at Agroicone

Leila Harfuch

Partner-manager at Agroicone



THIS IS AN INVITATION FOR US TO ENTER THE FOREST TOGETHER, TO LISTEN TO ITS GENTLE VOICE AND ITS CRY OF ANGUISH, TO FEEL ITS AROMAS AND THE DISTURBING SMOKE THAT BURNS LIKE A FEVER OVER ITS BODY, TO ADMIRE ITS GREEN EXUBERANCE, BUT ALSO TO WITNESS THE DESTRUCTION CAUSED BY MINING THAT DIGS INTO THE HEART OF THE EARTH.

This is an invitation to tread lightly like ant-people, to feel the humidity, and to see the degradation advancing with monocultures.

I want you to see the River that flows there, one dark in color and another with muddy waters. In truth, everything is an extension of ourselves; it is the living spirit of our grandparents, it is a relative of ours – but we are afraid to drink from its waters, to eat its fish, and to immerse ourselves in it. The waters leap because they have life, they have a pulsing spirit, just like the trees at the top of the sky and the ants in the depths of the ground – but they agonize, contaminated with mercury by the greed for gold.

The Forest is sacred by its very nature. And it has the right to exist simply because it exists. Such is life: it is sufficient in itself. When we need to remove some trees to build our homes, canoes, paddles, or to farm, we ask permission from the Forest and its spirits; we perform rituals to seek permission from the enchanted beings.

All human and non-human beings are part of the same communal hut, the same village that is the universe. The Forest is our home, our shelter, it guarantees our food, spirituality through the songs of birds, and brings us healing through roots, seeds, and leaves.

Therefore, walking through the Forest is returning to the places of healing of humanity itself, which has fallen ill by distancing itself from it. It is time to collectivize and recognize ourselves as nature – a principle of life that we should never have lost.

Healing is not only in the medicines that biodiversity offers, but in the possibility of re-signifying thoughts, changing mindsets, and re-establishing lost connections. And in understanding that the Forest is not a collection of trees, a storeroom from which resources like medicine and water, or assets such as climate protection, are extracted. To look at it in this utilitarian, market-driven, capitalist way, as if it were merely an object, is to dehumanize humanity itself.

Of course that ecological functions exist and are important, that stored carbon has value, that the moisture evaporated by vegetation forms rains that are essential for people, cities, and agriculture. But the Forest is not limited to that. Treating it only as a natural resource that has economic value and can therefore be exploited by capitalism is a very reductionist and violent experience.

Those who hold capital and political power have the power to pay, buy, and invade land, to cut down forests and dig into the heart of the earth. We are

living in extremely hot cities because the forests around them are being cut down. In our Amazon region, we have experienced, over the past two years, extreme droughts and floods, fish dying from lack of oxygen, loss of crops, and food insecurity – affecting the very peoples who preserve them most and struggle to have their territories demarcated and protected.

They are advancing over our knowledge and taking raw materials that we collect through ancestral techniques. This has been patented without proper recognition of the management and technologies developed by our peoples. We sow, harvest, and handle plants so that the Forest can continue to be diverse, powerful, and balanced. This knowledge accumulated since ancestral times is being appropriated without our consent.

These are harsh words, but necessary. My original name is Diriciño, or Derequine in Portuguese, which means red ant, or fierce ant. Some politicians say that my speech is firm and forceful, and that I always speak strong words while smiling. This is because I belong to peoples of bitter and strong words, such as coca and tobacco, but balanced with the drink of sweet cassava.

Strong, bitter, and sweet, my words flow like a river making ways so that we can dialogue with great authorities and move forward little by little. I speak often of this word of life of my people, this word of abundance that comes from our elders, from our medicines, so I am very grateful to the sacred.

My Witoto people speak of the Forest as a feminine body, that is, a place that represents life, the earth

as a womb that sprouts, blooms, and bears fruit. It would not even be necessary to say that this feminine body has every right to exist and be respected.

May we continue to walk together, gently and with ancestry, like the fierce Atta ants across this body of life called the Forest. As the philosopher and poet Antônio Bispo dos Santos, Nêgo Bispo, used to say, when we experience nature, we have a very powerful life experience, one that changes our thinking and our position in the world. I come to bring a little of this message, so that we may have this living forest, standing, combined with these sweet words of life and strength.

Vanda Witoto

Indigenous leader, executive director of the Witoto Institute and fellow of the Arapyaú Institute



MESSAGES FROM THE ORGANIZATIONS INVOLVED



COP 30 took place at a decisive moment for the world and placed Brazil at the center of the debate, reinforcing the country's global leading position in the climate agenda. The Brazilian presidency of COP 30 made an important contribution by announcing the creation of two Roadmaps, making room for Brazil to lead these two agendas outside the strict scope of multilateral negotiations: the Roadmap on the Transition Away from Fossil Fuels and the Roadmap for Halting and Reversing Deforestation and Forest Degradation by 2030.

In tune with the Roadmap for Halting and Reversing Deforestation and Forest Degradation, the Arapyaú Institute joined different players and mobilized knowledge of multiple kinds – scientific, territorial, traditional, and applied – so that this document could be built by many hands. The result is a collective effort that brings together experiences and perspectives capable of indicating concrete ways for strengthening the forest agenda in Brazil, offering an action-oriented roadmap.

By bringing together data and evidence on the panorama of conservation, restoration, and forestry in Brazil, the document identifies progress already

achieved, points out obstacles, and highlights opportunities to accelerate the implementation of the commitment to halt and reverse deforestation and forest degradation. It is, therefore, an invitation to explore the levers capable of transforming the great potential of Brazilian forests into a driver of sustainable development.

As a Brazilian philanthropic organization, Arapyaú seeks to foster a continuous cycle of reflection, production, and action on knowledge and its applications in the agendas of nature, climate, and development. Over the years, the institute has fostered the emergence of networks and initiatives that operate with independence and impact to leverage solutions in climate, forests, and nature in Brazil. An Amazon Concertation, the Brazilian Coalition on Climate, Forests and Agriculture, MapBiomas, Conexão Povos da Floresta (Forest People Connection), and several regional arrangements in southern Bahia make up a diverse and complementary ecosystem that coordinates knowledge, science, communities, the private sector, and public authorities around solutions for Brazil's development.

Renata Piazzon, CEO, and Lívia Pagotto, Institutional Director of the Arapyaú Institute.

The updated *The Leading Role of Brazilian Forests in the Global Climate Agenda* document reasserts its strategic importance by showing how Brazil can transform its immense natural wealth into the foundation of a new development model, based on productivity, innovation, sustainability, 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 more resilient economy.

The data presented show that Brazilian forests play a central role in global carbon absorption and that conservation policies and deforestation control have already produced concrete results in reducing emissions. The document also highlights sectors with high productivity and positive impact, capable of combining income generation, creation of jobs, and technological innovation with direct environmental benefits, such as climate regulation and water security. By quantifying results and mapping opportunities, it provides a solid foundation for guiding public policies, private investments, and multi-sector partnerships.

This update also incorporates new elements, such as the role of financing in enabling Nature-Based Solutions (NbS), recognizing that a thriving economy is essential for financing climate change mitigation and adaptation. The text also presents forests as a key component of the new adaptation economy, offering products and services that are essential for Brazil's economic development in a scenario of global average temperatures exceeding 2°C.

In the global race for Artificial Intelligence, Brazil has advantages that go beyond technological capabilities. Its forest capital is a strategic natural infrastructure, capable of mitigating the impacts of climate change and ensuring water and ecosystem services essential for climate regulation. In a scenario of increasing pressure on energy, data, and the resilience of production systems, this asset takes on greater economic and competitive weight.

Marcelo Furtado, Sustainability head at Itaúsa and Executive Director of the Itaúsa Institute



The global debate on climate and nature gained new momentum with COP 30, held in Brazil, which reinforced the central role of forests in the transition to a low-carbon economy. In this context, Brazil has unique conditions to contribute with large-scale solutions that integrate conservation, restoration, sustainable production, and economic development.

The Brazilian Coalition on Climate, Forests and Agriculture has been playing a strategic role in this process. By bringing together more than 400 organizations from the corporate, financial, academic, and civil society sectors, the network has established itself as a room for coordination and consensus-building capable of improving public debate and mobi-

lizing proposals for a climate agenda based on the sustainable land use.

As the COP 30 process opens a new phase focused on implementing and scaling up climate ambition, it becomes even more relevant to strengthen initiatives that transform existing knowledge, experiences, and solutions into large-scale actions. Brazil has natural assets, institutional capacity, and ongoing initiatives that can make a decisive contribution to addressing the global climate crisis. The challenge now is to consolidate this leading role into concrete results for the climate, nature, and development of Brazil.

Carolle Alarcon, Executive Manager of the Brazilian Coalition on Climate, Forests and Agriculture



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., International Relations Director of the Brazilian Tree Industry (Ibá)



COP 30 in the Amazon marked a historic tipping point, in which Brazil consolidated itself as the global leader in the transition to an economy that is positive for the climate, nature and people. More than just an event, the Conference in Belém embodied the “spirit of collective effort” and the leading role of non-state actors, transforming commitments into practical results that now define the new cycle of development for Brazil.

At the Brazilian Business Council for Sustainable Development (CEBDS), we were one of the architects of this mobilization when we answered the call from the COP 30 Presidency to coordinate the vanguard of the productive sector. We led the structuring of strategic coalitions that planned the decarbonization route for the pillars of our economy: Transportation, Energy, Agriculture and Essential Minerals.

Página”

This new version of the document reinforces Brazil’s forest calling and its immense capacity to provide solutions to major problems caused by humanity. The revision of the report – with in-depth information, new approaches to topics such as finance, climate adaptation, and agribusiness, and an expanded view of all Brazilian biomes – results from a broader dialogue with readers and experts. This listening

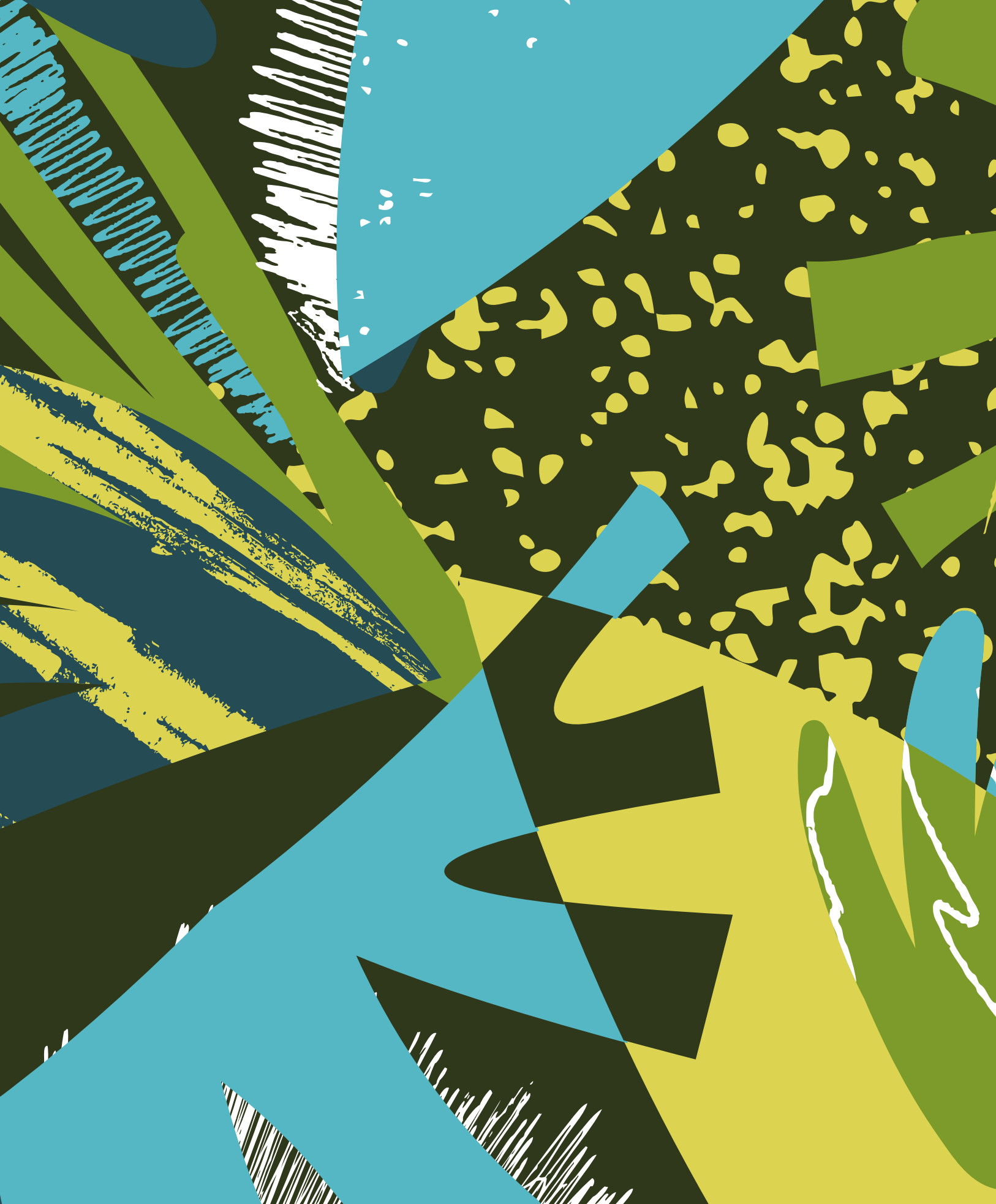
This unprecedented effort brought together more than 270 entities in a pre-competitive collaborative environment, creating guidelines to underpin Brazilian public policies based on priority levers and enabling elements for the decarbonization of each of these four sectors.

By combining these advances with our ongoing work in the Forests Coalition, CEBDS reasserts its role as the main catalyst for corporate climate action. The legacy of COP 30 was not just in the reports; it lives on in scalable solutions that generate prosperity with standing forests and in a low-carbon industry, guaranteeing a dignified future for local populations and positioning Brazil as a major global reference in cooperation and ambition.

Marina Grossi, President of the Brazilian Business Council for Sustainable Development (CEBDS) and Special Envoy for the Business Sector at COP 30.

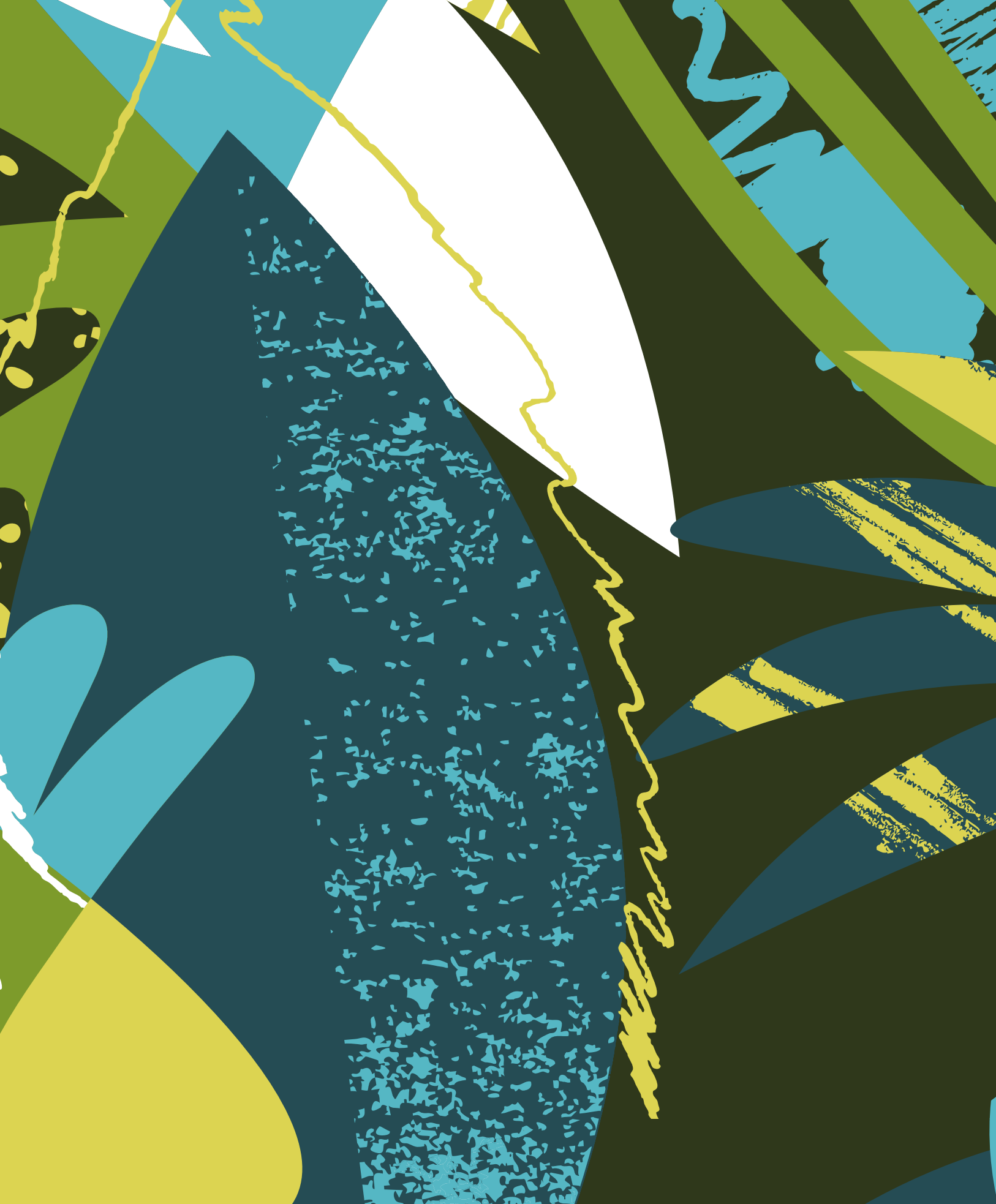
process makes this a living document, in constant improvement, much like nature itself. The Página22 team (with a new logo celebrating its 20th anniversary) takes great satisfaction in participating in this process, turning journalism into a long-term exercise with lasting relevance, working as a compendium, memory, and vision for the future.

Amália Safatle, co-founder of Página22



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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
- Through the Forest Code, Brazil has 215 million hectares of preserved forests and reforested areas on rural properties dedicated to food production*
- The concept of ecosystem service provision and its economic recognition related to conserved areas (not just private ones) has been the subject of significant technical and scientific advances, notably in the fields of water resources (“flying rivers”), biodiversity, and climate resilience.
- 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**
- Brazil has been leading the development of financial instruments aimed at leveraging the forest restoration segment, with combinations involving public initiatives (Eco Invest, BNDES) with private banks and philanthropy. In the conservation segment, the Tropical Forest Forever Facility (TFFF) and Jurisdictional Redd+ (JRedd+) may eventually become promising mechanisms
- Exotic species forestry in Brazil, the most competitive in the world, expects a significant increase in the planted area in the coming years, with positive prospects in the pulp, engineered wood for civil construction, panels, and energy sectors, and, more recently, grain drying. 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
- The forest sector will play a central role in public and private strategies aimed at climate adaptation across all biomes, offering resilience mechanisms and opportunities for emerging markets in this field

*For private areas, official information from the Rural Environmental Registry (CAR), rural settlements, quilombola community lands and unregistered public lands was used.

** 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.

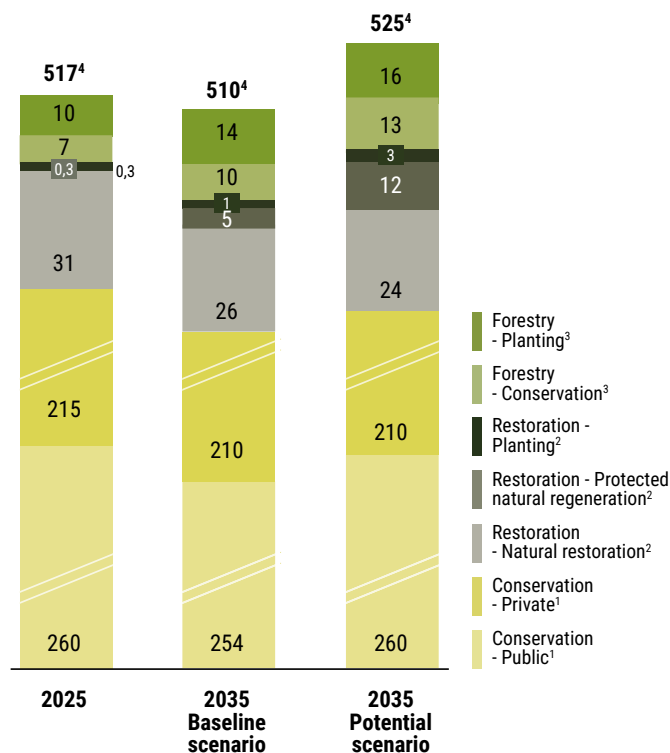
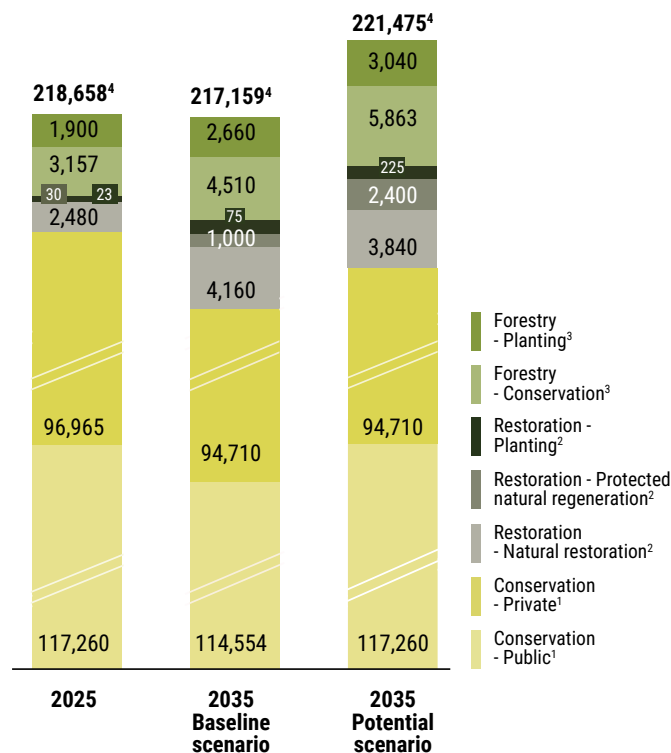
Brazil can increase its forest cover in the near future without competition for land for food production, which has a significant impact on the carbon equation and, consequently, on the contribution to global climate balance. By illustrating the balance between carbon emissions and removal through native 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 ₂ e)	Area (million ha)	t CO ₂ e/ha	Total carbon stock (million t CO ₂ e)	Area (million ha)	t CO ₂ e/ha	Total carbon stock (million t CO ₂ e)
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
Total⁴		517		218,658	510		217,159	525		221,475

AREA (million ha)

TOTAL CARBON STOCK (million tCO₂e)

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 Inbra, 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 (tCO₂e/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 MapBiomass 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 (tCO₂e/ha) used, an average annual growth of 8 tCO₂e/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 tCO₂e/ha, reaching 160 tCO₂e/ha for the base and potential scenarios.

For protected natural regeneration, the average annual growth will increase to 10 tCO₂e/ha, reaching a total of 200 tCO₂e/ha in both scenarios in 2035.

For planting, an average annual growth of 15 tCO₂e/ha was considered. For existing plantations in 2024, the average forest age was estimated at 5 years and, therefore, 75 tCO₂e/ha. The base and potential scenarios considered that, in 2035, plantations will also have an average of 5 years and, therefore, the same 75 tCO₂e/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 MapBiomass, Brazil has more than 500 million hectares of natural forests; the most recent MapBiomass 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 addition to carbon stocks, forests are essential for biodiversity and ecosystem services. Ensuring their conservation and restoration, as well as their sustainable use, is essential in the context of the Kunming-Montreal Global Biodiversity Framework.

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 around 60% of the national area.

These scenarios considered the total area of forests in Brazil across all of its biomes, but did not include areas of shrub and grassland vegetation present in the Cerrado (scrubland), Pampa (prairie), Pantanal (wetland), Caatinga (woodland) biomes, and, to a lesser extent, in the Amazon and high-altitude grasslands of the Atlantic Forest.

Therefore, the accounting of Brazil's natural capital

and carbon removal potential may be underestimated because it is unable to integrate the phytophysiognomies of all biomes. This is due to knowledge gaps regarding the carbon absorption potential of other Brazilian biomes beyond the Amazon and the Atlantic Forest, which must be addressed with increased scientific research.

However, this document brings together a series of information about all five terrestrial biomes and the Coastal Zone with its mangroves and restingas (coastal sandbanks covered by vegetation), showing both their contributions to climate mitigation, the hydrological cycle, soil protection, and biodiversity richness, and the challenges of restoration and conservation in the face of anthropogenic pressures.

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, mitigating global warming, 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.

The relationship between forest economics and

climate change has been guided by the ability to capture and store carbon, reduce emissions, and generate tradable credits. This context was essential for placing the forest topic on the global climate agenda and mobilizing innovative financial instruments. However, the intensification of the physical impacts of global warming has been shifting the focus of this discussion. Prolonged droughts, forest fires, extreme events, and water instability are no longer just future risks; they directly affect productive assets, supply chains, and public finances. In this new context, adaptation emerges as a structuring axis of the forest economy.

Adaptation is not limited to protecting ecosystems. It redefines how the economy deals with risk, productivity, and operational continuity. In an environment of increasing climate volatility, conserved, managed, and restored forests are taking on the role of natural economic infrastructure. They regulate rainfall patterns, protect soils, reduce exposure to extreme events, and stabilize the productive base of capital-intensive sectors such as agriculture, energy, logistics, and urban supply.

The economic value of forests, therefore, lies not only in carbon, but in their ability to reduce systemic risks and sustain long-term growth. Recent reports from international institutions converge in indicating that investing in adaptation is not a defensive expenditure, but a rational economic decision. Studies indicate that every dollar invested in adaptation can generate multiple economic benefits, whether through avoided losses or efficiency, productivity, and stability gains.

Climate solutions provided by nature, especially those linked to forests and productive landscapes, are among the investments with the highest aggregate return. Nevertheless, despite this economic rationale, adaptation remains underfunded and is often treated as a peripheral topic in investment strategies.

While global recognition of the role of forests in climate stability, water security, biodiversity, and economic development is growing, positive resources allocated to the sector remain limited, particularly in tropical forests, whereas significantly larger volumes of capital continue to be directed towards activities associated with deforestation and land-use degradation.

Relevant studies related to forest financing converge on the diagnosis that the flow of resources remains profoundly misaligned with the scale of global climate, environmental, and social challenges. There is a consensus that the volumes currently directed toward forests are insufficient and poorly allocated: while positive investments in conservation, restoration, and sustainable management remain limited, much larger financial flows continue to support activities associated with deforestation, whether through harmful public subsidies or through private financing of high-risk commodity chains.

These studies also indicate that, even with greater recognition of the role of forests as climate and development solutions, private capital remains concentrated in lower-risk markets, leaving tropical forests – where the climate, ecological, and social benefits are greater – structurally underfunded.

Although necessary, increasing resources is not enough: there must be structural transformations in the financial system and in the public policies that shape land use. The reports highlight the limitations of traditional instruments when applied in isolation and advocate for a combination of tailored solutions, such as blended finance, and innovative mechanisms adapted to institutional and territorial contexts.

In Brazil, the forest financing agenda takes on particularly strategic contours due to the scale of the biomes, the centrality of land use in the economy, and the existence of public and financial instruments already in operation. Initiatives such as the Nature Investment Lab (NIL) seek to transform this diagnosis into institutional design and applied financial innovation, addressing both bottlenecks related to the financing of Nature-based Solutions in general – such as restoration in particular – and the improvement of broader blended finance and land-use transition instruments – such as Eco Invest Brasil, a program led by the Ministries of Finance and of the Environment, focused on attracting private capital for sustainable projects.

An important highlight is the growing attention to funds intended for Indigenous peoples and local communities, recognized as central players for long-lasting environmental outcomes. The report indicates that the future of forest financing will depend on the intelligent combination of these instruments, and not on relying on a single solution.

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.

Often understood in a dichotomous way in relation to forests and vice versa, Brazilian agribusiness has an intrinsic and interdependent relationship with conservation and restoration policies, as well as with productive forestry activities. Accordingly, agribusiness permeates the entire landscape that composes the forest continuum.

Regarding conservation, agribusiness benefits greatly from forests, which add value to the activity as they provide climatic conditions and other ecosystem services that are essential for production. At the same time, considering compliance with the Forest Code, agribusiness foresees the existence of conservation areas through Legal Reserves and Permanent Protection Areas (APP) on private properties.

Regarding forest restoration, there are also opportunities both for agribusiness and for the expansion of forests. This is because there is a significant volume of areas on private properties that are not suitable for agricultural and livestock production – for example, very steep areas – but which can be used for forest

restoration. Therefore, benefits are generated for the climate and nature, as well as for productive activity, insofar as restoration helps address any environmental liabilities of rural properties and also generate carbon credits.

Moving further along the continuum, agribusiness establishes a relevant interface with forestry, considering the planting of forests as energy sources to produce biofuels, such as corn ethanol, which is becoming an engine of integration between agriculture, planted forests, energy, and carbon in Brazil.

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 2012 Forest Code sought to reconcile decades of changes in the rules for conserving native vegetation in private areas, blending production and 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.

Another important action is the protection of Indigenous peoples and traditional populations who live off the forest. Furthermore, a forest-based low-carbon economy (bioeconomy) must be developed, seeking to improve the well-being indicators of the populations inhabiting the most anthropized areas of the Amazon – considering that the majority of the Amazonian population is urban. This action is necessary to prevent these people from being drawn into predatory activities or even those 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, should be understood as an essential lever for the ecological transition, generating several socioeconomic co-benefits alongside carbon capture gains, which are central to allow Brazil to move toward emissions neutrality, incorporating its global leadership 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
- The Forest Code protects a significant portion of the forest, although full implementation of the Rural Environmental Registry (CAR) is necessary
- Advanced technological apparatus for monitoring and inspecting deforestation using satellite imagery, territorial intelligence, and inspection
- Institutional capacity to fight deforestation through command-and-control public policies, as exemplified by the effectiveness of the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm) actions
- The publication of the Atlantic Forest Law in 2006 resulted in a dramatic reduction in deforestation in this biome

Conservation

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
- Ensure the effective and complete implementation of the Forest Code throughout Brazil
- Advance land-use planning, particularly in non-designated areas, with emphasis on priority regions for conservation and sustainable use, while also reducing uncertainties in private areas, is essential for investments in the region to be made within a predictable and secure institutional environment
- 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 its conservation. This presupposes the consolidation of financial models based on rewards for avoided emissions or carbon removals through planting and forest regeneration. Examples such as TFFF and Jurisdictional Reed+ are being developed and could be part of a set of financial mechanisms aimed at the economic recognition of ecosystem services provided by forests
- Expansion of legal timber management, forest bioeconomy, and biobusinesses associated with innovative agroforestry systems that are beginning to be developed in the Amazon.
- Consolidate the legal framework for the protection of the Atlantic Forest
- Implement a national climate adaptation strategy, with emphasis on the role of forests in resilience to changing climate patterns and the occurrence of extreme weather events. Identify and promote, within the strategy, economic opportunities for ventures and new technologies



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
- Establishment of multi-sectoral coalitions to plan and implement restoration, such as the Floraz movement and the Atlantic Forest Restoration Pact. Launch of a pre-competitive Native Species Forestry program to boost the sector with timber production and carbon credits
- High natural regeneration across all biomes. In the Atlantic Forest alone, 4.9 million hectares of forest were regenerated, but their maintenance presents a challenge
- 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
- Launching a diverse set of specific financial mechanisms aimed at leveraging the forest restoration segment, combining public initiatives (Eco Invest, BNDES) with private banks and philanthropy
- Launching mechanisms and areas for public land concessions for forest restoration
- 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

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
- It is necessary to accelerate the implementation of the Forest Code, aiming at restoring Permanent Preservation Areas and Legal Reserves
- There are several challenges to overcome in scientific and technological pillars, production models, product development (timber and non-timber), services (ecosystemic), markets, financial instruments, social integration, and access to land. The sector, however, has the elements to become a specific asset class
- Consolidating and expanding of financial instruments, particularly regarding collaterals and insurance
- Developing a regulatory framework for recognition, indication of metrics, valuation, and incentive mechanisms for the provision of ecosystem services associated with forest restoration, including climate, biodiversity, water resources, resilience, and others
- Eliminating the market of illegal tropical timber, a situation that fosters unfair competition and discourages investment in restoration focused on native species forestry
- Developing integrated production systems for forest restoration and food production, such as Agroforestry System (SAF) and Integrated Crop-Livestock-Forestry (ICLF)
- Strengthening the integration of forest restoration with agribusiness, including addressing environmental liabilities, but also optimizing land use in areas that are suitable for food production

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 analysis 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 (*learn more on the analysis in the tables and charts of the Executive Summary*).

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.

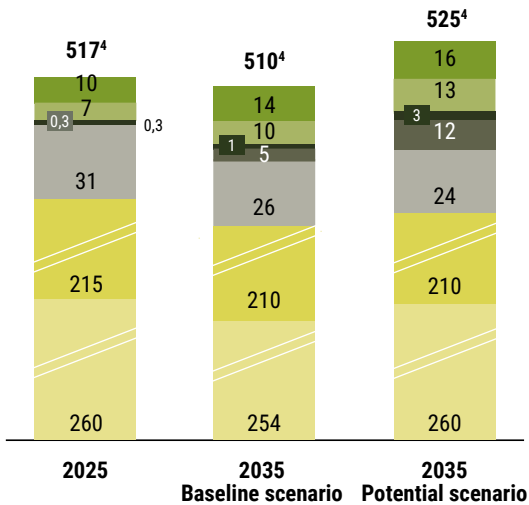
The forest continuum begins with the preservation of untouched forest massifs; continues with increasing human intervention in forests with sustainable use via forest management; progresses to the forestry enrichment of degraded forests; proceeds to forest restoration and then to the planting of native 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 forestry¹.

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).

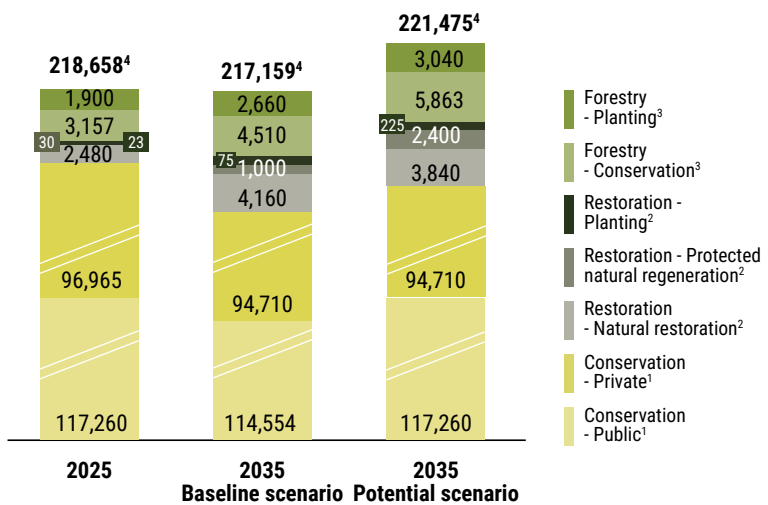
**DEFORESTATION, PLANTING
AND CARBON STOCK
SCENARIOS IN BRAZILIAN
FOREST FORMATIONS –
2025 AND 2035**

		2025			2035 – Baseline scenario			2035 – Potential scenario		
		Area (million ha)	t CO ₂ e/ ha	Total carbon stock (million t CO ₂ e)	Area (million ha)	t CO ₂ e/ ha	Total carbon stock (million t CO ₂ e)	Area (million ha)	t CO ₂ e/ ha	Total carbon stock (million t CO ₂ e)
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
Total⁴		517		218,658	510		217,159	525		221,475

AREA (million ha)



TOTAL CARBON STOCK (million tCO₂e)

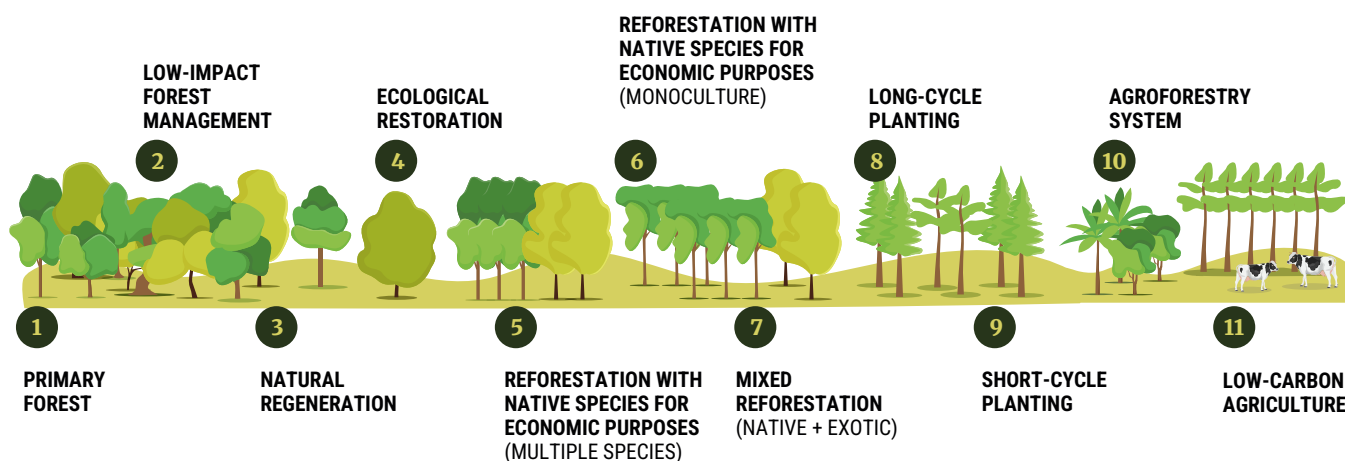


1. The total forest area of Brazil in all its biomes was considered. Areas of shrub and grassland vegetation present in the Cerrado (scrubland), Pampa (prairie), Pantanal (wetland), Caatinga (woodland) and, to a lesser extent, in the Amazon and high-altitude fields of the Atlantic Forest are not included. 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 (tCO₂e/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 MapBiomass 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 (tCO₂e/ha) used, an average annual growth of 8 tCO₂e/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 tCO₂e/ha, reaching 160 tCO₂e/ha for the base and potential scenarios. For protected natural regeneration, the average annual growth will increase to 10 tCO₂e/ha, reaching a total of 200 tCO₂e/ha in both scenarios in 2035. For planting, an average annual growth of 15 tCO₂e/ha was considered. For existing plantations in 2024, the average forest age was estimated at 5 years and, therefore, 75 tCO₂e/ha. The base and potential scenarios considered that, in 2035, plantations will also have an average of 5 years and, therefore, the same 75 tCO₂e/ha. 3. For forestry, data from the Brazilian Tree Industry (IBA) and B&M2C Consultoria were assumed. For 2025, the actual planting and conservation areas were assumed according to IBA 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 MapBiomass, Brazil has more than 500 million hectares of natural forests; the most recent MapBiomass 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 services². 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 TOWARD MITIGATING THE CLIMATE CRISIS AND, THEREFORE, ENSURING HUMANITY AND OTHER SPECIES THE CONDITIONS FOR SURVIVAL ON EARTH. THEY ARE ALSO STRATEGIC IN ADAPTING TO THE IMPACTS THAT ARE ALREADY UNDERWAY

Forests regulate climate and rainfall, contribute to soil conservation, and provide significant benefits for agriculture, hydroelectric power generation³, 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 crucial⁴.

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

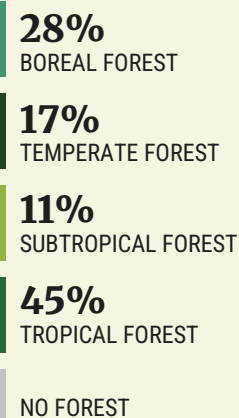
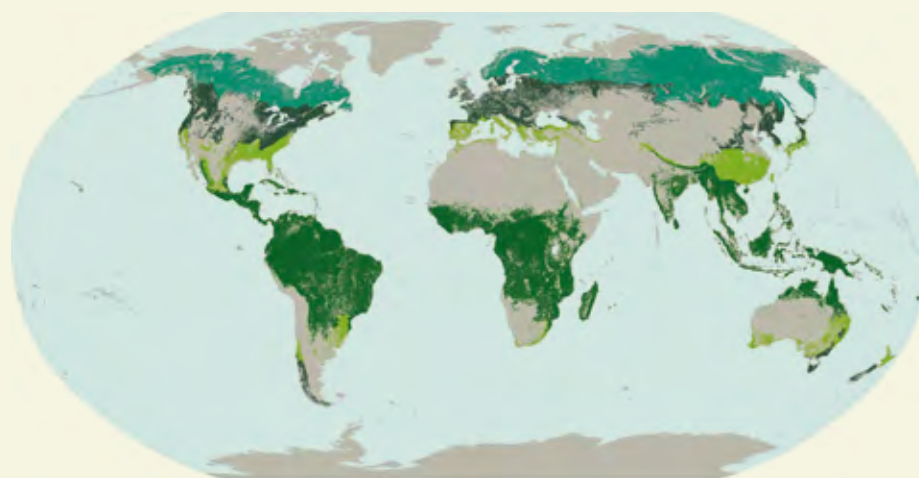
compartments: aboveground biomass (trunks, branches, and leaves), belowground biomass (roots), leaf litter, dead wood, and soil carbon. Restoration and reforestation activities are recognized as Nature-based Solutions (NbS) precisely because of their ability to remove carbon from the atmosphere in a 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 CO₂ emissions from human activity and are essential to achieve global climate targets.

Those living in urban areas may not realize it, but the world has a total forest area of 4.1 billion hectares,



DISTRIBUTION OF GLOBAL FOREST AREA, BY CLIMATIC DOMAIN



Sources: Bourgoin, C., Ameztoy, I., Verhegghen, A., Desclée, B., Carboni, S., Bastin, J., Beuchle, R., et al. 2024. Mapping global forest cover of the year 2020 to support the EU regulation on deforestation-free supply chains. JRC136960. Luxembourg, Publications Office of the European Union and the Joint Research Centre of the European Commission. <https://data.europa.eu/doi/10.2760/262532>. FAO. 2012. Global ecological zones for FAO forest reporting: 2010 update. Rome. <https://openknowledge.fao.org/handle/20.500.14283/ap861e>

which corresponds to almost a third (32%) of the global land area and is equivalent to half a hectare of forest per person, according to a report by the Food and Agriculture Organization (FAO) of the United Nations⁵.

The tropical region has the largest proportion of forests in the world (45%), followed by the boreal, temperate, and subtropical zones. More than half (54%) of the world's forests are in just five countries – Russia, Brazil, Canada, the United States and China, of which Brazil is the only tropical country.

And there is good news: the net loss of forest area has been reduced by more than half since the 1990's, from 10.7 million hectares in 1990-2000 to 4.1 million hectares in 2015-2025. This results from reduced deforestation in some countries and expansion of forest

area in others. Furthermore, over 90% of the world's forests are regenerating naturally. Forests undergoing natural regeneration cover 3.83 billion hectares, representing 92% of the world's total forest area.

China, Russia, and India lead the ranking of countries with the highest average annual net gain in forest area between 2015 and 2025. During the same period, Brazil tops the list of countries with the greatest losses, followed by Angola and Tanzania.

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

FOREST AREA, BY REGION AND SUBREGION, 2025

REGION/ SUBREGION	TOTAL (1 000 HA)	FOREST AREA % OF WORLD FOREST AREA	% OF LAND AREA
Africa	662 630	16	22
Asia	630 029	15	20
Europe	1 038 911	25	47
North and Central America	776 162	19	37
Oceania	183 898	4	22
South America	848 587	20	49
WORLD	4 140 217	100	32

Source: Global Forest Resources Assessment 2025 – FAO

TOP TEN COUNTRIES FOR FOREST AREA, 2025

RANKING/COUNTRY	TOTAL (1 000 HA)	ÁREA FLORESTAL % OF WORLD FOREST AREA
1 Russian Federation	832 630	20
2 Brazil	486 087	12
3 Canada	368 819	9
4 United States of America	308 895	7
5 China	227 153	5
6 Democratic Republic of the Congo	139 189	3
7 Australia	133 562	3
8 Indonesia	95 969	2
9 India	72 739	2
10 Peru	67 160	2

Source: Global Forest Resources Assessment 2025 – FAO



WHERE TROPICAL FORESTS ARE LOCATED

Mapping 91 countries with tropical forests (2023)



What needs protection

1.27 Billion hectares of forest area. Most biodiverse ecosystem. 593 GtCO₂e (1/3 historical global emissions)



Current threats

Over 10 Million hectares of deforestation annually in the last decade



Opportunity

49 GtCO₂e potential for carbon removals from forest restoration



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.

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-Climax Nexus report*⁶.

Forests provide livelihoods for more than 1.6 billion people worldwide, particularly in rural areas, 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 forests⁷.

THE LENS OF ADAPTATION

The relationship between climate and forests goes beyond mitigation and conservation. There is a growing urgency to broaden our view and incorporate the lens of adaptation – including our own adaptation – to the impacts of global warming. According to the Intergovernmental Panel on Climate Change (IPCC), this concept is defined as the adjustment in natural or human systems in response to actual or expected climate stimuli or their effects. Adaptation plays the role of reducing damages or taking advantage of beneficial opportunities.

In parallel, the dissemination of the concepts of Ecosystem-based Adaptation (EbA) and Nature-based Solutions (NBS) shows the direct relationship between forest protection and climate adaptation. At different levels, both address the importance of ecosystem services in reducing vulnerabilities and tackling social challenges such as food security, disaster risks, and human health.



Serving as a natural infrastructure, forests and the goods and services they provide are fundamental to human well-being. Understanding the impacts of climate change on forests and the populations that live in them is fundamental for effective adaptation strategies, contributing to the regulation of the water cycle, temperature control, and reduction of risks from extreme events.

In summary: conservation, restoration, and sustainable management reduce climate vulnerabilities and increase the resilience of ecosystems – thus, forests should not be understood merely as carbon sinks, but as systems that support socio-ecological and climate resilience (*learn more on Adaptation on page 99*).



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 next page*), it has the greatest potential for carbon capture and obtaining income associated with it. McKinsey estimates at 3.3 gigatons of carbon equivalent (GtCO₂e) the potential of emission reduction by 2050 through the restoration of degraded pastures with tropical forests, reduced deforestation, and improved land use practices⁸.

Amazon 2030⁸ studies project show that with carbon prices exceeding US\$25 per metric ton of CO₂, 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 CO₂ removal and the development of a low-carbon economy

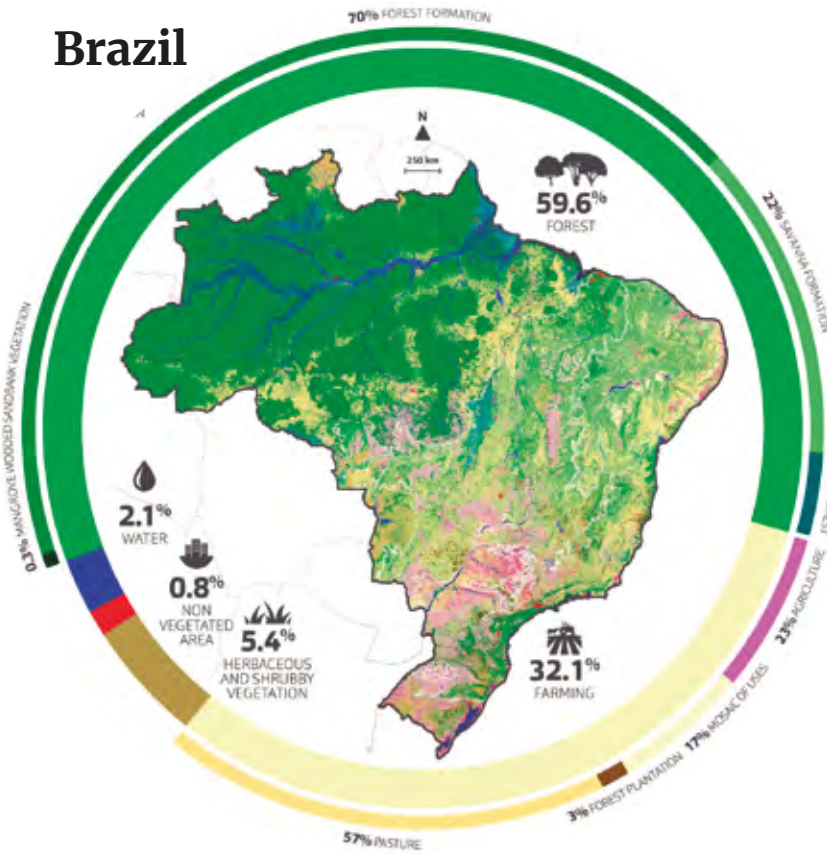
in Brazil. The stock of carbon dioxide equivalent (CO₂e) in planted forests intended for production has been increasing over the past decade and is currently estimated at 1.9 billion metric ton, or 1.9 gigaton (*learn more on Forestry on page 185*).

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 chapter*). Additionally, there are the benefits provided by forestry of exotic species, which contribute to carbon sequestration while maintaining mosaics with preserved forest areas.

CHANGES IN 40 YEARS

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

Brazil

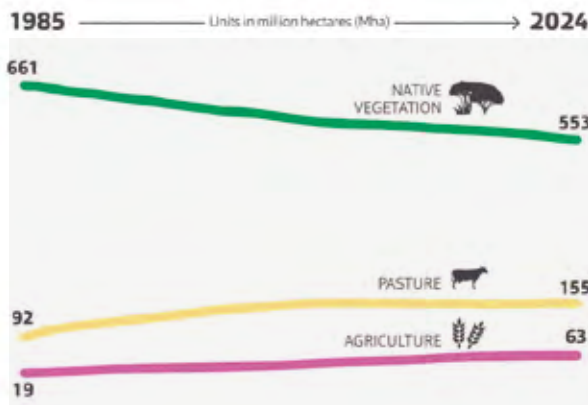


5x the area of Paraná State
108.4
NET LOSS OF NATIVE VEGETATION BETWEEN 1985 AND 2024

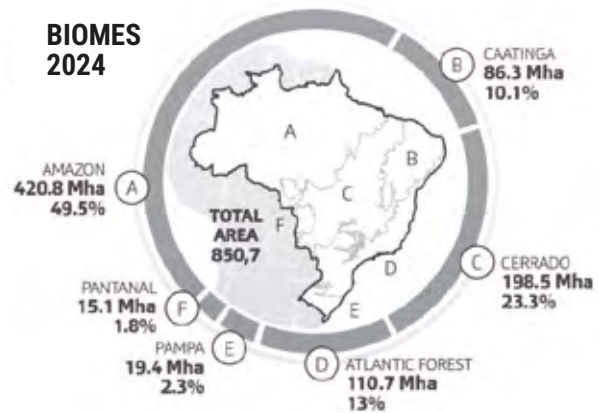
65%
NATIVE VEGETATION COVER IN 2024

3.4x
GROWTH OF AGRICULTURE AREAS BETWEEN 1985 AND 2024

68%
GROWTH OF PASTURE AREA BETWEEN 1985 AND 2024



BIOMES 2024

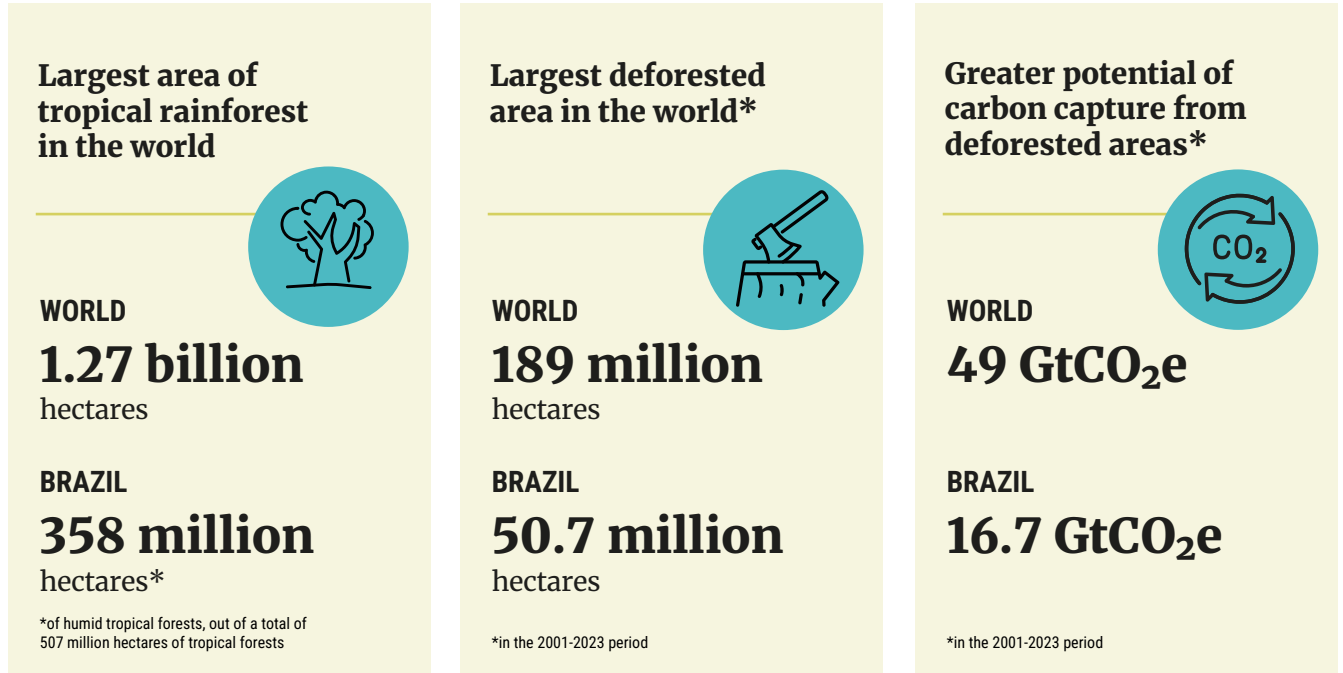


● FOREST ● FOREST FORMATION ● SAVANNA FORMATION ● MANGROVE ● FLOODABLE FOREST ● HERBACEOUS AND SHRUBBY VEGETATION ● GRASSLAND ● WETLAND ● FARMING ● PASTURE ● AGRICULTURE ● FOREST PLANTATION ● MOSAIC OF USES ● NON VEGETATED AREA ● URBAN AREA ● WATER



CRISIS AND OPPORTUNITY

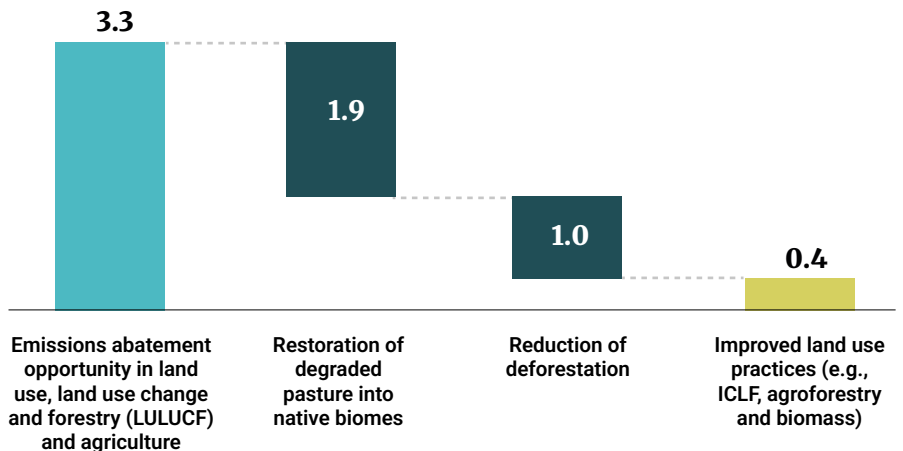
Brazil, which holds the largest areas of tropical forests in the world, is a champion in deforestation but also in carbon capture potential



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 GtCO₂e)



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 (NTFPs), 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).





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 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.

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), MapBiomias (2023), Aneel (2023) and IBGE (2021), 2025 in “Deforestation Cuts the Lights: Itaipu, Belo Monte, and the Price of Lost Forest” – Amazônia2030

According to the study *Energia das Florestas: os custos sociais do desmatamento para o setor energético brasileiro*⁹ (Energy from Forests: the social costs of deforestation for the Brazilian energy sector), cumulative deforestation in the Amazon since 1985 has cost the electricity sector approximately US\$1.1 billion annually due to reduced hydropower generation capacity, which made energy more expensive because of the increased use of thermoelectric plants. If deforestation had been avoided, hydroelectric production would have been 12.8 TWh (terawatt-hour) higher, showing the role of the forest in maintaining rainfall patterns.

Released in March 2026, the study was conducted by the Productivity & Sustainability Research Network (Rede PP&S), composed of 14 researchers from various institutions, including FEA-USP, FGV-SP, FGV-Rio, PUC-Rio, and Insper.

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 doubled¹⁰.

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. MapBiomass 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 beside*).

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 conservation of native vegetation on rural properties, including Permanent Preservation Areas (APP) and Legal Reserves (RL). The 2012 Forest Code sought to reconcile decades of changes in the rules for conserving native vegetation in private areas, blending production and environmental conservation.

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 (distributed 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 CAR is an instrument that will make it possible to provide updated information on the extension of conserved areas and areas undergoing restoration, and will also allow for the management of deforestation in private areas. However, the delay in validating the CAR by state environmental authorities is a huge obstacle to advancing the implementation of the Forest Code. Therefore, most rural landowners wait for this process to be completed before making commitments, because it involves 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 chapter*).

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 CO₂ avoided
per year**

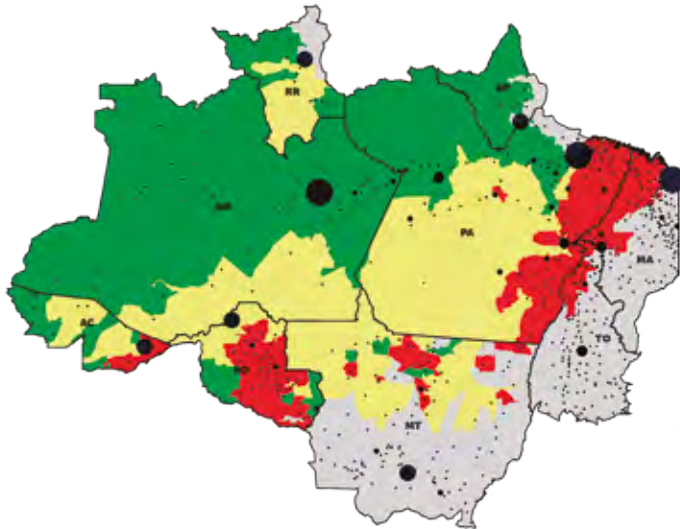
is the climate potential of Indigenous
Lands in Brazil

Source: MapBiomos/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.



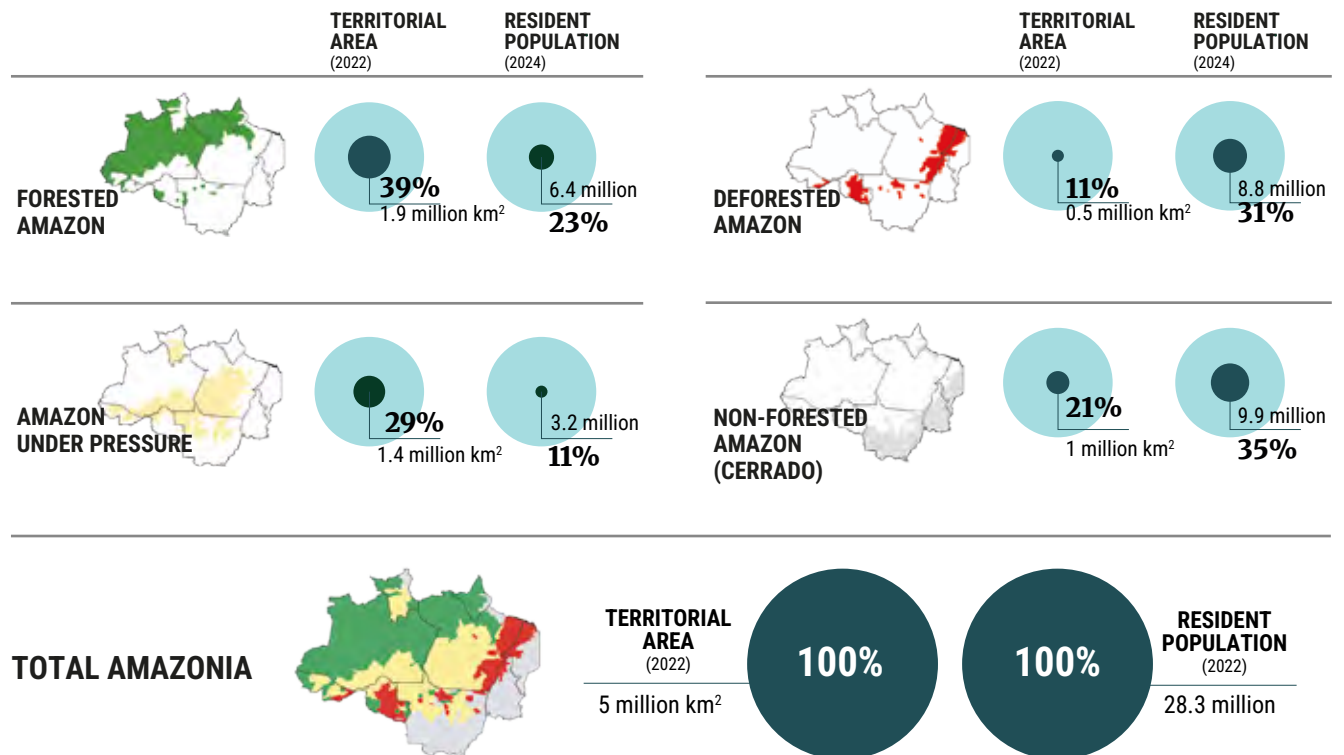
The Five Amazons

- 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.



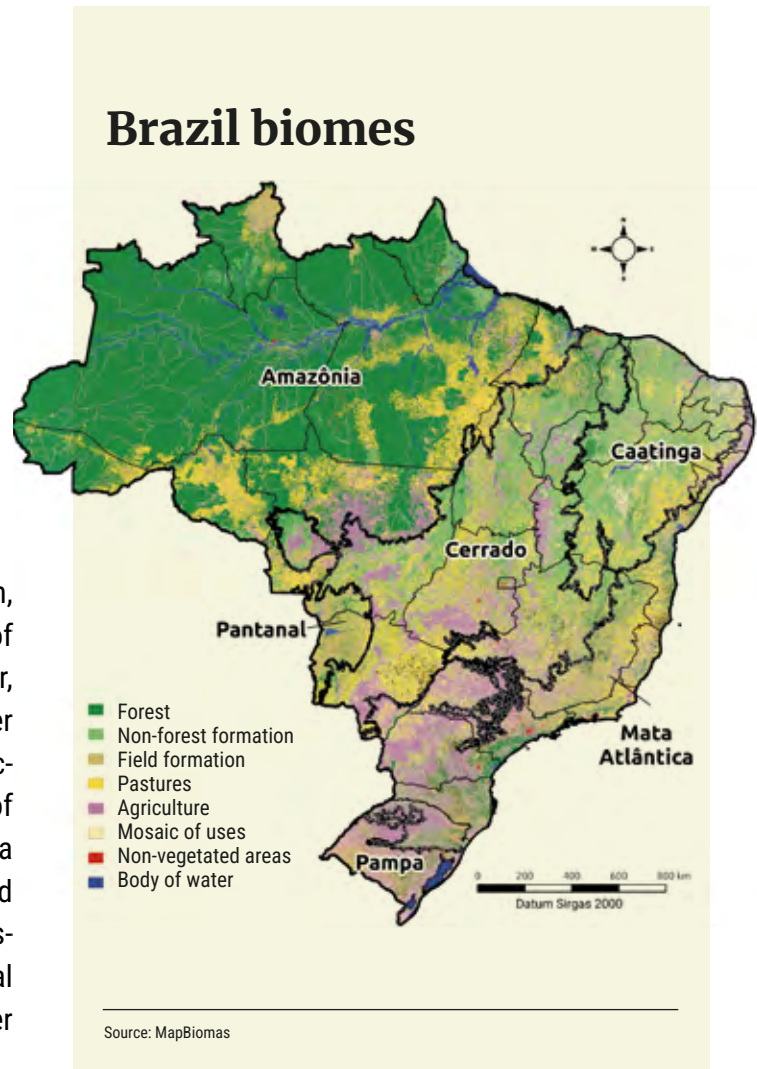
Source: Based on data from IBGE and Veríssimo et al. 2023. AMZ 2030.

More than just tropical forests

WITH FOREST, SAVANNA, OR GRASSLAND ECOSYSTEMS, THE ATLANTIC FOREST, CERRADO, CAATINGA, PAMPA, PANTANAL, AND COASTAL ZONES ALSO CONTRIBUTE TO CARBON REMOVAL, AMONG OTHER ENVIRONMENTAL SERVICES

Holder of approximately 59% of the Amazon region, Brazil is always remembered for the importance of its tropical forests to the global climate. However, our biodiverse wealth is expressed in five other biomes, equally essential in their ecosystem functions. This section will address the contributions of the Atlantic Forest, Cerrado (scrubland), Caatinga (woodland), Pampa (prairie), Pantanal (wetland), and the Coastal Zone, with their forest, savanna, or grassland formations, to carbon removal, the hydrological cycle, soil and biodiversity protection, among other environmental services.

It is necessary to consider, however, that there are still knowledge gaps regarding the carbon absorption potential of other Brazilian biomes beyond the Amazon and the Atlantic Forest. This publication includes, in the Executive Summary (*on page 37*), an estimate of the balance between carbon emission and removal through native forests, forests to be restored and planted, as well as two scenarios (baseline and potential) for 2035 that consider deforestation rates, forest restoration and forestry. 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).

The answer to this gap lies precisely in the production of more knowledge, which can provide insights into the carbon retention potential of other Brazilian biomes. There is a new frontier of knowledge to be



developed, and all of Brazilian society benefits from it. Furthermore, there is a unique opportunity for the exchange of information between researchers from Brazil and other countries that also have savannas, vegetation in arid and semi-arid climates, and coastal vegetation. Here, there is a real possibility for the exchange of studies and the sharing of experiences with African, Asian, and Oceania countries.

ATLANTIC FOREST: PERSISTENCE AND REBIRTH

A species native to the Atlantic Forest gives Brazil its name. The near extinction of Brazilwood (*Paubrasilia echinata*), resulting from centuries of predatory exploitation, is a symbol of both the threats and the resilience of the biome. The Atlantic Forest, devastated by different economic cycles and urbanization, survives as a major global biodiversity hotspot, with its more than 20,000 species of living beings (about 8,000 endemic, that is, that only exist in the biome) and a mosaic of associated ecosystems, from open rainforests to Araucaria forests, restingas (coastal sandbanks covered by vegetation), mangroves, high-altitude grasslands, marshes and oceanic islands.

Present in 12.8% of Brazilian territory, in the large area stretching from the state of Rio Grande do Sul to the state of Piauí, the Brazilian Atlantic Forest covers 17 states, 2,741 municipalities, is inhabited by 123 million people, and concentrates 80% of Brazil's Gross Domestic Product. Essential services such as water supply, agriculture, climate regulation, fishing, energy generation, and tourism, among others, depend on it. It is also the only Brazilian biome to have a specific law – the Atlantic Forest Law (11.428/2006), enacted in 2006, which added an extra layer of protection to the remaining areas that are still highly threatened today.

THE CHALLENGE OF FRAGMENTATION

The most degraded biome in Brazil is also the most persistent. Today, only 24% of the forest cover that existed before colonial Brazil remains, of which 12.4% are mature and well-preserved forests. The major challenges to the conservation of the Atlantic Forest lie in its high degree of fragmentation (97% of forest fragments have less than 50 hectares), in the small fraction protected by Conservation Units (only 9.8% of the area), and in the concentration of remnants on private land (80%). Regarding land use, according to 2024 data from MapBiomas, forest, mangrove, and restinga areas account for 25.3%; pastures, 25%; agriculture, 19%; and a mosaic of uses, 17%.

Conversely, the biome presents a remarkable capacity for regeneration: between 1985 and 2024, there was a loss of 9.8 million hectares and regeneration of 4.9 million hectares of natural forests.

According to MapBiomas, the decade with the greatest forest loss was between 1985 and 1994, when 4.7 million hectares of the Atlantic Forest were converted agriculture and livestock farming. Between 1995 and 2014, it was already possible to see the effect of the Atlantic Forest Law on the biome – in this period, the area of recovery was larger than the area of conversion, with a net gain of 200,000 hectares. In the following decade, between 2015 and 2024, once again the scenario demanded greater attention. The areas of deforestation and recovery became equivalent, even after the approval of the Forest Code reform (2012), which had the potential to boost a resumption of regeneration based on recovery plans for Permanent Preservation Areas (APPs) and Legal Reserves (RLs) on rural properties. This is a crucial point when considering the resto-

ration of the biome: accelerating the implementation of the Forest Code, aiming to correct the deficit of Permanent Preservation Areas (APPs) and Legal Reserves (RLs), is a key point to safeguarding the environmental services provided by the Atlantic Forest.

Another challenge is to halt the loss of mature forests (over 40 years old), which are precisely those that provide the most ecosystem services, as they have greater biodiversity and carbon stock. In 2024, 50% of deforestation occurred precisely in these formations. Field areas, in turn, were reduced by 28% compared to 1985, with annual losses in every year since 2000. The conversion was more pronounced in the last decade, with an average of 38,000 hectares lost per year.

Studies suggest that the natural regeneration capacity of the Atlantic Forest is linked precisely to its great biodiversity, where animals act as seed dispersers, and also to certain areas of steep slope, common in the biome, which hinder the expansion of agricultural activities. The Atlantic Forest is persistent and flourishes when it finds the ideal conditions for its restoration: so much so that it was chosen as one of the 10 global flagship regions of the UN Decade on Ecosystem Restoration – 2021-2030 (*learn more in the Forest Restoration chapter*).

CERRADO: UNDER STRONG PRESSURE FROM THE AGRICULTURAL FRONTIER

The Cerrado (scrubland), Brazil's second largest biome, occupying 23.3% of the territory (198.5 million hectares), is also one of the most pressured, especially by the agricultural frontier. It has already lost almost half (47.2%) of its original vegetation cover

to anthropization, and is home to half of Brazil's soybean cultivation and 31% of its planted pastures. Agriculture in the Cerrado has grown an astonishing 74% over the last 40 years, a process that helped position Brazil as a major global producer of grains and animal protein, but at the cost of losing natural capital and important ecosystem functions.

The fact is that the Cerrado is still being studied and understood beyond certain clichés – such as “Brazil's water tower” and “the world's most biodiverse savanna”. In fact, eight of Brazil's twelve river basins originate in this biome, which also feeds the country's three main aquifers (Guarani, BambuÍ, and Urucuia). Regarding biodiversity, science estimates that the Cerrado is home to 12,000 plant species (40% of which are endemic) and accounts for 5% of all animal species in the world – 199 species of mammals, 864 of birds, 180 of reptiles, 150 of amphibians, and more than 1,200 of fish are known. Social and cultural diversity is also a prominent feature of the Cerrado: the Povoado platform identified 6,767 communities in 480 municipalities within the biome, of which 2,641 identify themselves as Indigenous peoples and traditional communities, quilombola communities, and riverside communities.

Compared to other savannas in the world, the Brazilian Cerrado has more forested areas (44.8% of the biome) than herbaceous vegetation, although it combines forest and savanna formations. Forests are characterized by vegetation with a predominance of tree species and a continuous canopy, classified as riparian forests, gallery forests, dry forests, and the so-called “cerradão” (dense cerrado). Savannas,



on the other hand, are distinguished by a type of vegetation that combines trees, shrubs, and herbaceous plants – with herbaceous and shrubby vegetation occupying 6.4% of the biome (2024).

THE DIFFICULTY OF RESTORATION

The current situation in the Cerrado is delicate and requires consistent and rapid improvement of conservation policies. Pressured by the expansion of the agricultural frontier, especially in Matopiba – a region formed by the border of the states of Maranhão, Tocantins, Piauí and Bahia – the biome has only 8% of its area (16 million hectares) protected by Conservation Units. Even under current legislation, the Cerrado is vulnerable. The Forest Code allows high rates of deforestation in the biome – rural landowners can deforest between 65% (within the Legal Amazon) and 80% (outside the Legal Amazon), which is an aggravating factor considering that private areas correspond to 62% of the land, a total of 124.2 million hectares.

Even in the areas that should be legally preserved, the conservation deficit is high: the Cerrado has the largest number of polygons (43%) and the greater area (55%) of deforestation in Legal Reserves (RLs) and Permanent Preservation Areas (APPs), in violation of the Forest Code. Between 2022 and 2023, there was a 136% leap in deforested areas in RLs and a 152% leap in APPs, according to MapBiomias.

Last agricultural frontier of the Cerrado, the agricultural area in Matopiba has increased 24 times in the past 40 years. The region is simultaneously the one that has lost the most native vegetation since

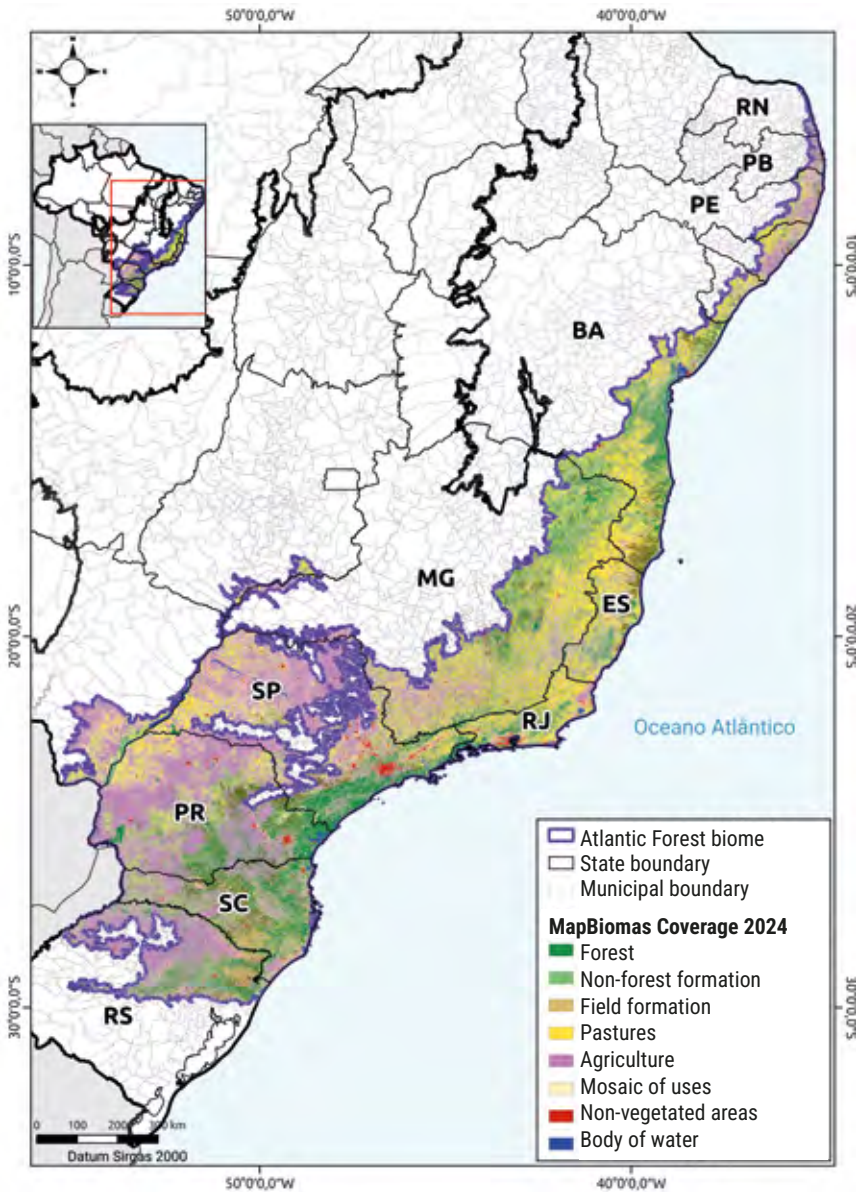
1985 (-15.7 million hectares) and also the one that concentrates the largest cover of remaining native vegetation, with 48.6 million hectares.

In 2024, 16% of the municipalities in the Cerrado region had more than 80% of native vegetation, and eight of the ten municipalities with the largest forest surpluses are located in Matopiba. This opens opportunities for public or private policies aimed at conserving these remnants, in order to curb the loss, especially of primary vegetation. In the last decade (2015-2024), on average, 73% of deforestation occurred in primary areas, which is equivalent to 1 million hectares of loss of a biome with high ecosystem functionality. Studies have shown that the effects of primary forest removal on regional climate are even greater than those linked to the cutting of secondary forests.

Another factor weighing on the biome is its low potential for natural restoration without anthropogenic intervention. Unlike the Amazon, which has greater potential for restoration in abandoned areas, the Cerrado soil does not recover easily, especially after an intensified process of mechanization and compaction.

This is the main challenge for restoration in the Cerrado, which has been the subject of studies by the Amazon Environmental Research Institute (IPAM) and the Brazilian Agricultural Research Corporation (Embrapa), among other institutions. Therefore, experts point out that the key to maintaining the ecosystem functions of the biome is the conservation of its current remnants and the creation of connectivity axes between them, such as ecological corridors (*learn more in the Forest Restoration chapter*).

Atlantic Forest biome



1,088,852.3 km²
in area¹ (12.8% of Brazil)

2,741
municipalities¹

123,13 million
in habitants in 2025²

532,3 million
tCO₂e emissions in 2024,
with 15% (79.8 million
tCO₂e) originating from the
Land Use Change sector³

275,000 km²
of forests in 2024⁴

65,100 km²
of non-forest vegetation
in 2024⁴

483,000 km²
of agriculture and pastures
in 2024⁴

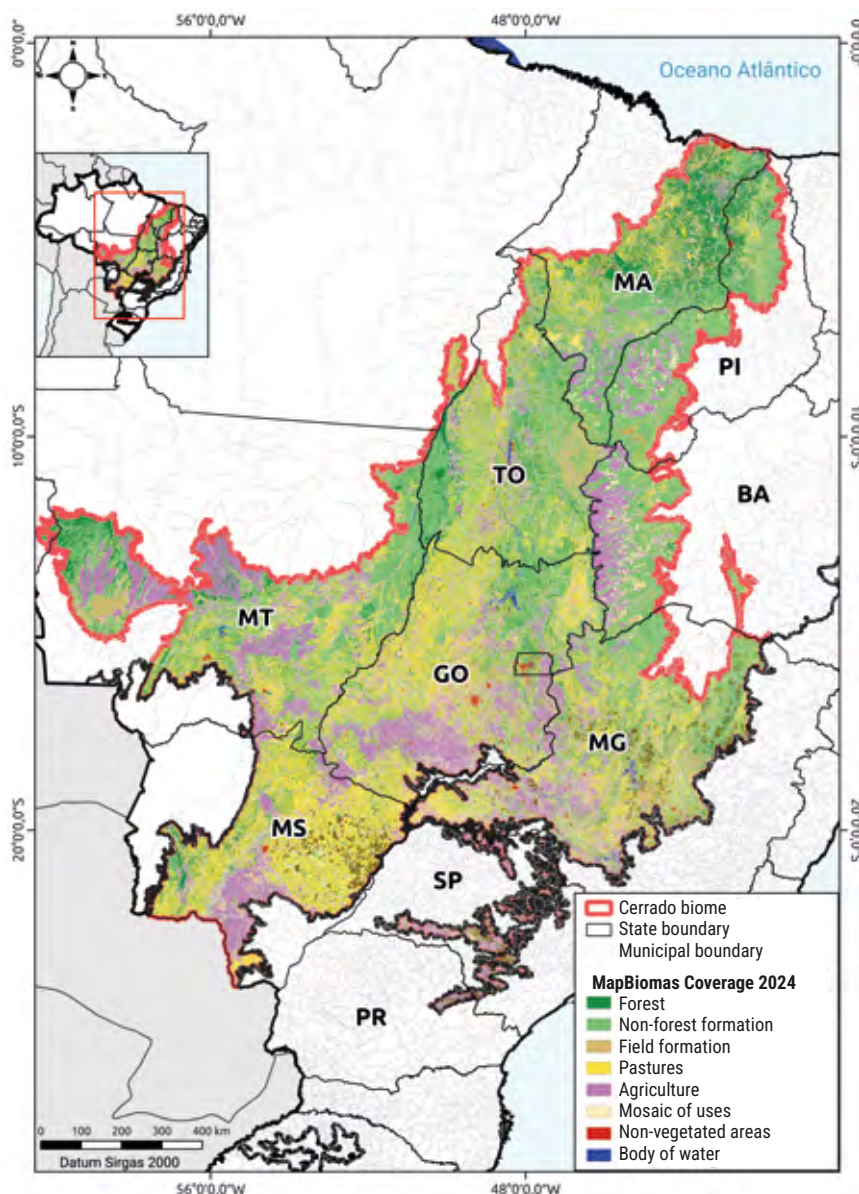
1,357,729
family farming
establishments
(76% of the total)⁵

2,002
rural settlements⁶

Fonte: MapBiomias. 1. IBGE. 2024. Área territorial Brasil, Grandes Regiões, Unidades da Federação e Municípios. <https://bit.ly/3Ne8Coo>. 2. IBGE. 2025. População Residente Estimada: Estimativas de População - EstimaPop. <https://bit.ly/3RkXdIX>. 3. SEEG. 2025. Sistema de Estimativas de Emissões e Remoções de Gases de Efeito Estufa. <https://bit.ly/4eLUP8b>. 4. MapBiomias. 2025. Projeto de Mapeamento Anual da Cobertura e Uso do Solo do Brasil - Cobertura do Solo Classe Nível 1 Coleção 10 2024. <https://bit.ly/4bM7UFT>. 5. IBGE. 2017. Censo Agropecuário: estabelecimentos agropecuários por tipo. <https://sidra.ibge.gov.br/tabela/6778>. 6. INCRA. 2024. Assentamentos Rurais e Terras Quilombolas. <https://bit.ly/4bHg16A>



Cerrado (scrubland) biome



1.98 million km²
in area¹ (23% of Brazil)

1,062
municipalities¹

33.8 million
in habitants in 2025²

516 million
tCO₂e emissions in 2024,
with 42% (215 million
tCO₂e) originating from the
Land Use Change sector³

326,500 km²
of forests in 2024⁴

689,900 km²
of non-forest vegetation
in 2024⁴

740,500 km²
of agriculture and pastures
in 2024⁴

584,218
family farming
establishments
(71% of the total)⁵

2,438
rural settlements⁶

CAATINGA: FROM FIGHTING DROUGHT TO LIVING WITH THE SEMI-ARID CLIMATE

Sometimes dry, sometimes green, “Caatinga” (woodland) means “white forest” in the Tupi-Guarani Indigenous language due to this feature: during the dry season, its trees and shrubs lose their leaves, in an adaptation mechanism to the long months of low water availability. But just a few days of rain are enough for the green to sprout again, with its characteristic exuberance. Thus, in this duality, this exclusively Brazilian biome shows that, despite its apparent fragility, the Caatinga is home to an ecosystem of great biological relevance, with significant levels of endemism in its flora and fauna, including thousands of species of plants, bees, fish, birds, reptiles, and mammals.

The Caatinga encompasses the nine states of the Northeast region and also the north of the state of Minas Gerais, and, beyond its environmental aspects, is characterized by immense socio-cultural diversity, concentrating the largest portion of Brazil’s rural population, who seek their livelihood with a strong dependence on natural resources while living with the extreme characteristics of the semi-arid climate.

Temperatures range from 26 to 28 degrees Celsius, with average rainfall around 1,000 millimeters annually, although it can drop to below 500 millimeters in the driest regions. Thus, the Caatinga has forest and savanna formations characterized as a seasonally dry tropical forest, covering approximately 86.3 million hectares (10.1% of the national territory).

On the other hand, given its high climate vulnerability and biological uniqueness, the biome works as a unique natural laboratory for investigating degradation and resilience processes.

UNDER DESERTIFICATION AND FIRE

Despite its undeniable biodiversity, the Caatinga is one of the most threatened and degraded ecosystems in Brazil: it is estimated that about 60% of its original coverage has already been drastically altered by anthropogenic action, especially due to deforestation for agricultural and livestock farming expansion and the extraction of firewood.

The biome faces a scenario of vulnerability: less than 2% of its territory is guarded by fully protected Conservation Units, highlighting a serious deficit in the safeguarding of its wildlife. This degradation is linked to the desertification process of the biome, as pointed out in the Brazilian Action Plan to Combat Desertification and Mitigate the Effects of Drought (2025). Deforestation, along with fire, also accelerates the desertification process.

Historically, the biome has suffered significant degradation, with a loss of 15% (9.2 million hectares) of its native vegetation between 1985 and 2024. In 2025, according to estimates by MapBiomas, 29,100 deforestation alerts were identified in the total area of the Caatinga, representing 18.4% of all alerts in Brazil – the third biome with the most alerts in the country.

The year 2024 was particularly bad for the Caatinga



biome, with a total of 174,500 hectares deforested – including the highest deforestation rate in Brazil according to the historical series of MapBiomas, which occurred in the municipalities of Canto do Buriti and Pavussu, in the state of Piauí, corresponding to a total of 13,600 hectares. Approximately 404,000 hectares were burned, and in the last 40 years this number has reached 11.4 million hectares affected by fire.

ADAPTATION AND SOCIAL TECHNOLOGIES

Given this context, a paradigm shift has been taking place in relation to public policies and the tackling of risks in the region. The traditional “fight against drought” has been giving way to the development of strategies for living with the semi-arid climate. The adoption of social technologies, such as rainwater harvesting cisterns, combined with agroecological innovations, has been strengthening the capacity of rural communities to adapt to climate irregularity. On the other hand, the recovery of the biome requires urgent attention, as the historical degradation of the soil and native vegetation accelerates the formation of serious desertification hotspots in the territory.

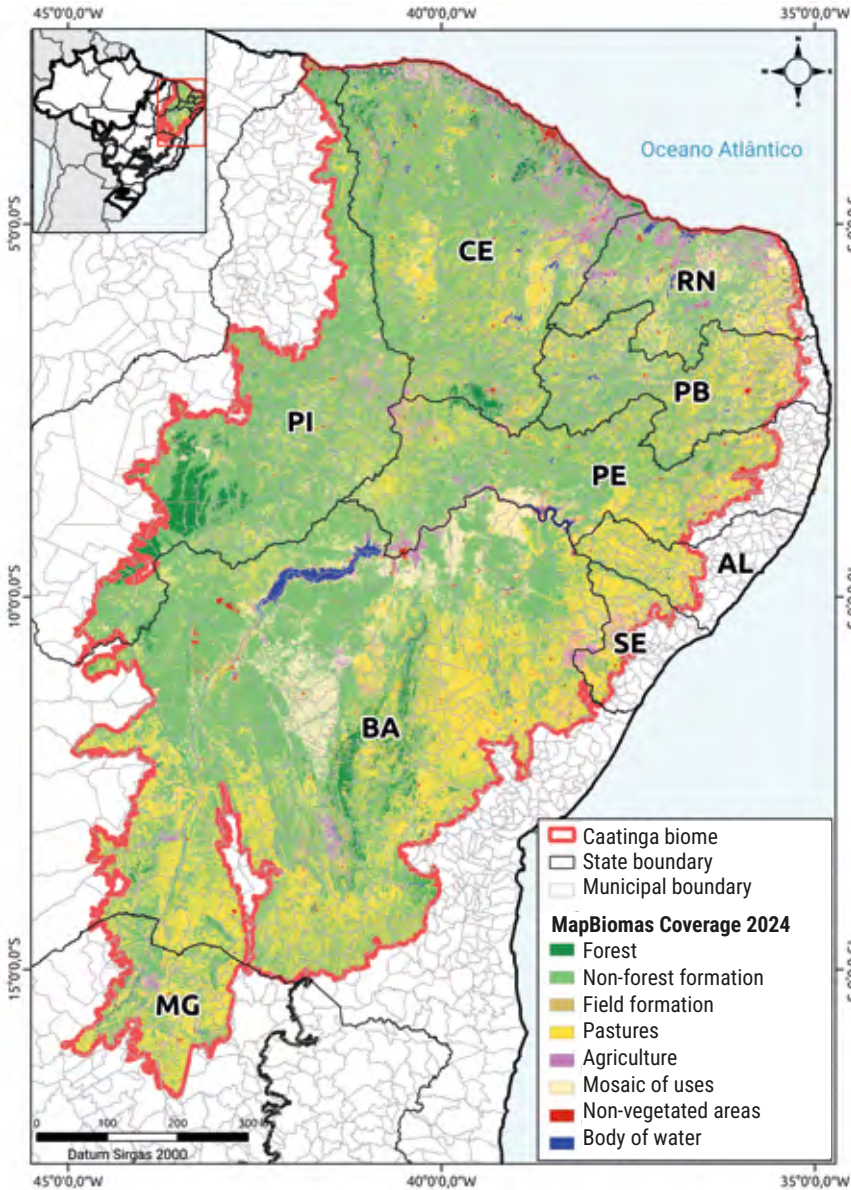
More than an exclusively national heritage, the Caatinga is a crucial environment for studies of ecological adaptation. Amid the global climate crisis, the region, which is already classified as a risk hotspot and extremely vulnerable to future changes, shows that curbing degradation is not a utopia, but a necessity for survival. Only the presence and conservation of the adapted vegetation of the

Caatinga prevent the transformation of a large part of the Brazilian Northeast into a vast desert, proving that its plants and animals offer valuable lessons in water resilience and tolerance to severe droughts and high temperatures.

Despite its importance, the Caatinga biome represents one of the largest research gaps in current carbon modeling, which has primarily focused on the Amazon and Atlantic Forest biomes. The deepening of scientific knowledge and socio-environmental mobilization make the conservation and the sustainable use of the Caatinga strategic for mitigating the growing impacts of global warming, which already threaten water availability and regional food and energy security. Practices that combine agroforestry systems, sustainable management of forest resources, ecotourism, and the recovery of traditional knowledge and cultures are proving to be fundamental to valuing the standing biome and promoting the so-called “recaatingamento” (“recaatingization” or restoration of the Caatinga) (*learn more in the Forest Restoration chapter*).

Investing in the creation of new Conservation Units and in the restoration of the Caatinga, therefore, not only protects its unique biodiversity and scarce natural resources, but also promotes inclusive socioeconomic opportunities for the reduction of poverty and inequality. Protecting and restoring this biome is a crucial measure for Brazil’s environmental, climate, and socioeconomic security, and key to reconciling regional development with biodiversity conservation and coexistence with the climate.

Caatinga (woodland) biome



857,852 km²
in area¹ (10% of Brazil)

1,095
municipalities¹

27.2 million
in habitants in 2025²

148 million
tCO₂e emissions in 2024,
with 41% (61 million tCO₂e)
originating from the Land
Use Change sector³

31,500 km²
of forests in 2024⁴

486,400 km²
of non-forest vegetation
in 2024⁴

232,700 km²
of agriculture and pastures
in 2024⁴

1,276,827
family farming
establishments
(79% of the total)⁵

2,737
rural settlements⁶

References: 1 IBGE. 2024. Territorial area of Brazil, major regions, states and municipalities. <https://bit.ly/3Ne8Coo> 2 IBGE. 2025. Estimated Resident Population: Population Estimates – EstimaPop. <https://bit.ly/3RkXdIX> 3 SEEG. 2025. System for Estimating Greenhouse Gas Emissions and Removals. <https://bit.ly/4elUP8b> 4 MapBiomias. 2025. Annual Project for Mapping Land Cover and Land Use in Brazil – Land Cover Class Level 1 Collection 10 2024. <https://bit.ly/4bM7UFT> 5 IBGE. 2017. Agricultural Census: agricultural and livestock farming establishments by type. <https://sidra.ibge.gov.br/tabela/6778> 6 INCRA. 2024. Rural Settlements and Quilombola Community Lands. <https://bit.ly/4bHg16A>



PANTANAL: SHAPED BY THE DYNAMICS OF THE WATERS

The Pantanal (wetland) is not homogeneous. Shaped by the dynamics of water, drought, fire, vegetation, and different anthropic uses, the biome extends across 1.8% of the national territory (in the states of Mato Grosso and Mato Grosso do Sul) and is part of the Upper Paraguay River Basin (BAP). The plain, which is characterized by a vast flooded area and rich fauna and flora, has a systemic interdependence relationship with the plateau, formed by the neighboring biomes Cerrado (83%) and Amazon (17%).

The plateau is the water regulator of the Pantanal biome: its weather and environmental conditions directly affect the Pantanal wetlands, and the rivers that originate in these areas gain speed and potential energy due to the uneven topography. As these waters flow into the plain, they overflow, depositing sediments and enriching the soil with nutrients, thus creating favorable living conditions for flora and fauna. The quality and quantity of water flow from the plateau depends on rainfall and the water's path to the plain, with the Amazon also contributing to the weather conditions and influencing the rainfall pattern within the Upper Paraguay River Basin, through the dynamics of "flying rivers".

The Pantanal is considered Brazil's most preserved biome. The wetlands, with their forest and savanna formations, have the largest proportion of native vegetation in Brazil – 84.8% of the biome. Its exuberance is linked to the flood pulse – as the annual cycle of floods and droughts is called, which is essential for the biodi-

versity of the biome, which alternates between floods from November to April and droughts between May and October. Maintaining the integrity of the Pantanal is fundamental for preserving its ecosystem functions and conserving the species that inhabit it.

IMPACTS OF THE CLIMATE CRISIS

With its diverse landscapes (forest formations, savannas, grasslands, flooded fields), the Pantanal is vulnerable to both vegetation loss and weather conditions. Since 1985, the biome has lost 1.7 million hectares of its native vegetation, which has been mostly replaced by exotic pastures. Meanwhile, forest loss on the plateau totals 4.8 million hectares between 1985 and 2024, with anthropized areas occupying 58% of the plateau and agriculture that grew 3.8 times during the period and now totals 1.4 million hectares. In 1985, the plateau covered 7 million hectares and had lost 12% of its native vegetation (2.6 million hectares).

Because it is a biome that depends on the maintenance of the hydrological cycle, any change in this dynamic can compromise the ecosystems and modify the Pantanal landscape. Climate change and the projected trend of hotter and drier days in central Brazil are, therefore, an inherent threat to the stability of the Pantanal, which has already been feeling the impacts of a recurring severe drought. The year 2024 was recorded as the hottest and driest year of the last 40 years in the Pantanal; the average temperature in the Upper Paraguay River Basin reached 27 degrees Celsius, about 1.6 degrees Celsius above the historical average.

The Water Surface Loss Alert – a tool developed by MapBiomas that takes into account data since 1985 on the dynamics of flooded areas (water bodies and flooded fields) – has revealed concerning data: in the last decade (2015-2024), the area that remained flooded every year was reduced by 75% compared to the first decade of the historical series (1985-1994). From 16,000 km², this portion fell to 4,600 km².

The climate anomalies resulted, therefore, in lower rainfall volume and reduced flooding, which generates other consequences for the ecosystems of the plain. One of them is what researchers describe as woody encroachment – which is the process of increasing the density of trees and shrubs in open ecosystems, such as grasslands and pastures. As a result, the Pantanal becomes more like a savanna, which alters the natural structure of the biome.

Another aggravating factor is the increased risk of wildfires and the vulnerability of vegetation to fire, since the recurrence of fires has a high potential to degrade biodiversity, especially in forest areas less adapted to fire. Areas surrounding the Paraguay River that were previously permanently flooded are now more affected by degradation, showing the water collapse that affects the biome. The last major flood in the Pantanal was recorded in 2018.

Analysis of the Pantanal biome, integrated with the plateau of the Upper Paraguay River Basin, shows that the effects of climate variations are exacerbated by changes in vegetation cover and land use. There-

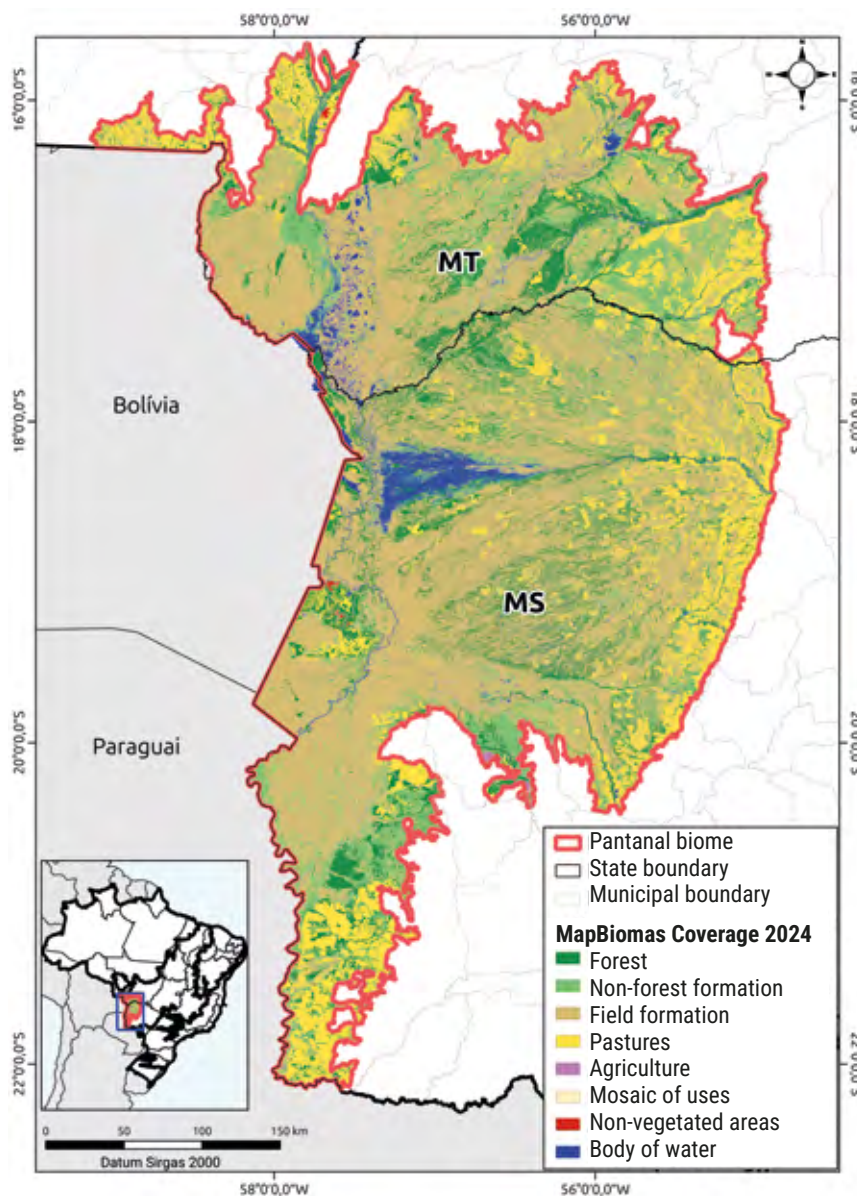


fore, preserving the natural vegetation is important to ensure the integrity of both the floodplain and the headwaters. Ensuring the protection and continuity of the Pantanal biome depends, above all, on conserving and restoring the Permanent Protection Areas (APPs) in rivers and springs of the Upper Paraguay River Basin and on adopting conservationist agricultural and livestock farming practices that minimize soil erosion and silting processes.

Forest restoration should therefore complement the preservation of natural environments. Payment for Environmental Services (PES) mechanisms that compensate rural producers for maintaining conserved natural areas, and connectivity through ecological corridors (essential for allowing wildlife movement) are possible approaches. The preservation of the Pantanal is inseparable from the global climate agenda due to its high capacity to provide ecosystem services (*learn more on this in the Forest Restoration chapter*).



Pantanal (wetland) biome



169,958.8 km²
in area¹ (2% of Brazil)

9 municipalities¹

349,986
in habitants in 2025²

16.6 million
tCO₂e emissions in 2024,
with 30% (5 million tCO₂e)
originating from the Land
Use Change sector³

22,400 km²
of forests in 2024⁴

101,400 km²
of non-forest vegetation
in 2024⁴

22,900 km²
of agriculture and pastures
in 2024⁴

8,567
family farming
establishments
(62% of the total)⁵

51
rural settlements⁶

References: 1 IBGE. 2024. Territorial area of Brazil, major regions, states and municipalities. <https://bit.ly/3Ne8Coo> 2 IBGE. 2025. Estimated Resident Population: Population Estimates – EstimaPop. <https://bit.ly/3RkXdIX> 3 SEEG. 2025. System for Estimating Greenhouse Gas Emissions and Removals. <https://bit.ly/4eUP8b> 4 MapBiomias. 2025. Annual Project for Mapping Land Cover and Land Use in Brazil – Land Cover Class Level 1 Collection 10 2024. <https://bit.ly/4bM7UFT> 5 IBGE. 2017. Agricultural Census: agricultural and livestock farming establishments by type. <https://sidra.ibge.gov.br/tabela/6778> 6 INCRA. 2024. Rural Settlements and Quilombola Community Lands. <https://bit.ly/4bHg16A>

PAMPA: THE UNIQUE GAUCHO PLAINS

Unique, the Pampa (prairie) is the only Brazilian biome restricted to just one state, Rio Grande do Sul, occupying only 2.7% of the national territory – although it extends into neighboring Argentina and Uruguay, covering approximately 1 million hectares. Another peculiarity that differentiates the Pampa from other Brazilian biomes is the modest presence of forests. Although trees are present, they do not have the same prominence observed in typically forested biomes.

Throughout their evolutionary history, grasslands have become the predominant vegetation, with grasses, herbaceous plants, and shrub species of high biological diversity. It is estimated that there are more than 3,000 plant species, many of them endemic. Forest patches have occupied smaller portions of the territory since before the arrival of Europeans on the South American continent.

PROTECTIVE EFFECT OF NATIVE FORESTS

The Pampa is one of the oldest ecosystems and also one of the most threatened by agricultural expansion in South America. Grassland vegetation has been systematically converted into agriculture at an alarming rate, resulting in the loss of 3.4 million hectares between 1985 and 2024. In contrast, native forests, which represent 11.9% of the biome (2.3 million hectares), have remained stable over the last 40 years, with indications of increased area.

Where do the forests grow in the Pampa? They are mainly distributed along watercourses and are also associated with hillside areas in regions of rolling terrain – on south-facing slopes, they show greater development and accumulate more carbon due to lower direct incidence of solar radiation, resulting

in a microclimate with higher humidity and lower temperature. Forests play an essential ecological role, such as increasing water infiltration into the soil, controlling erosion and siltation of rivers, and regulating rainfall, which is even more relevant in the current climate change scenario.

Current climate models indicate increases in the annual rainfall volumes and extreme precipitation events in the coming decades in the Southern region of Brazil – which went through one of the Brazil's worst environmental disasters with the 2024 floods. Therefore, restoring riparian forests in areas where they have been removed or reduced is imperative to minimize the impacts of floods. The protective effect of forests, in a scenario of increased rainfall, also occurs through the reduction of landslides, soil stabilization by roots, and decreased surface runoff.

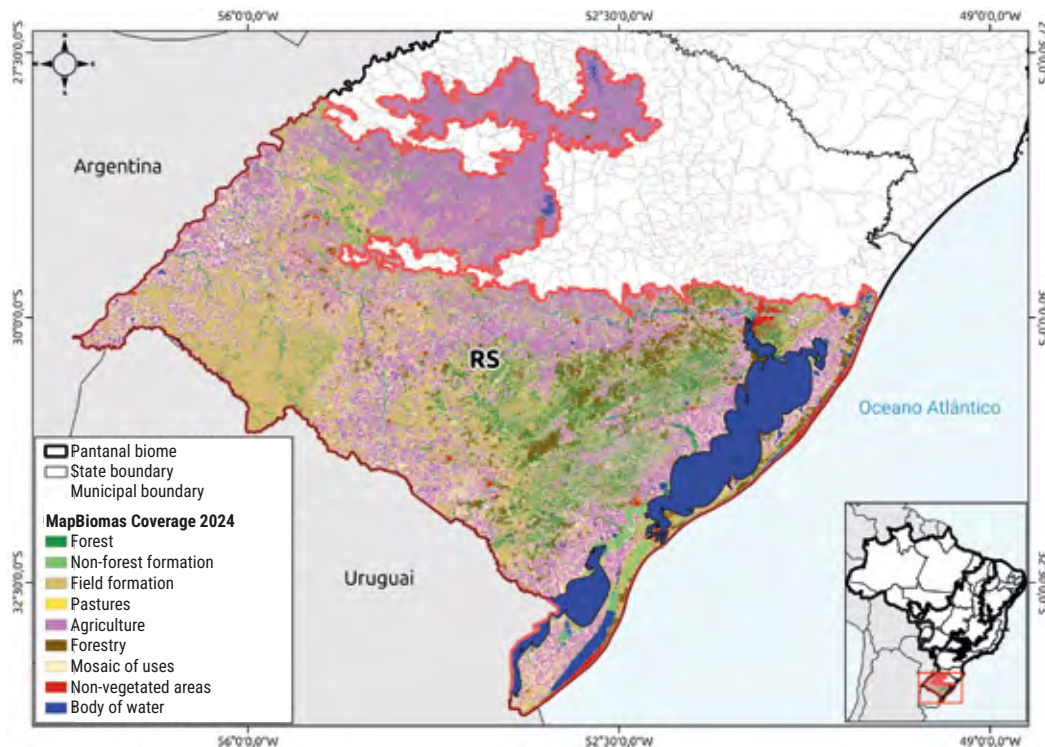
The Pampa biome is experiencing an expansion of forestry, based on exotic species (eucalyptus, pine, and acacia), which has seen strong growth in the last four decades, reaching a planted area of 700,000 hectares in 2024, which is equivalent to 3.8% of the biome. These cultivated forests are concentrated from the center to the east of the Pampa, especially in the Serra do Sudeste, Depressão Central and Planície Costeira regions.

In order to consider environmental conservation and the economic viability of forestry in the state of Rio Grande do Sul, government bodies, companies, and entities joined forces to establish new rules for the expansion of the forest sector, establishing the Environmental Forestry Zoning (ZAS).

ZAS is a regulatory instrument created to guide forestry activity in a balanced way that is compatible



Pampa (prairie) biome



197,285.1 km²
in area¹ (2.3% of Brazil)

162
municipalities¹

6.43 million
in habitants in 2025²

64.4 million
tCO₂e emissions in 2024,
with 23% (15 million tCO₂e)
originating from the Land
Use Change sector³

22,100 km²
of forests in 2024⁴

64,500 km²
of non-forest vegetation
in 2024⁴

55,900 km²
of agriculture and pastures
in 2024⁴

105,714
family farming
establishments
(73% of the total)⁵

253
rural settlements⁶

with nature conservation. In 2025, the State Environmental Council (Consema) approved the update of this regulation, introducing significant changes to the Connectivity and Permeability of Landscape methodology, which replaces the old criteria based solely on size and distance between plantations.

The results of this experiment in land-use planning of forestry, at landscape scale, still need to be evaluated and may represent a path for the responsible and sustainable expansion of forestry in typically non-forest regions of Brazilian biomes.

COASTAL ZONE: CARBON AND RESISTANCE

Brazil's coastal ecosystems are of strategic importance for the climate. Mangroves and restingas, present along more than 7,000 kilometers of coastline, play a fundamental role in carbon capture and storage, climate regulation, biodiversity protection, and the stability of coastal zones in the face of rising sea levels, and are also essential for climate adaptation. Brazil is home to one of the largest contiguous stretches of mangroves on the planet, covering 1.4 million hectares and extending from the state of Amapá to the state of Santa Catarina, with about 80% concentrated in the states of Maranhão, Pará, and Amapá.

Restingas, in turn, are a vegetation system associated with the sandy coastal plains of the Atlantic Forest, and work as important regulators of microclimate and hydrology. They stabilize dunes, protect coastal aquifers, and work as ecological corridors between marine and forest environments. This vegetation is highly adapted to saline conditions, wind, and nutrient-poor soils; and, in the context of climate change, it plays a crucial role in maintaining coastal biodiversity and the resilience of ecosystems.

BLUE CARBON SOLUTIONS

Despite the overall scenario of relative stability in the total area of mangroves in Brazil – strongly influenced by the greater integrity of these ecosystems in the North of the country – the reality observed in the Northeast and Southeast regions over the last 20 years is substantially different. In these regions, the pressures are cumulative: coastal urbanization, port expansion, aquaculture, water pollution, and changes in the dynamics between water and sediments have caused a persistent process of ecological degradation.

Mangroves are among the world's most efficient ecosystems at capturing and storing carbon, forming part of the so-called blue carbon solutions. The reason for this is the high biological productivity of these environments, combined with the deposition of organic matter in sediments at the bottom of water bodies, which allows for the formation of large carbon stocks per hectare, often exceeding those observed in terrestrial tropical forests.

However, knowledge production needs to advance in the analysis of the levels of structural and functional degradation of these ecosystems. Equally urgent is the development of robust estimates of carbon stocks associated with mangroves, considering both aboveground biomass and the large carbon stocks accumulated in sediments. Over the past 20 years, restinga ecosystems have shrunk by around 16,000 hectares, a loss associated with their high susceptibility to suppression by buildings and urban expansion in native coastal areas.

The conservation and restoration of these coastal environments complement continental forest strategies, expanding Brazil's potential for climate mitigation and adaptation.



Agribusiness and forests, closer than one might suppose

AS IT PERMEATES THE ENTIRE FOREST CONTINUUM, AGRIBUSINESS SHOWS INTERDEPENDENCIES WITH THE FIELDS OF CONSERVATION, RESTORATION, AND FORESTRY

Often understood in a dichotomous way in relation to forests and vice versa, Brazilian agribusiness has an intrinsic and interdependent relationship with conservation and restoration policies, as well as with productive forestry activities. Accordingly, agribusiness permeates the entire landscape that composes the forest continuum.

Regarding conservation, agribusiness benefits greatly from forests, which add value to the activity as they provide climatic conditions and other ecosystem services that are essential for production. At the same time, considering compliance with the Forest Code, agribusiness foresees the existence of conservation areas through Legal Reserves and Permanent Protection Areas (APP) on private properties.

This natural capital, which is an integral part of agricultural and livestock farming activity, tends to be increasingly valued and priced, not only due to

the new international accounting standards defined by the International Financial Reporting Standards (IFRS), which will begin to include it in organizations¹¹ balance sheets, but also because of the increasingly evident relationship between conservation and economic gains.

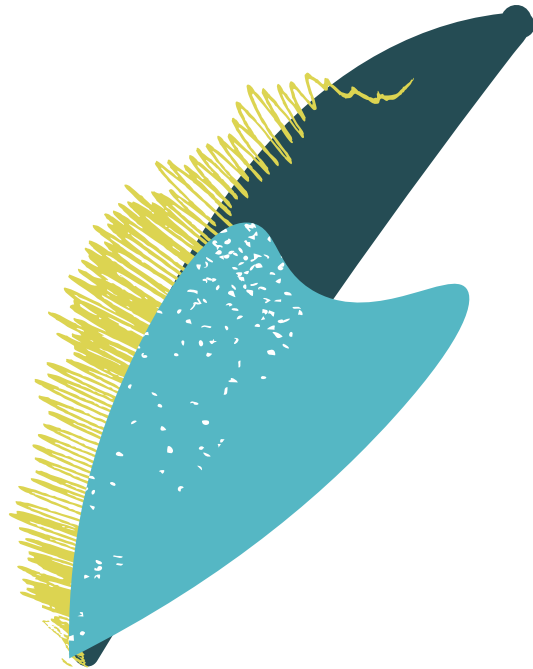
An international study released in February 2026, for example, numerically confirms what was already known: conserved forests are immensely important for Brazilian agricultural production because they generate rainfall that irrigates crops. With the participation of Brazilian writers, the research published in the journal *Communications Earth & Environment* (part of *Nature's* portfolio) estimates that the rainfall generation of the Amazon Forest is worth US\$59.40 per hectare annually, and that the Brazilian Legal Amazon generates precipitation valued at US\$20 billion per year (with a margin of error of US\$7 billion more or less)¹².

SUITABILITY OF AREAS FOR RESTORATION

Regarding forest restoration, there are also opportunities both for agribusiness and for the expansion of forests. This is because there is a significant volume of areas on private properties that are not suitable for agricultural and livestock production – for example, very steep areas – but which can be used for forest restoration. Therefore, benefits are generated for the climate and nature, as well as for productive activity, insofar as restoration helps address any environmental liabilities of rural properties and also generate carbon credits.

A study conducted by Agroicone, together with Movimento Floraz (*learn more about the movement in the Forest Restoration chapter*) sought to map agribusiness-linked areas suitable for forest restoration, identifying regions within the Brazilian territory where restoration with native species can represent an alternative land use on rural properties, especially in areas that are currently occupied by degraded pastures.

The study, which is still in a preliminary stage, cross-referenced different public and private geospatial databases and developed different territorial prioritization scenarios by applying filters related to the biophysical conditions of the areas and current land use. Among the main criteria considered were the presence of degraded pastures; low or restricted agricultural suitability; the existence of medium- and large-sized properties, favoring operational scale; the absence of recent deforestation, in line with the criteria used in carbon projects; the distance from industrial hubs of the exotic forestry sector, reducing competition for land prices; moderate slope; and the presence of a minimum continuous area within the properties.





The application of these criteria made it possible to identify millions of hectares of areas that are potentially eligible for forest restoration, varying according to the filters applied. In a more conservative scenario, taking into consideration medium- and large-sized properties, distances greater than 200 km from wood-consuming industries, absence of recent deforestation (until 2015), and a minimum area of 100 hectares per property, the study identifies approximately 2.6 million hectares distributed across around 8,000 rural properties.

When some criteria are relaxed, such as the minimum area within the property or the distance from industrial hubs, the potential universe may exceed 10 million hectares, indicating a significant territorial stock for the expansion of restoration projects.

These figures should be interpreted as orders of magnitude of territorial potential, because the study does not yet incorporate, at this stage, some factors that may directly influence the economic viability of specific projects, such as land opportunity cost, implementation cost, potential carbon productivity, and logistical and market conditions.

From this initial stage onward, the identified areas will serve as the basis for more in-depth analyses. The next phase provides for the development of economic modeling, business models, and contractual structures capable of enabling partnerships between restoration companies and rural landowners.

These analyses are expected to support the presentation and discussion of business alternatives with representatives from the agricultural and livestock farming sector, exploring ways to integrate forest

restoration and productive activities on rural properties. Restoration activities should be carried out by companies in the sector, which have more specialized knowledge.

Such integration between restoration and agribusiness areas is not expected to be straightforward and will require cultural adaptation. This is because the timeframes typically applied in agribusiness, both for grains and cattle, involve shorter cycles than those associated with forests – which are long-term, especially when considering the generation of carbon credits. In addition, the agribusiness allows for greater freedom in land use, including crop rotation and more flexibility. Nevertheless, this integration is expected to generate highly positive outcomes, improving land use in Brazil.

FORESTS FOR BIOENERGY

Moving further along the continuum, agribusiness establishes a relevant interface with forestry, considering the planting of forests as energy sources to produce biofuels, such as corn ethanol, which is becoming an engine of integration between agriculture, planted forests, energy, and carbon in Brazil.

In recent years, planted forests have gained a new use associated with corn ethanol production, aiming to achieve a lower carbon footprint. Corn ethanol produced in Brazil reduces emissions by at least 70% compared to gasoline. Exotic trees, such as eucalyptus, are essential in this equation because wood chips provide the thermal energy required for the ethanol production process in a renewable way.

According to a study by Agroicone¹³, the carbon footprint of corn ethanol in Brazil is calculated at 18

g and 25.5 g CO₂eq/MJ (grams of carbon equivalent per megajoule), taking into consideration two different scenarios for assessing corn-related emissions. These values represent a reduction of more than 70% compared to gasoline and are significantly lower than the carbon footprint of corn ethanol produced in the United States.

The main reasons are the use of eucalyptus biomass as an energy source and second-crop corn, which optimizes resources through its rotation with soybeans. Under a consequential approach, the carbon footprint is 3.1 g CO₂eq/MJ. The difference is striking due to the treatment of co-products (bioelectricity) and the direct and indirect effects of land use.

Corn ethanol production accounted for 22% of total ethanol production in the 2024/2025 harvest season, reaching 8.2 million m³. The 2025/2026 harvest is expected to reach 9.97 million m³, and the projected growth by 2034/2035 could reach 22.55 million m³, according to the Mato Grosso Institute of Agricultural Economics (Imea)¹⁴.

According to the study *Dynamics of energy demand and supply by agribusiness*, published by FGV Bioeconomia in 2023, bioenergy linked to agribusiness accounted for approximately 60% of the renewable energy available in Brazil. If this contribution were disregarded, the share of renewable sources in Brazil's energy matrix would fall from 49.1% to around 20%, approaching the global average, currently estimated at 15%.

Together with sugarcane ethanol, corn ethanol is essential for strengthening the decarbonization of the transportation sector, contributing to Brazil's energy

transition. Biofuels will also play a major role in enabling the production of Sustainable Aviation Fuel (SAF), within the framework of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) of the International Civil Aviation Organization (ICAO), as well as in the decarbonization of the maritime sector under the International Maritime Organization (IMO).

Given this scenario, it is important to see the expansion of corn ethanol production from the forest continuum standpoint, incorporating the following goals:

- produce a renewable source of energy with a low carbon footprint that replaces gasoline
- produce DDG for animal feed as a co-product, contributing to food security (DDG stands for Dried Distillers Grains, resulting from ethanol production, mainly from corn, and widely used in animal nutrition as a concentrated source of protein, energy, and essential nutrients)
- promote the production of the second crop grown on the same area throughout the year
- encourage the expansion of eucalyptus areas for the production of wood chips used in the industrial process, which is essential for reducing the carbon footprint of ethanol
- conserve native vegetation associated with corn and eucalyptus production areas

These indicators inherent to corn ethanol production show the importance of the sustainable use of biodiversity associated with the conservation of native vegetation. Additionally, the possibility of expanding corn production through the recovery of degraded areas makes room for the integration of new production areas while ensuring that no forests are converted.



It should also be noted that the production of biofuels under RenovaBio (the National Biofuels Policy, created to reduce carbon intensity in the transportation matrix and meet the targets of the Paris Agreement) includes the non-conversion of land as an eligibility criterion, reinforcing the sustainability of production.

The complementarity between eucalyptus planting and the use of wood chips in the industrial production of corn ethanol represents an important advantage in enabling lower-carbon-footprint scores. Data from the Index Group estimate a growing demand for wood chips for corn ethanol production in the state of Mato Grosso, requiring 250,000 hectares to meet current demand, potentially reaching 450,000 hectares over the next 5 to 6 years¹⁶. This creates opportunities to expand plantations closer to corn-producing regions, which requires planning aimed at increasing the area of planted forests dedicated to ethanol production.

Attention should also be paid to water availability, considering the study *O Eucalipto e a Embrapa: quatro décadas de pesquisa e desenvolvimento* (Eucalyptus and Embrapa: four decades of research and development), with the participation of researcher Eduardo Assad. The work points to a trend of increasing water deficit toward the Mid-West region, with the potential to reduce eucalyptus productivity, which would require either relocating productive areas or seeking clones that are more tolerant to water deficit (*learn more in the Adaptation section, page 99*)

Mapping prepared by Agroicone within the context of the Programa Caminho Verde¹⁷ (Green Pathway Program), which proposes restoring 40 million hectares of degraded land, indicates that the state of

Mato Grosso has a potential of 3.6 million hectares of degraded areas suitable for forestry, covering 64,800 rural properties. In the state of Mato Grosso do Sul, there are 2.65 million hectares of degraded areas suitable for commercial forest planting, involving 18,500 rural properties¹⁸.

The study *Descarbonização do Agronegócio – Caminhos para reduzir emissões e promover sustentabilidade* (Agribusiness Decarbonization – Pathways to reduce emissions and promote sustainability), published in 2025 by the Brazilian Business Council for Sustainable Development (CEBDS) within the scope of the Agriculture Coalition, suggests that the area of planted forests is likely to expand by 4 to 5 million hectares by 2050, potentially reaching 13-14 million hectares (*learn more about the study in the box on page 91*). This increase is of a similar order of magnitude to the figures considered in the table on page 38 of the Executive Summary.

The goal of expanding 4 million hectares of planted forests by 2035, provided for by the Climate Plan, signals important opportunities when combined with the target of recovering 30 million hectares of degraded areas. It becomes essential, however, to create incentives for the development of forest plantations aimed at supporting the corn ethanol industry and other biomass uses, including, for example:

- Mapping areas with potential around ethanol production plants and assessing opportunities to implement eucalyptus plantations dedicated to biomass production
- Defining priority areas for recovery for the purpose of implementing eucalyptus plantations
- Expanding financing to structure planted forest

projects for woodchips, involving partnerships among banks, industry, rural producers, and other stakeholders

- Creating state-level policies to encourage biomass production for corn ethanol production and other industrial uses

These are examples of actions that can be implemented to strengthen the potential of forest biomass for the corn ethanol industry. In this context, the vision of a forest continuum is extremely timely when considering the win-win relationship between eucalyptus biomass and corn ethanol as drivers of development for Brazil.

The Climate Adaptation and Mitigation Plan, approved by the Interministerial Committee on Climate Change in March 2026¹⁹, establishes sectoral mitigation targets that highlight the importance of the forest continuum approach, integrating land-use sectors, in public and private areas, agriculture and livestock farming and planted forests, and also energy and transport sectors within the context of biofuel production. Among the targets for 2030, it is worth mentioning the following:

- Eliminating deforestation across all Brazilian biomes
- Compensating deforested areas through the recovery of native vegetation in public areas and collective territories

- Reducing illegal logging areas by 80%
- Designating 21 million hectares of public land by 2027
- Recovering 2.5 million hectares of native vegetation in public areas
- Restoring 9.5 million hectares in private areas
- Expanding planted forest areas by 4 million hectares
- Reducing the legally permitted native vegetation suppression rate by 50% compared to 2022
- Restoring 30 million hectares of degraded pastures
- Increasing biomass processing capacity (2035)
- Achieving an 8% reduction in emissions through the use of Sustainable Aviation Fuel (SAF) compared to the fossil fuel scenario
- Increasing the biodiesel blending mandate to 25%
- Increasing the ethanol blending mandate to 35%
- Increasing the production and use of synthetic fuels: SAF: 2.6 billion to 4.5 billion liters; and green diesel: 2.6 billion to 4.5 billion liters

The potential to achieve these targets includes, among other objectives, the expansion of actions that promote benefits aligned with the forest continuum approach. In this context, the increase in forest plantations dedicated to biomass production reflects a great opportunity to expand gains that enhance the value of forests associated with productive activities.



THE SYNERGY BETWEEN FORESTS AND AGRIBUSINESS

A study by the Agriculture Coalition identified planted forests as one of the 11 decarbonization drivers for Brazilian agribusiness

Planted forests – understood as the cultivation of native or exotic forest species for economic purposes, such as the production of timber, pulp, energy, charcoal, or for environmental purposes, such as the restoration of Permanent Preservation Areas and Legal Reserves – were identified as one of the 11 decarbonization drivers for Brazilian agribusiness. This was one of the conclusions of the report prepared from the efforts of the Agriculture Coalition of the Brazilian Business Council for Sustainable Development (CEBDS) in 2025.

According to the study²⁰ – which considered only the carbon storage capacity in the soil of planted forests – they are strategic for the decarbonization of the agricultural and livestock farming sector and complementary to priority regenerative practices such as no-tillage farming, Integrated Crop-Livestock-Forestry (ICLF), and the expansion of high-vigor pastures.

Planted forests add value to agribusiness production activities by improving the resilience of degraded pastures, promoting carbon sequestration, water regulation, and more fertile soils, which increases productivity by up to 60 million hectares suitable for integration. This synergy strengthens agribusiness as a partner in conservation, aligning economic production with ecosystem services without compromising native areas.

Regarding their importance for conservation combined with production, planted forests add direct value to agribusiness activities by restoring degraded soils and capturing atmospheric carbon, complementing the discussion on the correlation between exotic-species forestry and regenerative practices.

As identified in the CEBDS study, they enhance productive conservation, mitigate climate risks, and generate economic returns through a large-scale sustainable bioeconomy. This approach positions the sector as a leading player in the transition toward regenerative agriculture, supporting partnerships between agricultural and livestock production and forests.

As mentioned before, the Agriculture Coalition prioritized low-productivity pasture areas as a driver for forest restoration, with up to 60 million hectares identified for implementation without territorial competition. This strategy combines climate mitigation and productivity, serving as a foundation for more precise and sustainable land-use policies.

Due to their underground storage capacity, planted forests can contribute to the capture of around 0.8 MtCO₂e/Mha/year through mechanisms such as carbon sequestration in biomass and soil, tree growth itself, and reduced pressure on native forests by

supplying the demand for forest products with legally sourced timber. To this end, it is important to identify suitable species, locations, and planting architecture and their intended purpose, as well as to plan rotation cycles, forestry management (fertilization, weed and pest control, thinning), and harvesting.

These efforts, however, face implementation challenges, such as high initial investment with medium- to long-term returns. In the case of Integrated Crop-Livestock-Forestry (ICLF) systems, there may also be competition and operational constraints. Additionally, licensing procedures and the land and environmental regularization scenario may not be straightforward.

The Agriculture Coalition forecasts that the expansion of corn ethanol will increase demand for the forestry of exotic species – such as eucalyptus – consolidating Brazil as a global leader in competitive bioenergy, which may also further boost the Brazilian bioeconomy.

This planting combines decarbonization with the generation of green energy, mitigating concerns such as competition between food and fuel production and contamination by illegal timber through traceability and tax incentives, thereby expanding the bioenergy sector without compromising food security.

The challenge of unlocking finance for forests

THE CURRENT ALLOCATION OF PRIVATE CAPITAL, CONCENTRATED IN LOWER-RISK MARKETS, HIGHLIGHTS AN INVESTMENT GAP IN TROPICAL FORESTS – STRATEGIC TERRITORIES FOR CLIMATE MITIGATION, BIODIVERSITY, AND SOCIAL DEVELOPMENT. THERE IS, THEREFORE, A CONCRETE OPPORTUNITY TO MOBILIZE PRIVATE CAPITAL THROUGH THE REDESIGN OF ECONOMIC INCENTIVES, THE REFORM OF SUBSIDIES, AND THE STRENGTHENING OF PUBLIC GOVERNANCE, CREATING ENABLING CONDITIONS TO EXPAND DIRECT FINANCING, REDUCE RISKS, AND SCALE SOLUTIONS OF PUBLIC INTEREST

In recent years, an important set of studies on forest finance has begun to converge around a common diagnosis: financial flows directed toward conservation, restoration, and sustainable land use remain insufficient and structurally misaligned with the scale of global climate, environmental, and social challenges.

At the same time that the recognition of the role forests play in climate stability, water security, biodiversity, and economic development is growing, the positive resources allocated to the sector remain limited – especially in rainforests – while significantly larger volumes of capital continue to be directed toward activities associated with deforestation and land-use degradation. *The State of Finance for Forests 2025*²¹ represented a systematic effort by the United Nations to map, in an integrated

manner, public and private financial flows specifically directed toward forests. The report shows that, in 2023, global investments in forests fell far short of what is needed for the sector to consistently contribute to addressing climate change, biodiversity loss, and land degradation. The document establishes an unprecedented baseline, essential for guiding public policies, multilateral banks, philanthropy, and private investors.

The central diagnosis is striking: annual investments in forests would need to more than triple by 2030 to be in line with global targets, rising from about US\$ 84 billion to approximately US\$ 300 billion per year. Despite growing recognition of the role of forests as a climate solution, private financing remains marginal and concentrated in lower-risk markets, while the



rainforests – where the greatest climate and social benefits lie – continue to be underfunded.

Beyond the resource deficit, the report exposes a structural contradiction: significantly larger volumes of capital continue to be directed toward activities associated with higher deforestation risk, whether through harmful public subsidies or private financing in commodity chains. Even within the same production chain, there are players that have advanced in disassociating production from deforestation and others that still contribute to forest conversion. This asymmetry reinforces the need to not only expand positive financial flows but also redirect the capital that is currently allocated indiscriminately, in order to

penalize destructive practices and reward producers and companies that are committed to deforestation-free supply chains.

*The Transforming Forest Finance*²² report starts with the recognition that the problem of forest financing is not limited to a quantitative gap. The document argues that, even with more resources, results will remain limited if there are no structural changes in the international financial system, in fiscal rules, and in the economic incentives that shape land use in countries with forests.

The text critically analyzes traditional instruments, such as REDD+ and results-based payments, pointing out their inability to achieve scale and to efficiently

INVESTMENT IN FORESTS THROUGH 2030

Tropical forests need more funding



reach the players that are responsible for forest protection. The report highlights how macroeconomic factors – sovereign debt, the need for fast foreign currency generation, and perverse subsidies – push forest countries toward extractivist trajectories, even in the face of environmental commitments.

As a response, the document advocates a deep reform agenda, including debt restructuring, redirection of subsidies, strengthening of public governance, and increased direct funding to Indigenous peoples and local communities.^b The focus shifts from isolated projects to systemic changes capable of aligning economy, climate, and nature in the long term.

IN SEARCH OF INNOVATIVE MECHANISMS

The *Emerging Forest Finance Instruments (Forest Declaration Assessment)* report complements the systemic diagnosis by mapping innovative financial instruments that have been tested to expand and diversify forest financing. It organizes these solutions into categories such as thematic bonds, forest funds, debt reduction mechanisms, and new market instruments, providing a practical view of the state of the art.

The document acknowledges that there are no universal solutions: each instrument responds to distinct institutional contexts, risks, and objectives. Cases of forest bonds, jurisdictional funds, and debt-for-nature swaps are analyzed in light of their ability to attract private capital, reduce risk, and align long-term incentives for conservation and restoration.





An important highlight is the growing attention to funds led by Indigenous peoples and local communities, recognized as central players for long-lasting environmental outcomes. The report points out that the future of forest financing will depend on the intelligent combination of these instruments, rather than relying on a single solution.

The *Toolbox on Financing Nature-Based Solutions*²³ study presents an approach applied to financing Nature-based Solutions (NbS), including forests, with a focus on blended finance structures. The report was developed in the context of Brazil's G20 Presidency in 2024 and presents concrete case studies that help translate financial concepts into operational arrangements.

The document starts by recognizing that forests and other NbS generate public goods, with diffuse benefits and difficult monetization, which limits the appetite of traditional private capital. To address this challenge, the report describes how concessional resources, collaterals, and risk mitigation instruments can unlock investments at different stages of project maturity.

The main contribution of the report is to show that forest financing requires, in many cases, tailored solutions, combining public policies, philanthropy, and private capital. It reinforces the idea that blended finance is not an end in itself, but a bridge to create more mature and scalable markets in the future.

The *Financiamento Florestal Sob Medida*²⁴ (Tailored Forest Financing) report deepens the debate by

mapping around 30 international financial mechanisms aimed at rainforests. It provides a comparative view that helps policymakers, financiers, and organizations choose instruments that are in line with specific objectives, such as conservation, restoration, or sustainable management.

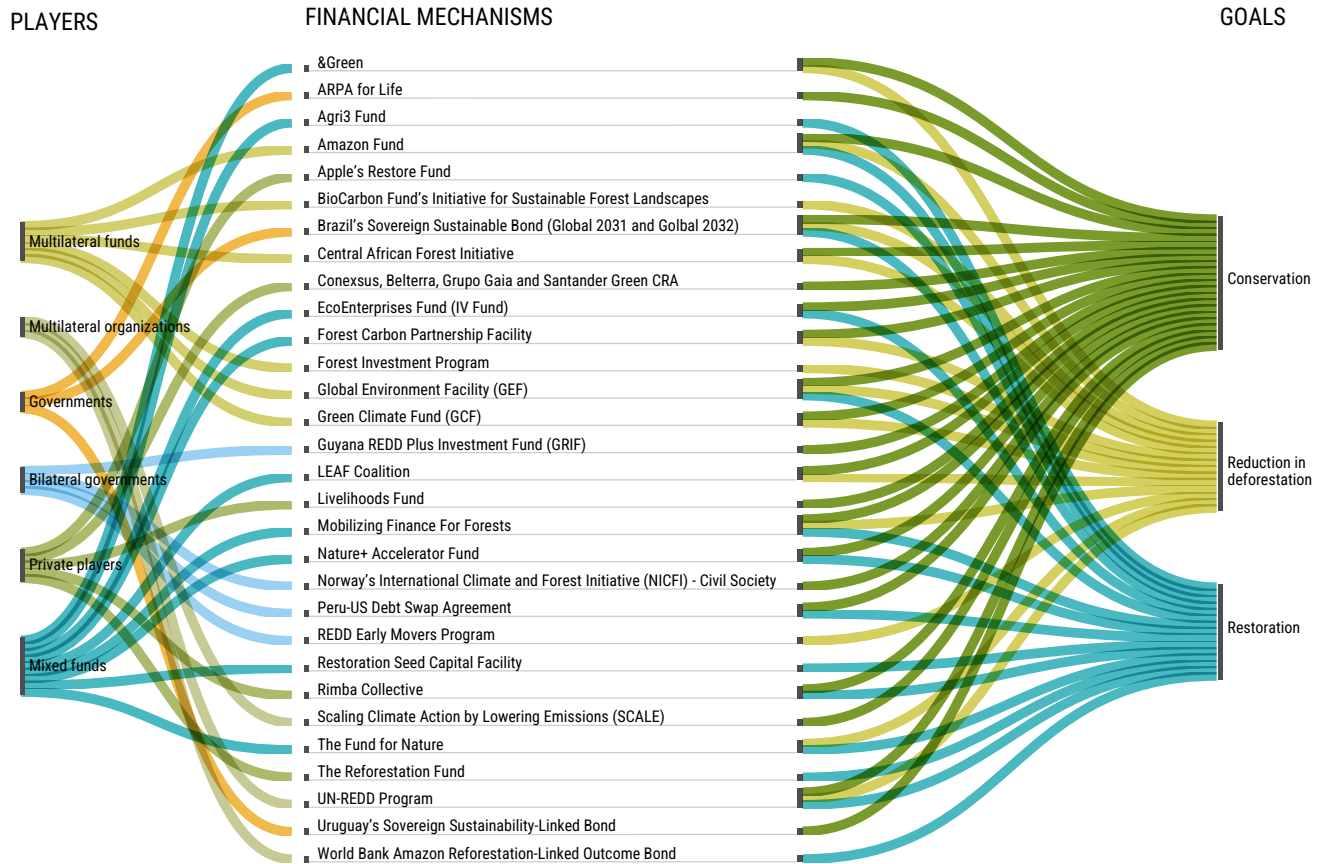
The document reinforces that current flows to rainforests are far below what is needed and highlights the strategic role of climate finance, international cooperation, and hybrid instruments to fill this gap. The report directly engages with the Brazilian context, emphasizing Brazil's potential to lead solutions at scale.

By emphasizing the need to align financial instruments with institutional and territorial realities, the study contributes to the design of public policies and funds that avoid generic solutions and maximize environmental and social impact.

CENTRAL CONVERGENCES

In recent years, a consistent set of studies has converged on the diagnosis that forest financing remains deeply misaligned with the scale of global climate, environmental, and social challenges. There is consensus that the volumes currently directed toward forests are insufficient and poorly allocated: whereas positive investments in conservation, restoration, and sustainable management remain limited, much larger financial flows continue to support activities associated with deforestation, whether through harmful public subsidies or through private financing of high-risk commodity chains.

FINANCIAL MECHANISMS FOR TROPICAL FORESTS



Source: "Financiamento Florestal Sob Medida: Menu de Mecanismos Financeiros" (Tailored Forest Financing: Menu of Financial Mechanisms) – CPI/PUC-Rio based on accumulated data publicly available on the official websites of mechanisms and financial entities, according to the research completion date, 2025.

These studies also point out that, even with greater recognition of the role of forests as climate and development solutions, private capital remains concentrated in lower-risk markets, leaving rainforests – where climate, ecological, and social benefits are greater – structurally underfunded.

Another central convergence, as stated in previously mentioned studies, is the understanding that the challenge is not limited to expanding resources, but requires structural transformations in the financial system and

in the public policies that shape land use. The reports highlight the limits of traditional instruments when applied in isolation and advocate for the combination of tailored solutions, such as blended finance, hybrid instruments, and innovative mechanisms adapted to institutional and territorial contexts.

There is also strong alignment around the need to redirect economic incentives, reform subsidies, and strengthen public governance, while at the same time expanding direct financing. Taken together, the



FUNDING VOLUME AND NUMBER OF FINANCIAL MECHANISMS BY TYPE OF PLAYER



Source: "Financiamento Florestal Sob Medida: Menu de Mecanismos Financeiros" (Tailored Forest Financing: Menu of Financial Mechanisms) – CPI/PUC-Rio based on accumulated data publicly available on the official websites of mechanisms and financial entities, according to the research completion date, 2025.

studies indicate that the future of forest financing will depend less on isolated projects and more on a systemic agenda that is capable of aligning economy, climate, and nature in the long term.

BRAZILIAN POTENTIAL

Based on this diagnosis, the forest financing agenda in Brazil takes on particularly strategic contours due to the scale of its biomes, the centrality of land use in the economy, and the existence of public and financial instruments that are already in operation.

Initiatives such as the Nature Investment Lab (NIL) seek to transform this diagnosis into institutional design and applied financial innovation, working both on bottlenecks related to financing Nature-based Solutions in general – such as restoration in particular – and on improving broader instruments of blended finance and land-use transition – such as Eco Invest Brasil, a program led by the Ministries of Finance and of the Environment, focused on attracting private capital to sustainable projects.

From this standpoint, the idea of forests as infrastructure stands out, as well as the role of the National Bank for Economic and Social Development (BNDES) and the Climate Fund, bottlenecks related to collaterals and insurance, de-risking mechanisms (risk reduction), the opportunity represented by Eco Invest Brasil, the need to integrate small producers into the restoration agenda, and, at an international scale, the proposal of the Tropical Forest Forever Facility (TFFF) (*more about the fund on pages 133 and 182*).

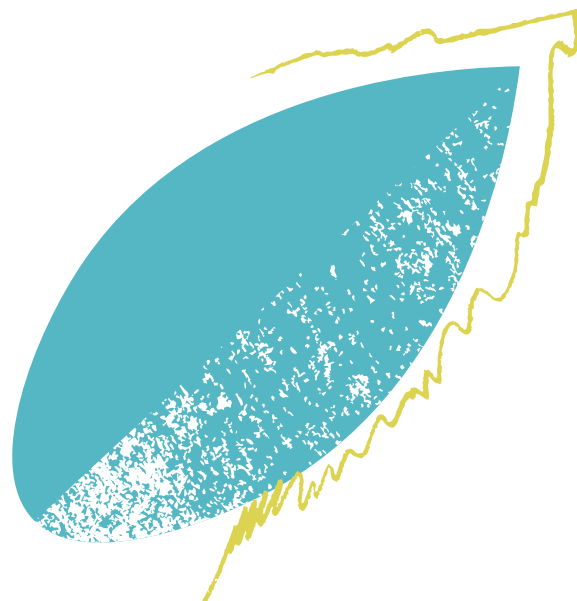
FORESTS AS NATURAL INFRASTRUCTURE

Large-scale forest restoration requires a financial architecture closer to that used in infrastructure sectors than to that applied to conventional short-cycle productive activities. These are capital-intensive investments in the initial phase, with long maturation, gradual revenues, and strong dependence on contractual predictability, efficient risk allocation, and appropriate mitigation instruments to attract long-term capital. This logic brings restoration closer to sectors such as renewable energy, sanitation, and road concessions.

Framing forests as natural infrastructure means recognizing that these assets sustain essential economic functions, such as climate stability, water security, and agricultural productivity, and that, therefore, they require a financial approach that is compatible with their long-term nature. This implies understanding that financing for the sector depends less on conventional corporate credit and more on

building structures that are capable of allocating risks in a way that it adheres to project cycles, combining patient capital, adequate collaterals, de-risking mechanisms, and, progressively, more sophisticated market instruments.

Within this logic, a promising path is to structure credit for reforestation on bases that are closer to project finance, allowing the financier's exposure to project risk to intensify mainly in the operational phase, when assets already show a higher degree of maturity, predictability, and revenue-generating capacity (*learn more on finance and the restoration agenda on page 171*).





The role of adaptation in forests

FROM PROTECTING NATURAL CAPITAL TO BUILDING A RESILIENT ECONOMY

The relationship between forest economics and climate change has been guided by the ability to capture and store carbon, reduce emissions, and generate tradable credits. This context was essential for placing the forest topic on the global climate agenda and mobilizing innovative financial instruments. However, the intensification of the physical impacts of global warming has been shifting the focus of this discussion. Prolonged droughts, forest fires, extreme events, and water instability are no longer just future risks; they directly affect productive assets, supply chains, and public finances. In this new context, adaptation emerges as a structuring axis of forest economics.

Adaptation is not limited to protecting ecosystems. It redefines how the economy deals with risk, productivity, and operational continuity. In an environment of increasing climate volatility, conserved, managed, and restored forests are taking on the role of natural economic infrastructure. They regulate rainfall patterns, protect soils, reduce exposure to

extreme events, and stabilize the productive base of capital-intensive sectors such as agriculture, energy, logistics, and urban supply.

The economic value of forests, therefore, lies not only in carbon, but in their ability to reduce systemic risks and sustain long-term growth. Recent reports from international institutions converge in indicating that investing in adaptation is not a defensive expenditure, but a rational economic decision. Studies indicate that every dollar invested in adaptation can generate multiple economic benefits, whether through avoided losses or efficiency, productivity, and stability gains.

Climate solutions provided by nature, especially those linked to forests and productive landscapes, are among the investments with the highest aggregate return. Nevertheless, despite this economic rationale, adaptation remains underfunded and is often treated as a peripheral topic in investment strategies.

FORESTS UNDER IMPACT

Up to 75%

of the world's accessible freshwater comes from forested basins

5% to 20%

was the increase in the mortality rate of trees in tropical and temperate regions this century, associated with more intense droughts and higher temperatures

30% of forest species

are at risk of extinction due to habitat loss and altered ecological conditions if global warming exceeds 2–3 °C

2 to 3 times faster

is the recovery speed of biodiverse forest ecosystems after extreme events (droughts, wildfires, storms) compared to degraded areas or areas with low biodiversity

5% to 15%

is the increase in productivity due to agroforestry practices that enhance the resilience of agricultural crops to extreme weather conditions

Sources: IPCC (AR6 2021–2023) and Food and Agriculture Organization – Forests and Water, Frontiers

This is where forest economics stands out as an emblematic case. Forests combine three rare attributes: they are productive assets, natural protection systems, and platforms for generating territorial income. While reducing physical risks – such as droughts, floods, and fires – they also support entire production chains and create economic opportunities associated with restoration, forest management, forestry, and nature-based solutions. In this aspect, adaptation ceases to be an additional layer of the forest agenda and becomes its organizing principle.

BRAZILIAN MISMATCH

In Brazil, this potential is particularly relevant. Few countries combine territorial scale, forest diversity, and economic interdependence between forests and productive sectors like Brazil. Brazilian forests directly influence the rainfall patterns that sustain agribusiness, hydroelectric matrix, river navigation, and the supply of water to large cities.

The loss of this natural infrastructure would imply systemic economic costs that are difficult to absorb. At the same time, large-scale forest restoration and sustainable management represent a concrete frontier of investment and territorial development. Despite this, financing adaptation – and in particular, forest adaptation – remains insufficient.

A recent study conducted by the Center for Sustainability Studies at the Getulio Vargas Foundation (FGVces), in partnership with Morphosis and the Itaúsa Institute, helps explain this mismatch. The



study, called *Perspectivas fragmentadas, financiamento fragmentado: um estudo de caso sobre o desafio da adaptação no Brasil* (Fragmented perspectives, fragmented funding: a case study on the challenge of adaptation in Brazil), points out that the main obstacle to mobilizing private capital is not only the scarcity of resources, but also the strategic misalignment among the main players involved.

According to the study, government, financial institutions, and companies start with different definitions of what adaptation is, which problems should be prioritized, and which instruments are more appropriate. The public sector tends to classify adaptation as an agenda of social policy and provision of financial instruments, focusing on vulnerability and climate justice. Financial institutions, in turn, recognize the relevance of the topic, but point out the lack of well-structured projects, reliable data, and clear metrics as the main obstacles to financing. Large companies, on the other hand, address adaptation in a pragmatic manner, incorporating climate risk into investment and management decisions, often without labeling these actions as “adaptation.”

This mismatch of perspectives has practical consequences. Without a common language, there is a lack of standardized projects, structured pipelines, and financial instruments compatible with the risk and return profile of adaptation investments. As a result, adaptation occurs in a diffuse, fragmented, and reactive manner, even when there is willingness to invest. In the case of forest economics, this

CLIMATE ADAPTATION GAPS

US\$310 billion per year

is the amount needed for developing countries to adapt by 2035

US\$284 billion to US\$339 billion per year

12 to 14 times higher than current flows – represents the financing gap for adaptation.

US\$40 billion by 2025

the Glasgow Climate Pact’s target of international public financing for adaptation that has not been met

PROGRESS ACHIEVED

172 countries

have at least one national adaptation policy, strategy, or plan

1,600 adaptation actions

that have been implemented, mainly in the fields of biodiversity, agriculture, water and infrastructure, were reported by these countries

86% growth

in support for new projects from the Adaptation Fund, Global Environment Facility and Green Climate Fund between 2019 and 2024 (US\$920 million)



problem is even more evident, given the long-term horizon, the implementation risks, and the often indirect nature of economic returns.

The study also highlights that large companies have already been investing in resilience, especially for climate protection of supply chains and critical assets. However, these initiatives are rarely classified as adaptation, which reduces their visibility and hinders the creation of dedicated financial instruments. At the same time, small and medium-sized companies face structural and informational barriers to access financing, despite being among the most exposed to climate risks. Startups, in turn, struggle to scale innovative adaptation solutions in the face of a scarcity of patient capital and support from the impact ecosystem and its players.

CHANGE OF APPROACH

In the forest economics, these limitations translate into a mismatch between the economic value of resilience and the instruments available to finance it. Forest restoration and management projects often face difficulties in accessing long-term credit, adequate collaterals, and risk-sharing mechanisms. Without a compatible financial architecture, the potential of forest adaptation remains underexploited, despite its broad economic benefits.



Overcoming this deadlock requires a change of approach. Adaptation needs to be recognized as an economic strategy and integrated into investment decisions, land-use planning, and industrial policy. In the case of forests, this means treating conservation, management, and restoration as investments in productive infrastructure, capable of protecting the existing value and creating new economic opportunities. It also means aligning financial instruments with the long-term cycle of forest assets, incorporating risk mitigation mechanisms, collaterals, and mixed financing structures.

In this process, the role of organizations such as Morphosis, dedicated to adaptation solutions in contexts of greater climate risk, FGVces, as a center for the production of applied knowledge, and the Itaúsa Institute, as a strategic and philanthropic catalyst, has been to bring research, public policy, and the market closer together. The study shows that advancing this agenda requires less the creation of new, isolated instruments and more alignment between definitions, incentives, and expectations, in order to reduce uncertainties and enable scalability.

International experience shows that markets do not spontaneously arise on emerging agendas. The energy transition, for example, only gained

scale when clear public policies, adequate financial instruments, and business strategies converged. The economics of adaptation – and, in particular, the adaptation-oriented forest economics – faces a similar challenge. Without coordination and clarity, the window of opportunity remains closed, even in the face of increasing risks.

In the 21st Century, the forest economics that will thrive will be the one capable of delivering climate, economic, and social resilience. Adaptation is no longer a peripheral topic on the forest agenda. It is the axis around which investments, public policies, and development strategies are reorganized. For Brazil, this is less a matter of choice and more a historic opportunity: to transform its forests into the productive foundation of a more stable, competitive economy well-prepared for a rapidly changing climate.

PROGRESS IN INTERNATIONAL NEGOTIATIONS ON CLIMATE ADAPTATION

The evolution of the international adaptation agenda has historically influenced the development of national policies. Instruments such as National Communications and adaptation plans prepared under the United Nations Framework Convention on Climate Change (UNFCCC) have been contributing to guiding adaptation priorities and strategies in countries.

The decision on the Global Goal on Adaptation (GGA), adopted in Belém at COP 30, represents an unprecedented step forward by establishing indicators to measure global progress in adaptation, known as the Belém Adaptation Indicators (BAI). A central element in this decision is the recognition that climate adaptation is heavily dependent on local context, requiring indicators that reflect different territorial, social, and ecological realities.

Among the criteria provided for in the document for composing these indicators are geographical characteristics, considering contexts such as coastal areas, river basins, mountainous regions, and arid areas. And also the types of ecosystems – including terrestrial, coastal marine, and inland water ecosystems – and their environmental services. The data also take into account productive sectors and vulnerable populations.

This approach at the global level makes room for greater integration between climate and forest policies, and reinforces the strategic role of forests by contributing simultaneously to ecosystem resilience, water security, food production and a wide range of economic activities, in addition to the protection of traditional livelihoods and ways of life.

REGULATORY MOVEMENTS IN BRAZIL

In the Brazilian case, this strategic alignment is reflected in the updated National Adaptation Plan to Climate Change, presented in 2026, which incorporates Ecosystem-based Adaptation (EbA) as one of its pillars. One of the 12 targets is to connect 30% of the national territory through ecological corridors between protected areas and other conservation mechanisms by 2035.

The instrument expects to expand diversified and resilient agricultural and livestock farming systems by approximately 72 million hectares by 2030, which directly aligns with the expansion of agroforestry systems and productive forest landscapes. Among the more than 800 planned actions, the prevention and management of forest fires stand out, as they intensify with climate change.

The strategy emphasizes the conservation and restoration of ecosystems to increase climate resilience and reduce the exposure and vulnerability of populations and economic activities. It recognizes the value of traditional and local knowledge, such as ancient management practices developed by indigenous peoples and traditional communities, which are strategic sources of adaptation.

The background is a complex, abstract composition of various shades of teal and dark blue. It features large, overlapping, organic shapes that resemble natural forms like leaves or petals. There are also smaller, more intricate patterns, including a dense, textured area in the bottom left corner that looks like a close-up of a plant's surface. The overall effect is layered and textured.

/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 2035¹.

The conservation of tropical forests – along with the restoration of what has already been destroyed,

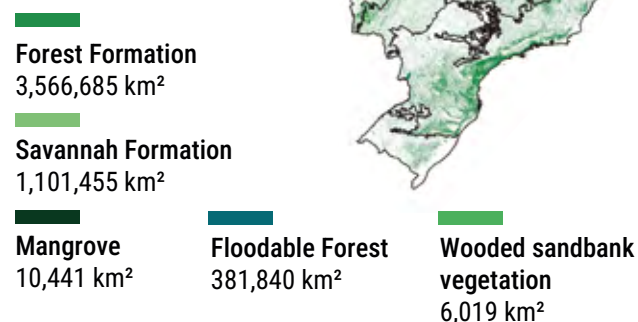


as will be seen in the following chapter – is one of the main elements that differentiate the various Amazons and their complexities, presented earlier in this report. The preserved areas also make up the mosaic of landscapes that characterize the great forest continuum and their distinct uses and purposes, 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 benefits generated by their conservation. The conservation of tropical forests is not just a national concern, it is a global priority.

FORESTS OF BRAZIL – IN 2024



Source: MapBiomias, 2024

MAPBIOMAS

MapBiomias 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, MapBiomias has prepared more than 420,000 reports that support direct action against illegal deforestation practices².

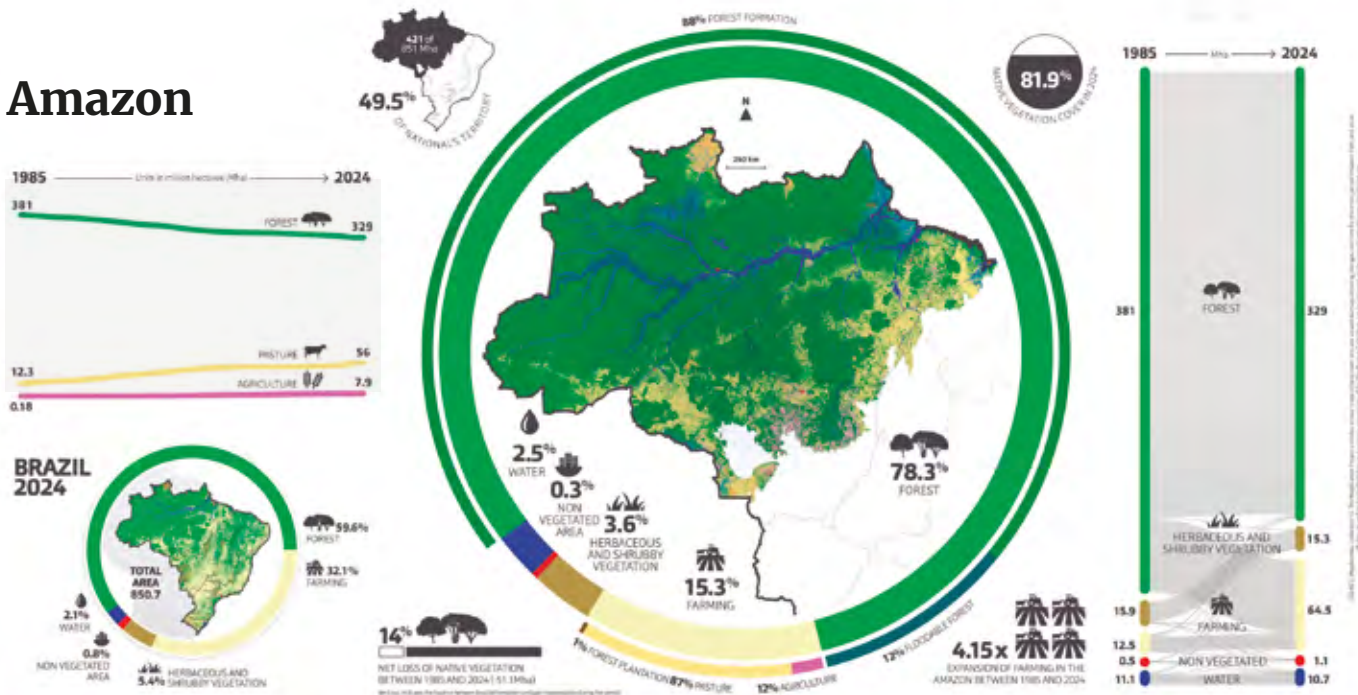
THE FORESTS OF BRAZIL

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 MapBiomias, indicates the distribution of different types of forests in Brazil in 2024.

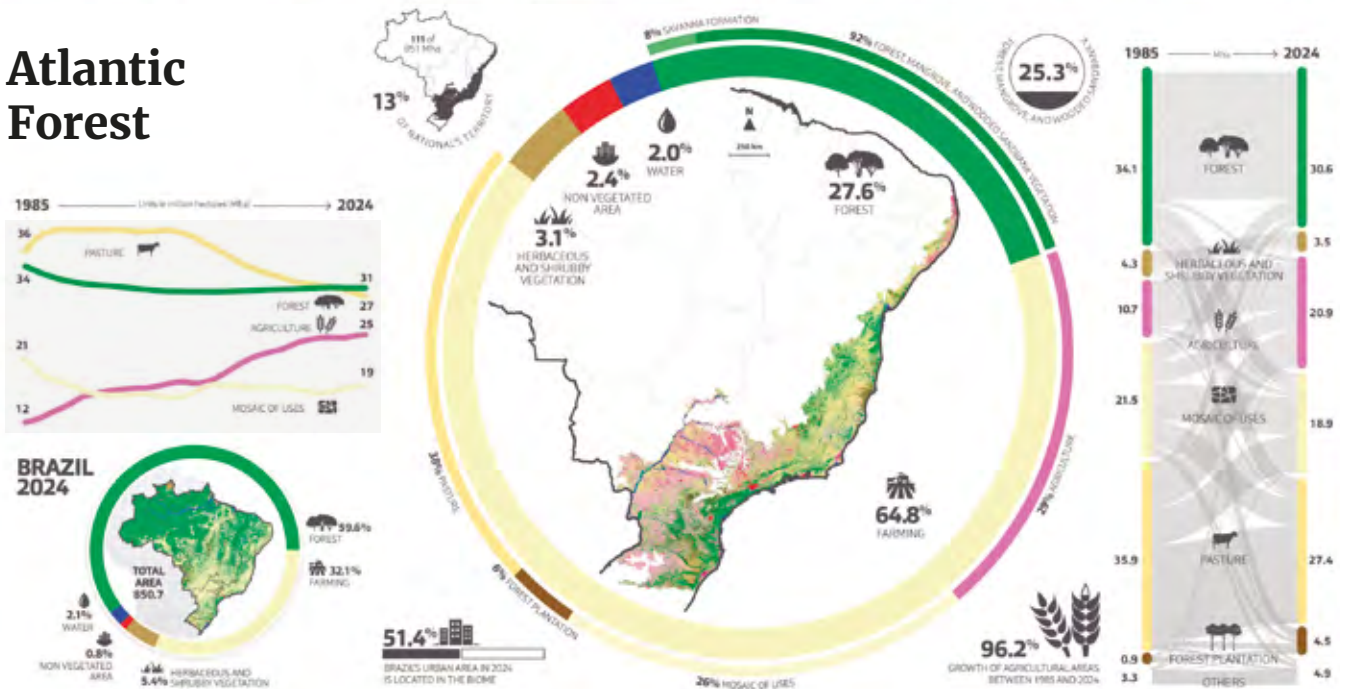
CLIMATE POTENTIAL OF NATURAL FORESTS

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

Amazon



Atlantic Forest



● FLORESTA ● FORMAÇÃO FLORESTAL ● FORMAÇÃO SAVANNA ● RESTINGA ARBÓREA ● MANGUE ● VEGETAÇÃO HERBÁCEA E SHRUBIVETA ● FORMAÇÃO CAMPESTRE ● CAMPO ALAGADO E ÁREA PANTANOSA ● AGROPECUÁRIA ● PASTAGEM ● AGRICULTURA ● SEVICULTURA ● MOSAICO DE USOS ● ÁREA NÃO VEGETADA ● URNA URBANIZADA ● COPO D'ÁGUA

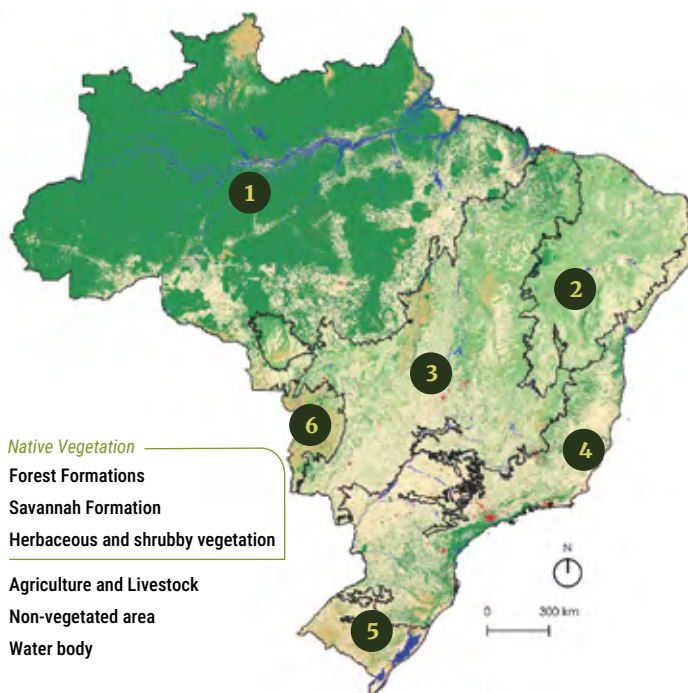


HISTORY OF PLANT COVER AND LOSS OF NATURAL AREAS IN BRAZILIAN BIOMES

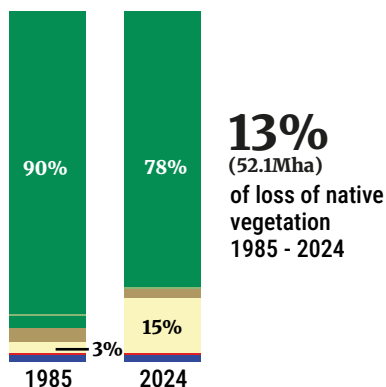
The **Amazon** and the **Cerrado** (Brazilian scrubland) are the biomes that have lost native vegetation the most

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

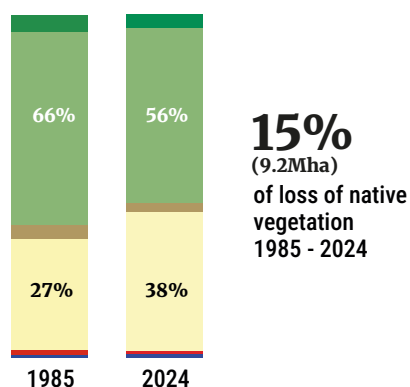
The **Amazon** and the **Pantanal** (Brazilian wetland) are the biomes with the largest proportion of native vegetation (80%)



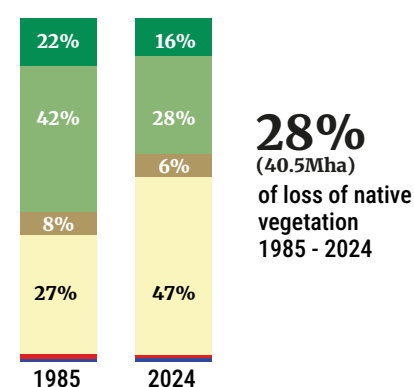
1. AMAZON



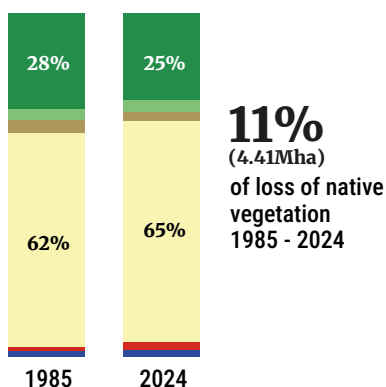
2. CAATINGA (BRAZILIAN WOODLAND)



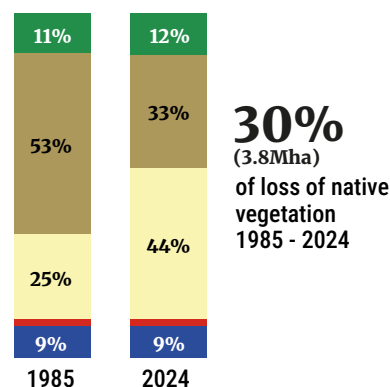
3. CERRADO (BRAZILIAN SCRUBLAND)



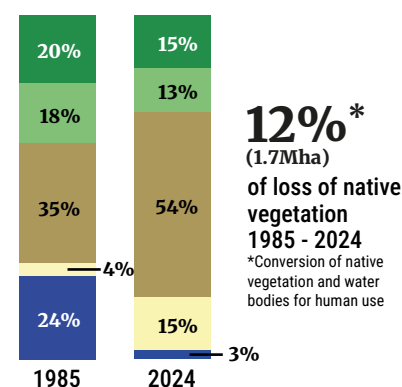
4. ATLANTIC FOREST

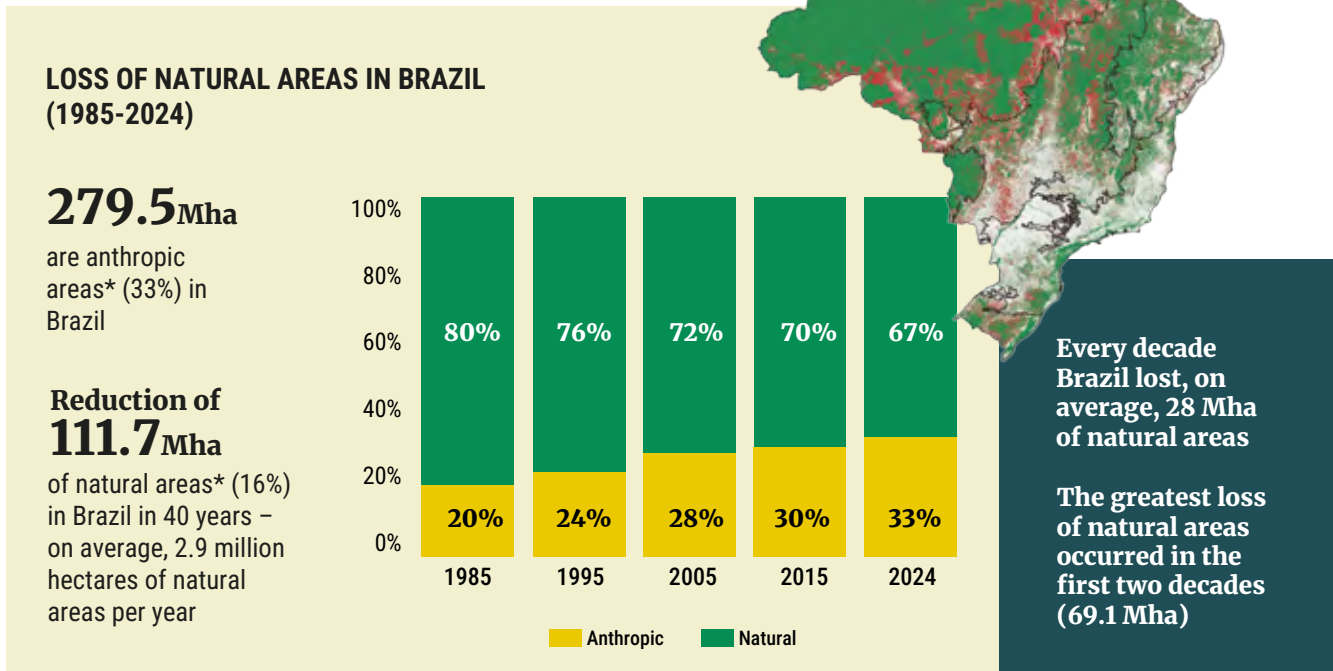


5. PAMPA (BRAZILIAN PRAIRIE)



6. PANTANAL (BRAZILIAN WETLAND)





*Note: natural areas include forests and also other types of non-forest ecosystems, such as those dominated by herbaceous and shrubby vegetation, in addition to beaches, dunes, and sandy areas.
Source: ManBiomass

EVOLUTION OF FOREST COVER, A THERMOMETER OF CHALLENGES

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.

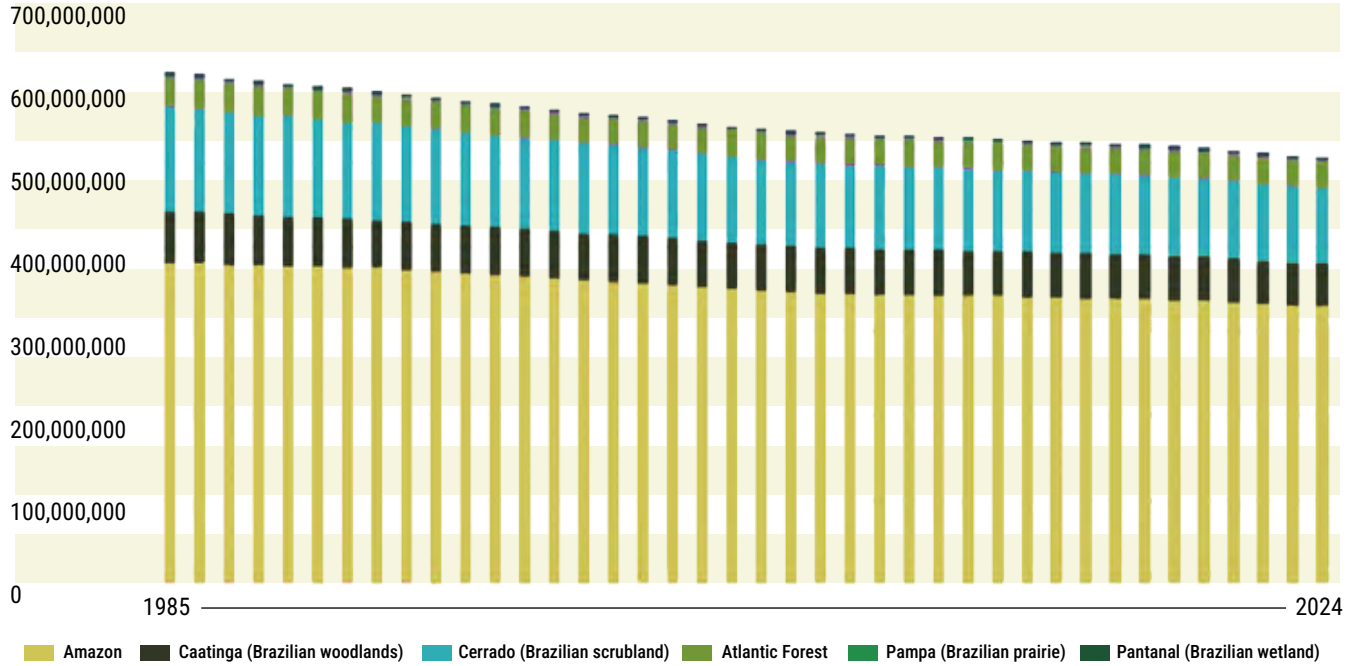
Due to human actions, between 1985 and 2024, 52 million hectares (13%) of native vegetation area were

lost in the Brazilian portion of the Amazon, 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 decade³.

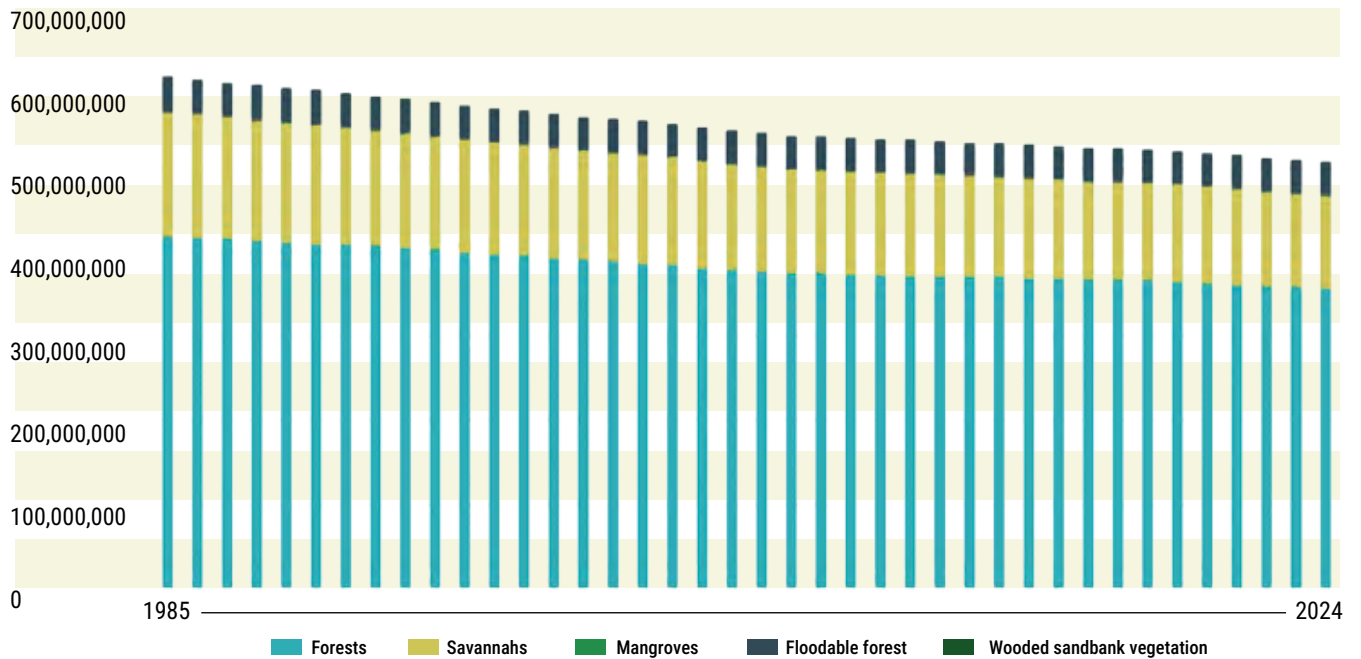
In Brazil, the loss of native vegetation reached 108.4 million hectares between 1985 and 2024, around 47% in the Amazon, in a more significant manner before the federal inspection and control policies that reduced deforestation after 2005. As a result of this process, around 33% of the Brazilian territory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

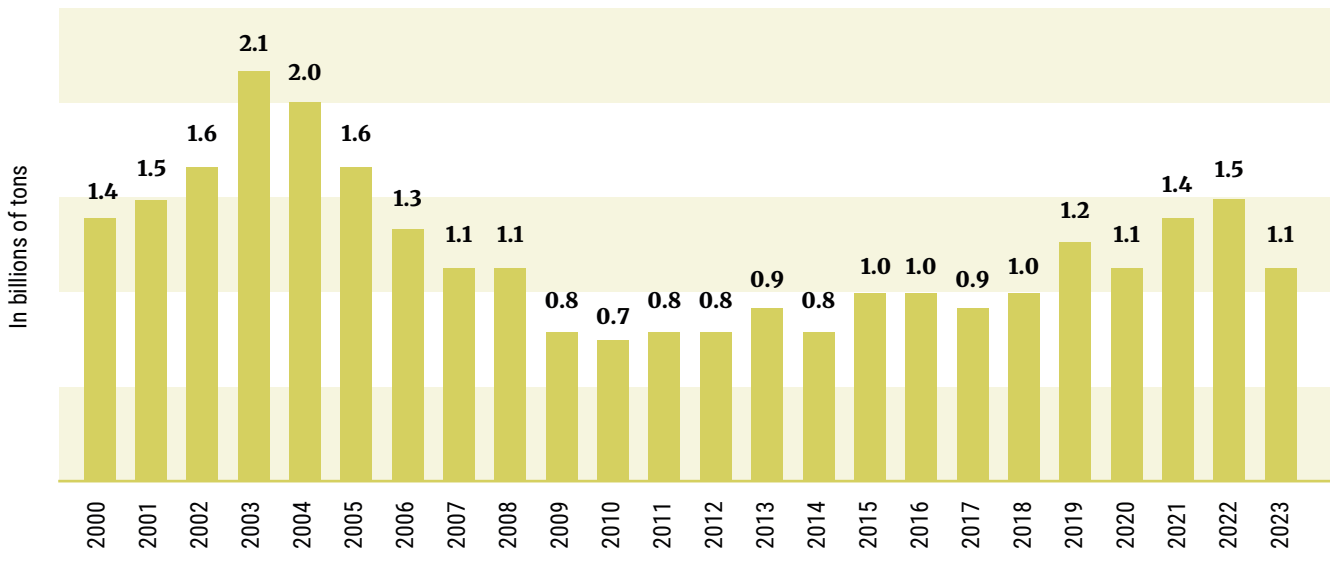
Changes in land use, due to deforestation, are the main sources of greenhouse gas emissions in Brazil. Containing the loss of native vegetation

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 CO₂e was emitted in the Legal Amazon region, which represents 48% of Brazil’s emissions that

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



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 the carbon stock in the planet's forests, including carbon in the soil, totals 3,111 gigatons of CO₂e.⁴ Of this total, 65% are found in tropical forests, with around 45% in the Amazon and the Atlantic Forest (Source: MapBiomass). In Brazil, the Amazon biome accounts for 85% of the total forest carbon stock. According to the IPCC, 440 to 730 tCO₂/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.

LEGAL CERTAINTY AND NEW TECHNOLOGIES AGAINST DEFORESTATION

Brazil has already demonstrated it has the institutional capacity to fight deforestation, but command and control, however effective in the field, has its limits. In addition to the difficulties at the federal level, the system depends on the political will and the institutional and financial capacity of the states, for example. Added to this are the risks of legal uncertainty regarding environmental frameworks and political contexts that influence actions.

Conventional control measures alone are not enough, especially when looking toward the zero-deforestation target. As a way to increase the efficiency of deforestation control, Brazil is seeking mechanisms that go beyond inspections at farm gates. Brazil has developed the ability to map areas, size, and location within municipalities, but there is a challenge in further refining digital innovations to verify what is legal or illegal and involving the rural credit system and other financial agents, enabling control at scale.

In view of this, the Ministry of the Environment and Climate Change (MMA) has begun to adapt regulations and the legal framework to the use of this technological tool, for example, for automatic embargoes on properties that deforest. In this regard, Resolution No. 510 of the National Environment Council (Conama) was approved, which mandates the integration of data, transparency, and cross-referencing of the Rural Environmental Registry (CAR) with deforestation polygons on a single public electronic platform.

In effect since March 2026, the regulation fosters dialogue with the states to accelerate its implementation so that the Public Prosecutor's Office, bank managers, and companies that restrict products without sustainable origin can check whether a given deforestation activity is authorized, within the criteria of the Forest Code.

Meanwhile, Brazilian Institute of the Environment and Renewable Natural Resources (Ibama) has changed its procedures for sanctions and can now simultaneously embargo several irregular areas within the same territory in a single administrative process, which reduces the working time of employees and increases the chances of punishment. Approximately 200,000 deforestation polygons are detected annually, with a liability rate between 10% and 20% due to the sluggishness of the traditional system when carrying out a separate process for each polygon.

With artificial intelligence mechanisms and agile and transparent data on embargoed areas, Ibama estimates it will triple its inspection capacity. In practice, the model transforms rural credit managers in Brazil into "inspectors" of deforestation, given the Central Bank rules that require banks to only provide subsidized credit to those who have not deforested since July 2019. It is necessary to present the respective vegetation suppression authorization or regularize with the Environmental Recovery Plan (PRA) in order to access financing. The Ministry of the Environment (MMA) coordinated three changes in the National Monetary Council's rules on the subject, with strong support from the Ministry of Finance.

DISTINGUISHING BETWEEN ILLEGAL AND LEGAL DEFORESTATION

The new Conama resolution also supports traceability agendas to guarantee legal origin in markets and subsidized funds that are currently channeled to agriculture and livestock farming without specific requirements regarding deforestation. This issue impacts the conservation agenda and the ambition for zero deforestation, which involves eliminating both illegal and legal suppression, and can be achieved through significant reductions via financing strategies.

In Brazil's Nationally Determined Contribution (NDC) under the Paris Agreement, the Ministry of the Environment (MMA) is working on the following scenarios: the transition scenario, which is the reduction of 50% in the rate of legal deforestation by 2030; the ecological transformation scenario, which foresees a 75% reduction; and the forest restoration scenario. The government expects that, starting in 2030, the total area of native vegetation cover per biome will stabilize, with net zero deforestation. According to the Ministry of the Environment, the remaining areas of illegal deforestation, plus the remaining areas of legal deforestation, will need to be offset by regeneration.

Mechanisms that use Artificial Intelligence (AI) to automatically apply environmental sanctions help in the process, including predictively defining areas at risk of future deforestation, as in the PrevisIA system (Imazon). In this way, preventive monitoring allows properties to be guided before the infraction occurs. Today, using new technologies, Ibama sends notifications for preventive action against fires. In



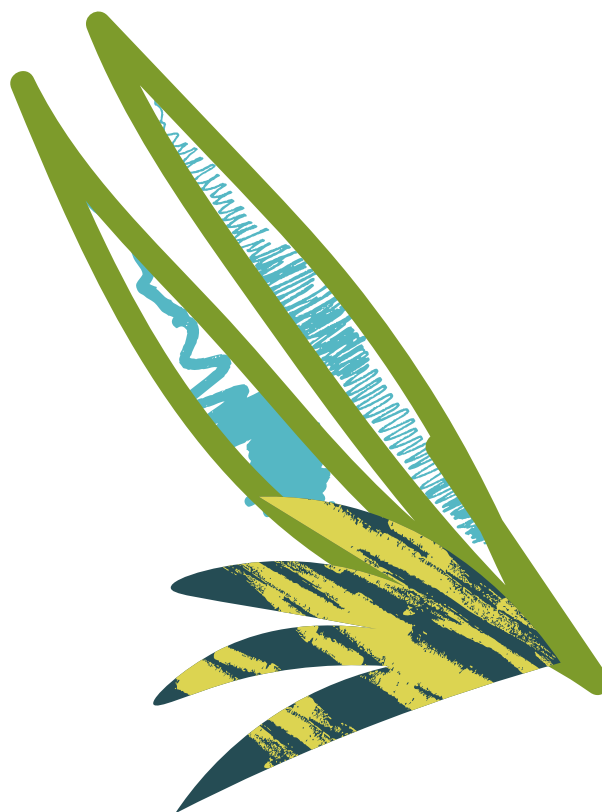
2022, 7% of the forest was destroyed by fires in the Amazon. In 2023 and 2024, this indicator increased, and in 2025 it reached 38%. Given this situation, the National Policy for Integrated Fire Management was approved, providing for resources and prevention and control plans undertaken by states, rural landowners, and Indigenous peoples, with an emphasis on territorial planning and the coordination of projects and initiatives among sectors.

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.

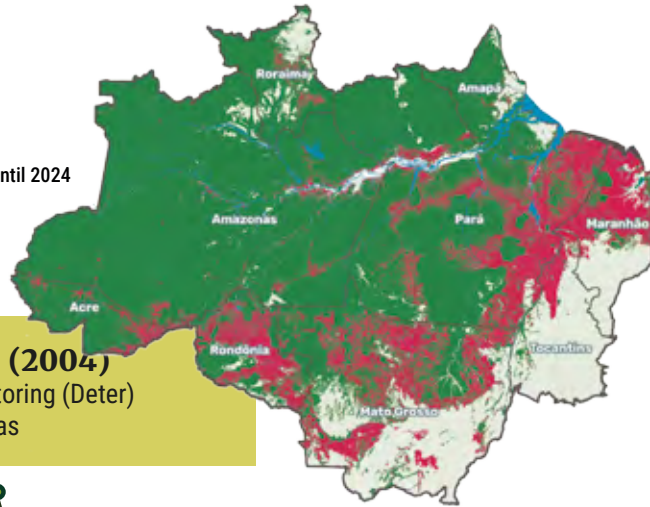
The rate of primary forest deforestation in the Legal Amazon fell from 13,038 km² in 2021 to 6,518 km² in 2024, according to the National Institute of Space Research (INPE). The accumulated total reached 857,339 km² by 2024 – that is, an accumulated loss of 20.6% of the original forest cover. The state 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 environ-



DEFORESTATION CURVE

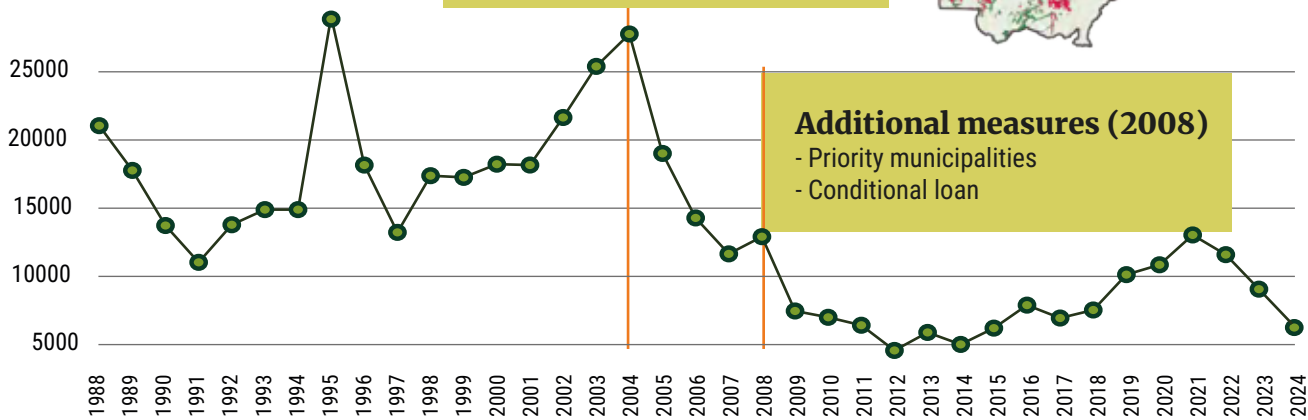
Deforestation rates respond to public policies to fight them

- Forest cover
- Deforestation until 2024
- Non-forest
- Main rivers



POLICIES TO FIGHT DEFORESTATION IN THE AMAZON

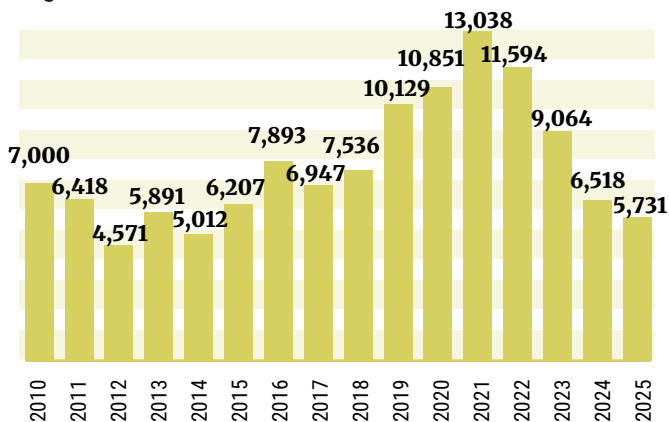
Deforestation rate (km²/year)



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

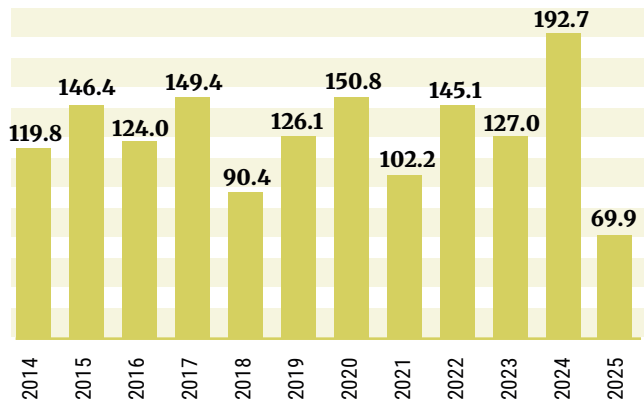
DEFORESTATION AND HOTSPOTS IN RECENT YEARS

Deforestation (in km²) in the Legal Amazon region – 2010-2025



Source: based on data from Inpe.

Number of hotspots (in thousands) in the Legal Amazon region – 2014-2025



Source: based on data from BDQueimadas, Inpe.



mental 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.

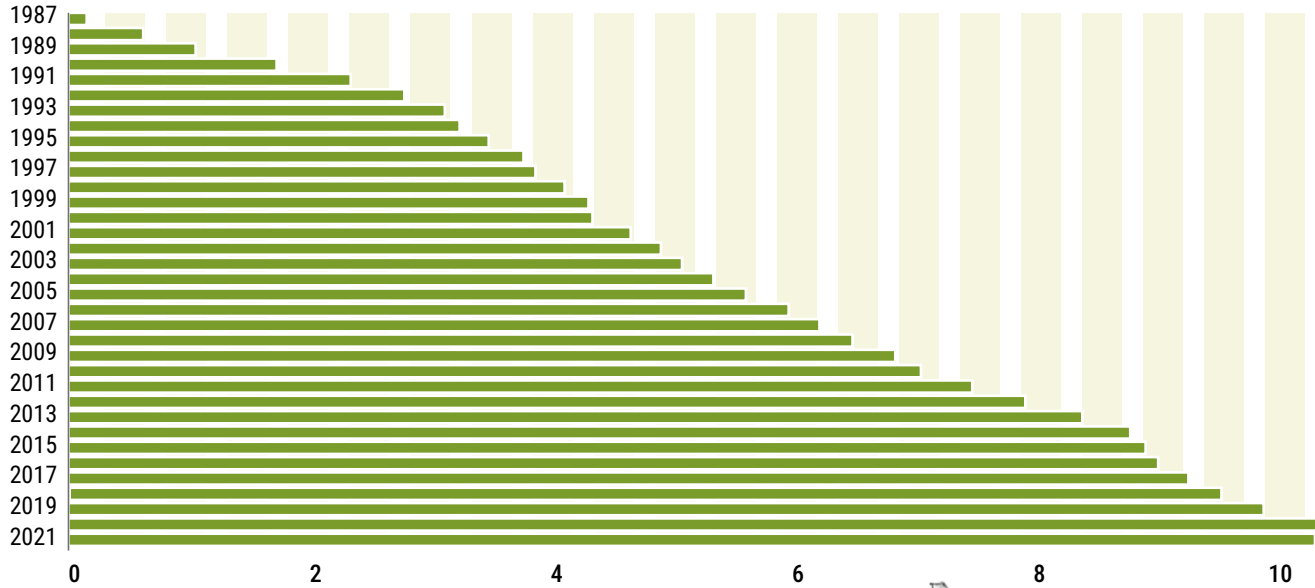
A FOREST THAT REGENERATES ITSELF

According to MapBiomass, secondary plant cover – that is, the area that was previously deforested and

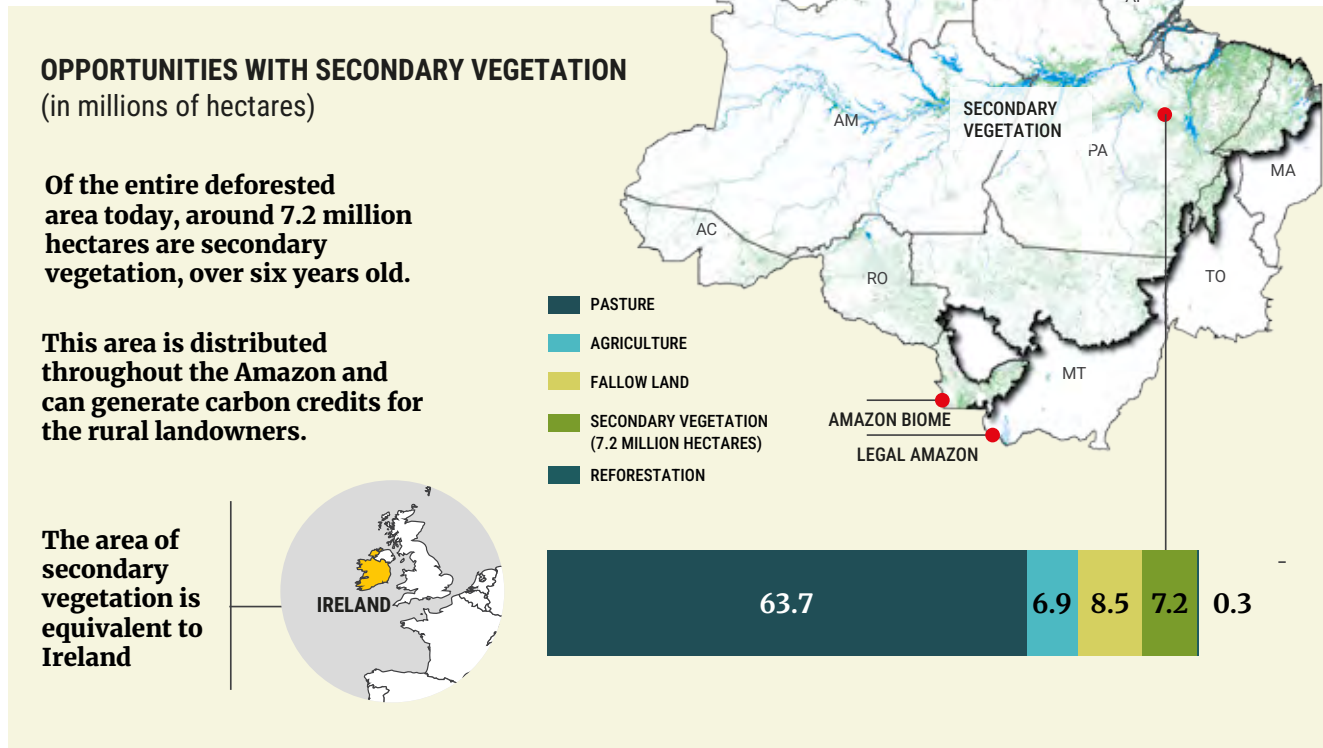
is in the process of natural regeneration – totals 6.9 million hectares in the Amazon, 2% of the region's native cover, in the past decade. Most of it occupies areas with low agricultural potential, without competing with the cultivation of grains and other foods, and represents opportunities for forest 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 (MapBiomass). 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: MapBiomias



Source: Amazon 2030



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 215 million hectares of conservation on private properties, 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.

In addition to the lack of validation of the Rural Environmental Registry (CAR) by the states, in rural properties the problems in conservation are evident in the disregard for Permanent Preservation Areas and Legal Reserves, which need to be adequately protected, cared for, and even have a sustainable use directed within environmental criteria, according to the Forest Code.

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*) initiative⁵, 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.

THE SITUATION OF CAR IN BRAZIL

Class	AREA IN HECTARES			
	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



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.

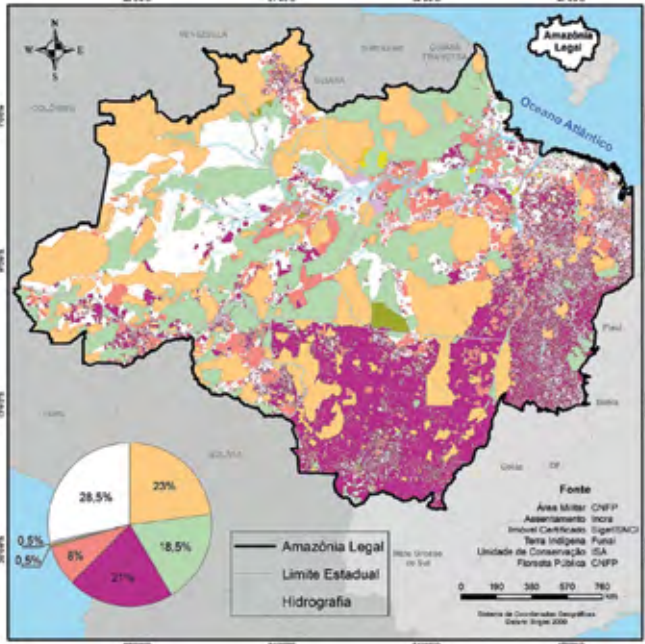
TERRITORIAL STATUS OF THE LEGAL AMAZON

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.

According to the 2024 National Register of Public Forests, the total area of non-designated public lands in the Amazon covers 50.9 million hectares. The designation of these areas – as Conservation Units, Indigenous Lands, forest concession areas, and jurisdictional REDD+ projects – is a prerequisite for managing deforestation in the Amazon.

Non-designated public lands cover 50.9 million hectares in the Amazon, according to the 2024 National Registry of Public Forests. Designating



SITUATION IN THE LEGAL AMAZON

LAND SITUATION	HECTARES	PERCENTAGE OF THE LEGAL AMAZON (%)
Indigenous land	115.092.052	23
Private property	105.324.702	21
Conservation unit (except environmental protection area)	92.543.383	18,5
Settlement project	39.219.596	8
Military area	2.669.359	0,5
Public forest	2.039.035	0,5
Quilombola community territory	969.208	*
Total non-designated areas or areas with no designation information	143.649.502	28,5
Total designated areas (excluding overlaps)	357.857.335	71,5
Legal Amazon total area	501.506.837	100

*Percentage lower than 0.2% Notes: The Legal Amazon encompasses parts of the Mid-West and Northeast regions. The data considered includes Non-designated Public Forests, areas with no designation information, unregulated deforested areas, and the Cerrado areas.

Source: 10 Fatos Essenciais sobre Regularização Fundiária na Amazônia Legal (10 Essential Facts about Land Regularization in the Legal Amazon). Authors: Brenda Brito, Jeferson Almeida, Pedro Gomes, Rodney Salomão – Imazon

these areas as Conservation Units, Indigenous Lands, forest concession areas, and Jurisdictional REDD+ projects, is a condition for managing deforestation 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.

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.

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

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.

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.

Following the launch of the National Bioeconomy Development Plan (PNDBio), initiatives are being developed to implement it in practice, such as the Prospera Sociobio call for proposals, led by the Ministry of the Environment (MMA) and aimed at establishing local networks, providing technical support, and implementing concrete actions in the territories. This model is aimed at offering integrated services to strengthen the sustainable business ecosystem, with the activation of six Sociobioeconomy Development Centers in the Amazon that combine low-carbon economy with nature-based solutions and the inclusion of Indigenous peoples and traditional communities.

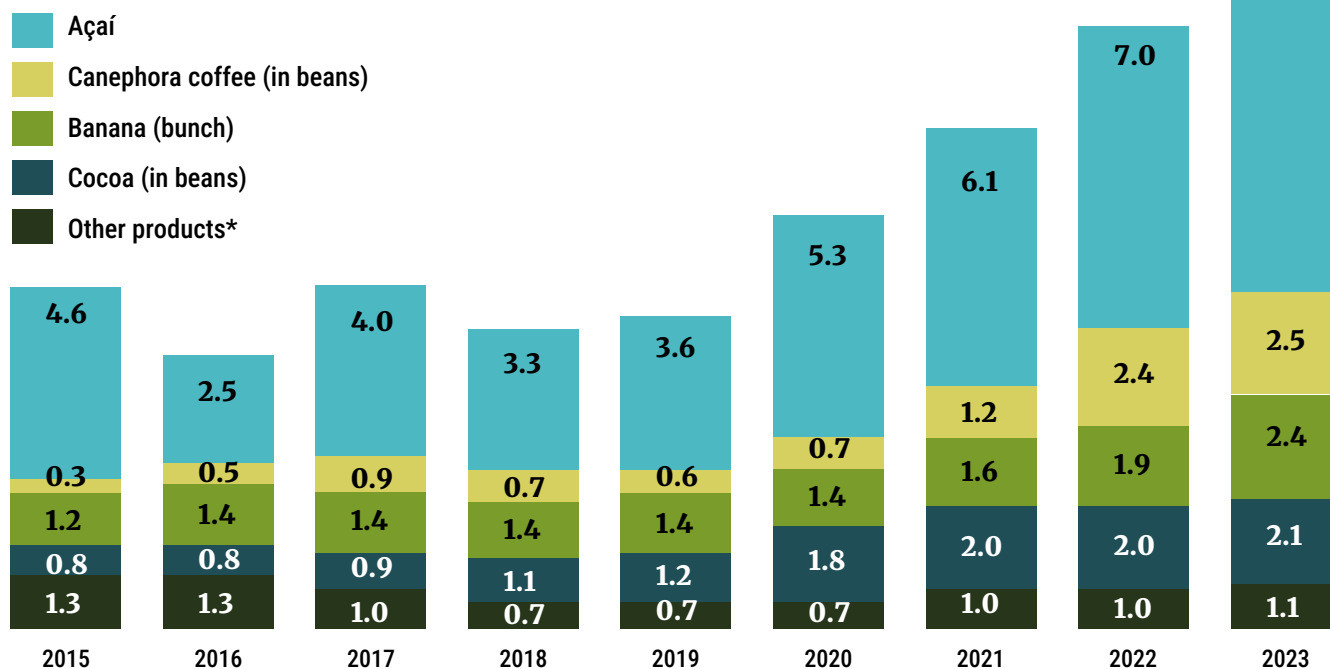
FRAMEWORK FOR BIOECONOMY IN THE AMAZON (SUMMARIZED VERSION)

	Sociobioeconomy (based on sociobiodiversity)	Forest-based bioeconomy (based on forest management)	Agrobioeconomy (based on commodity production)
Current predominant activities	<ul style="list-style-type: none"> • Extractivism • Non-extractivism • Subsistence farming • Fishing 	<ul style="list-style-type: none"> • Forestry of native species 	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Production method compatible with the maintenance of CO₂ stock • High resistance to the effects of climate change 	Production method compatible with the maintenance of CO ₂ stock	<ul style="list-style-type: none"> • Replacing fossil-based fuels and materials potentially reduces emissions, but large-scale production puts pressure on forest conversion (e.g., açai 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	<ul style="list-style-type: none"> • 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) 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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) 		



AMAZON BIOECONOMY PRODUCTS AND THEIR STILL UNDERUTILIZED POTENTIAL

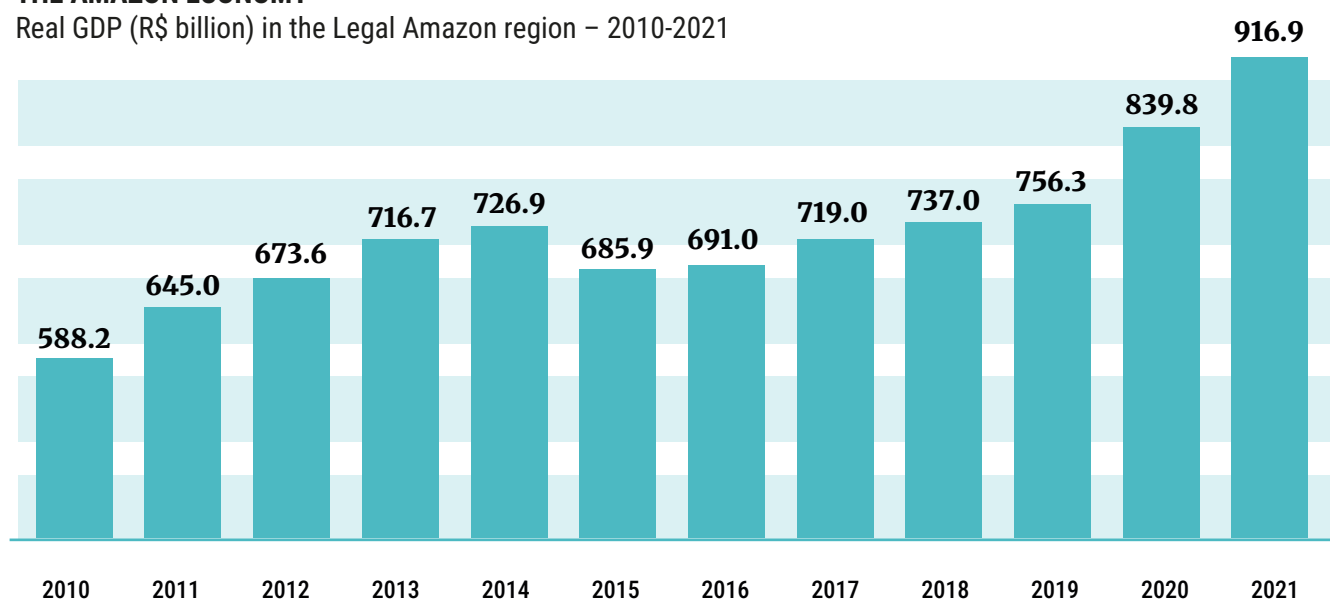
Production value per year (R\$ billion)



Source: Fatos da Amazônia - edição COP30

THE AMAZON ECONOMY

Real GDP (R\$ billion) in the Legal Amazon region - 2010-2021



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 chapter*).

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



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 tCO₂e

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

(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

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 chapter*). 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.

Brazil has a world-leading legal framework for forest conservation, but continued monitoring and effective measures are needed to ensure its implementation.

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



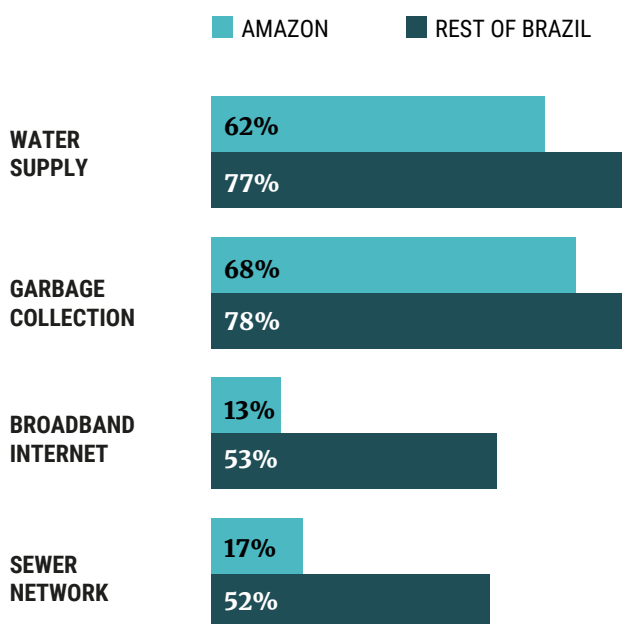
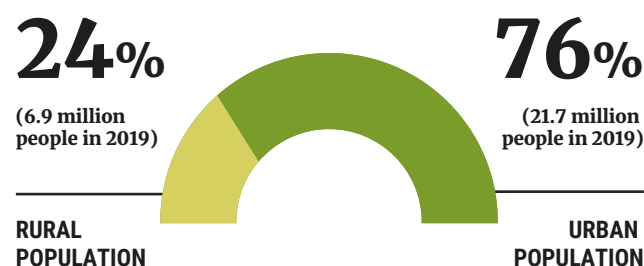
to children and the elderly. However, in the current lack of opportunities, the advantage could become a problem. Currently, around 40% of the population between 25 and 29 years of age in the region is out of the job market. In addition, violence has been steadily increasing in the region since the early 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 to 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 with the fight against deforestation – at current rates, the Amazon is today the largest source of greenhouse gases in Brazil and could unbalance Earth's climate, even though 72% of global emissions come from the burning of fossil fuels, although there are questionings about the use of forest credits as offsets.

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 the Brazilian portion represents one-third of the world's tropical forests, while the Pan-Amazon region (which includes other countries) represents half of them.

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.

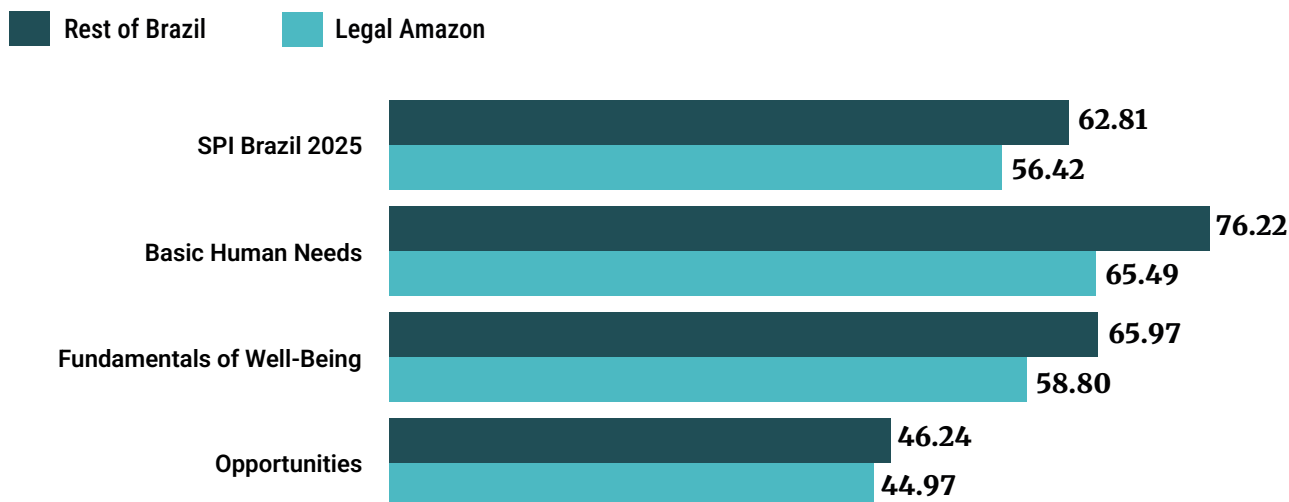
The first includes carbon credit mechanisms, generated, for example, through Reducing Emissions from Deforestation and Forest Degradation (REDD) projects, whereas the second provides for innovative financing formats such as the Tropical Forests Forever Fund (TFFF), conceived by Brazil during COP 28, 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 bio-economy 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.



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

1

2

3

Deforestation

PROBLEM
Brazil and the Amazon have deforested a lot and in a disorderly manner.

OPPORTUNITY
Production can be increased with only the area that has already been deforested for livestock and agriculture.

Emissions

PROBLEM
The Amazon is Brazil's largest source of greenhouse gases and can unbalance the Earth's climate.

OPPORTUNITY
Forest conservation is one of the cheapest and most efficient ways to offset carbon emissions.

Unemployment

PROBLEM
There are 8 million unemployed people in the Amazon, including many young people.

OPPORTUNITY
These people can generate income and wealth with job opportunities and good professional training.

Source: The Amazon Paradox /Amazon 2030

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.

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 – ore prospection, land grabbing, illegal logging, mining – 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.

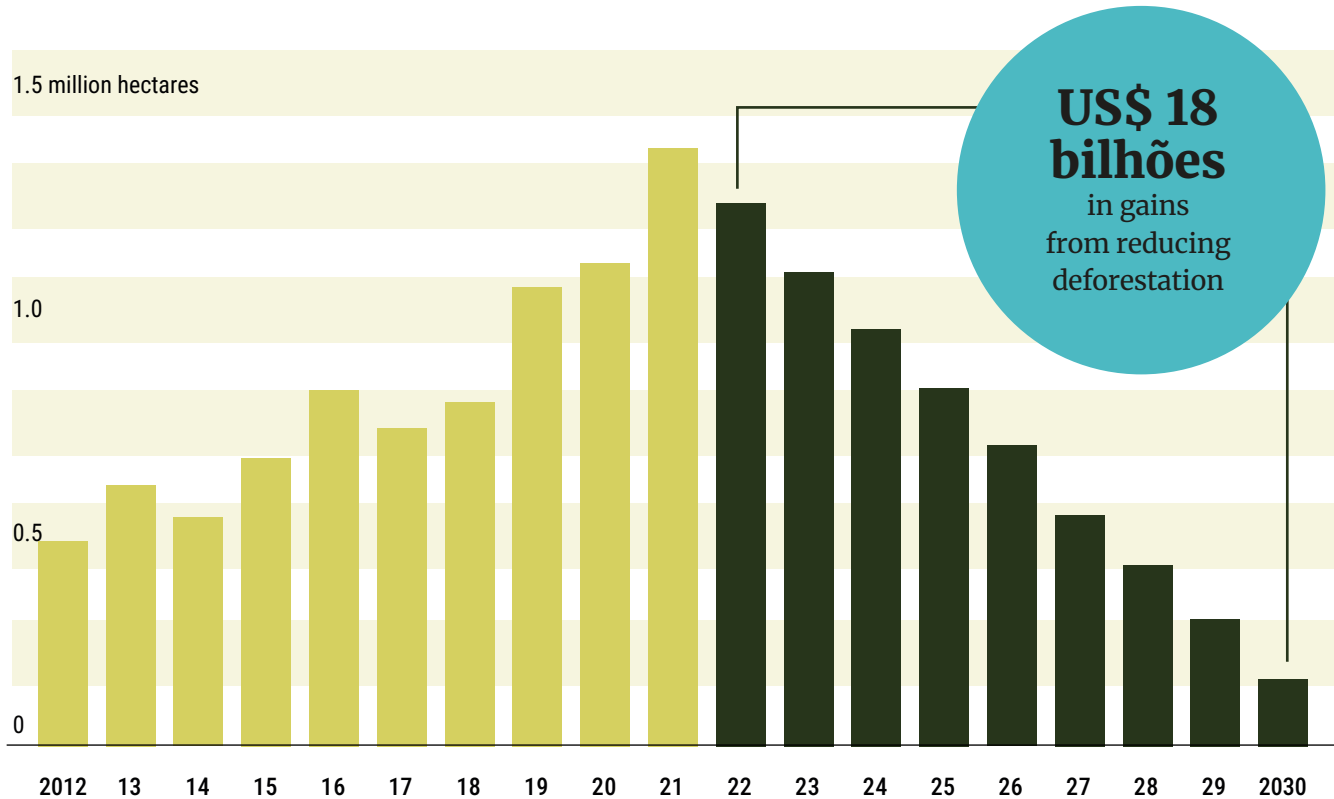
Race To Belém is an initiative launched by the Sylvania fund, in partnership with Conservation International (CI) and The Nature Conservancy (TNC), with Mercuria, one of the largest global organizations operating in the independent energy and environmental products market, as one of its main financiers.

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,

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*



*Note: This is a non-binding projection from LEAF as a buyer, especially because this reduction would not necessarily generate high-integrity credits.
Source: AMZ2030, based on data from Inpe (2022)

which is considered quite conservative). If prices rise to US\$15 per metric ton of CO₂, 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 CO₂ can prevent deforestation and stimulate forest regeneration and capture 16 Gt of CO₂, over the next three decades.

In this scenario, the Amazon would go from being a net source of emissions to an activity with high potential for removing and storing carbon. 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*).



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 MtCO₂e 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.

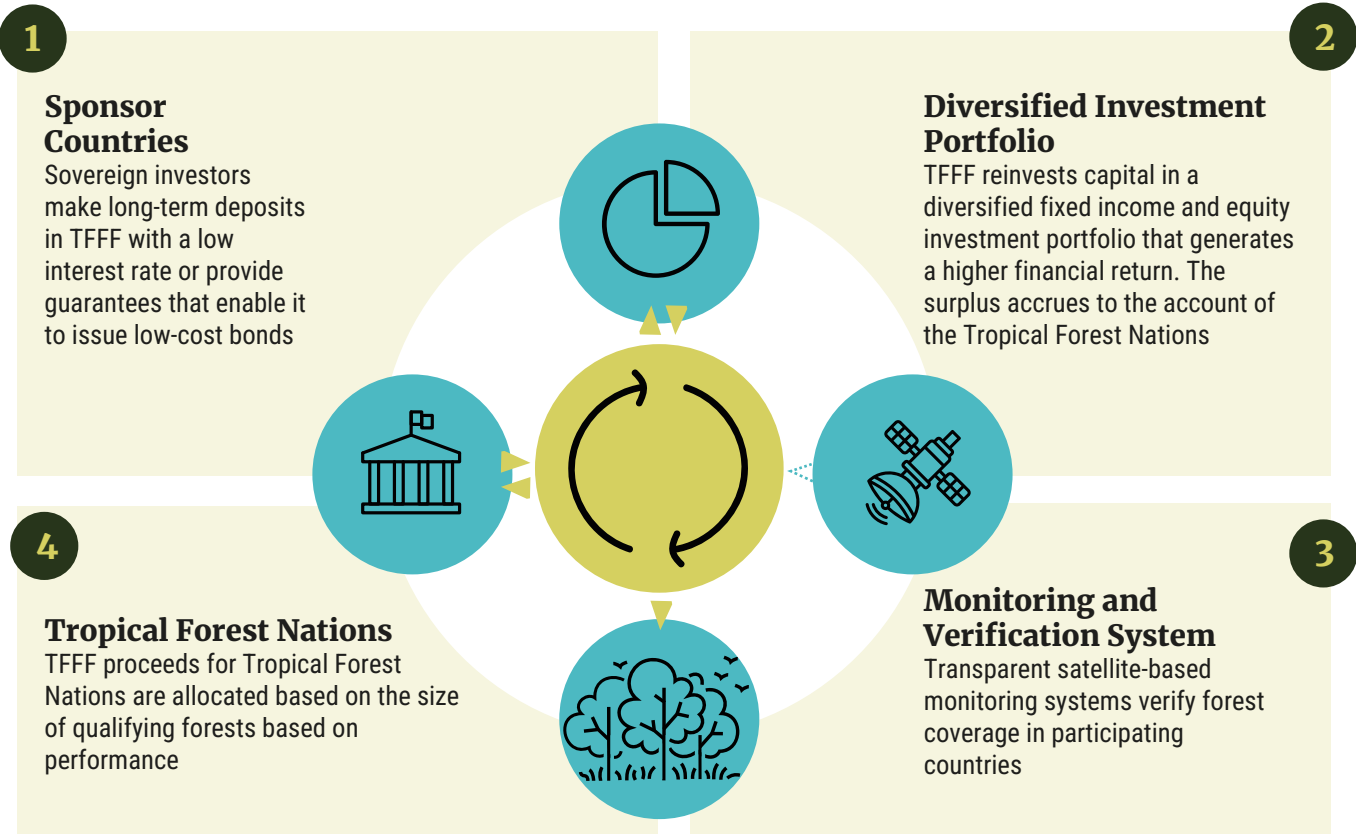
Regarding the reward for protecting existing forests, the most emblematic example is the TFFF, as mentioned before. This is a global investment fund, officially launched during COP 30 in 2025, which is aimed at rewarding investors while allocating a portion of the proceeds to countries that conserve their tropical forests.

The TFFF model, however, faces challenges. This is a complex financial mechanism that involves high risk perceptions and, therefore, according to analysts, it will

not be easy to mobilize capital in an environment of great financial uncertainty. In addition to involving risks that are not fully controlled, there are difficulties and uncertainties regarding the governance of resources.

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

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

government. Although the model is not linked to carbon credits, the logic is simple: reward responsible management and penalize forest loss⁶.

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 2030⁷.

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 (*learn more about the fund on page 182*).



/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 with 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 active restoration in Brazil – mainly carried out using the technique of planting seedlings or seeds. 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.

In addition to active restoration, biomes have a high capacity for regeneration from nature itself, without the need for direct planting of species. The National System for Reporting and Monitoring the Recovery of Native Vegetation, launched by the federal government in 2025, mapped 3.4 million hectares under restoration in Brazil, almost all through natural regeneration in areas that were deforested for some productive activity and then abandoned.

To give an idea of nature's persistence in recovering on its own, according to data from the SOS Mata Atlântica Foundation, in the Atlantic Forest, in three decades, this biome has already recorded approximately 5 million hectares of natural regeneration (*learn more about the Atlantic Forest on page 71*)

The areas of rural properties that need to be restored to comply with the Forest Code (*as mentioned in the Conservation chapter on page 119*), and the large extent of degraded pastures and already deforested land, present a promising scenario for planting new forests. They combine in multiple models and purposes, in light of the forest continuum concept and its different shades of green in Brazilian landscapes.

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.

SITUATION OF BRAZILIAN PASTURES – 2024



LOW VIGOR

Pastures with low forage production and a high presence of exposed soil throughout the year.

21.6%
(33.4 Mha)



MEDIUM VIGOR

Pastures with average forage production and average presence of exposed soil throughout the year.

43%
(66.6 Mha)



HIGH VIGOR

Pastures with high forage production and a low presence of exposed soil throughout the year.

35.4%
(54.8 Mha)



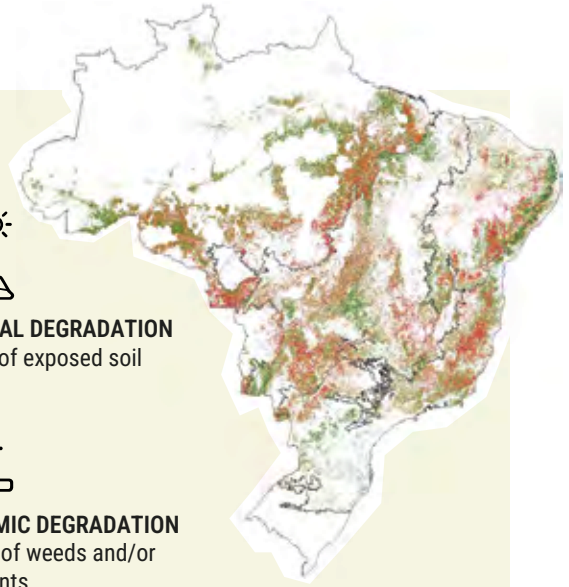
BIOLOGICAL DEGRADATION

Presence of exposed soil



AGRONOMIC DEGRADATION

Presence of weeds and/or native plants



The vigor of the pasture represents only biological degradation, related to the levels of exposed soil. Agronomic degradation, although not directly mapped, may be associated with medium and high vigor levels due to the increased development of shrubs.

Source: MapBiomias

This scenario is reinforced by the implementation of new public policies, academic expertise, and the expansion of collectives and alliances that bring together many 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 forest economics as a vector of development in Brazil.

Currently, Brazil has over 155 million hectares of planted pastures, of which 21.6% (33.4 Mha) have low vigor, that is, they show low forage production and a high presence of exposed soil throughout the year

(MapBiomias, 2025). As these are already converted areas, without native vegetation, these pastures showing signs of degradation represent a locational opportunity for expanding forest occupation, for both the restoration of native forests, agroforestry systems, integrated crop-livestock-forestry systems, and forestry itself, generating economic, social, and environmental benefits.

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

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



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

Players



Stages



Setting



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 diversi-

fication 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. The lack of land regularization and ownership is a huge obstacle to the environmental integrity of carbon credit projects.

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 67 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

Concentrate most of the Forest Code liabilities, also embargoed areas, and include everything from large properties to small rural properties.

Public areas

Conservation Units, agrarian reform settlements, non-designated public areas.

Collective and traditional territories

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.

Brazil has recently approved a resolution recognizing Assisted Natural Regeneration (RNA) as an essential strategy for achieving the target of restoring 12 million hectares by 2030, as provided for in Brazil's Nationally Determined Contribution (NDC) under the Paris Agreement. Approved by the National Commission

for the Recovery of Native Vegetation (Conaveg), the resolution seeks to promote natural regeneration, which is considered a low-cost and highly effective technique, as a primary or complementary strategy in the restoration of ecosystems. The technique creates conditions that enhance natural regeneration processes, with planned interventions to reduce degradation factors and accelerate the recovery of native vegetation¹.

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 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 CO₂ from the atmosphere.

- 12.5 tCO₂e/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 tCO₂e/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 tCO₂eq/ha
for preserved areas*

*According to Iba's inventory.



CARBON REMOVAL

12.5 tCO₂eq/ha/year
is the average removal in restoration



6.7 tCO₂eq/ha/year
in Agroforestry Systems (SAF)

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: Bracalioni et al., 2022. <https://repositorio.usp.br/item/003084978>

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/tCO₂e to US\$20–25/tCO₂e 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 m³ of timber and R\$ 776.5 billion in net revenue

RESTORATION PROGRESSES IN PUBLIC LAND CONCESSIONS

The public forest concession model, implemented in Brazil in the past few decades and initially focused on the sustainable management of timber, has reached the frontier of restoring degraded areas, seeing carbon as an asset. Following the pioneering work of the Triunfo do Xingu Recovery Unit, in Altamira (state of Pará), created in 2025 by the State of Pará, at the beginning of 2026, there was the first federal auction of a public forest for restoration: the Management Unit II of the Bom Futuro National Forest, in the state of Rondônia. Following a bidding process, the company re.green won the concession. This project, led by the Brazilian Forest Service, involves the management of 51,200 hectares over 40 years by the winning company, including the restoration of 6,300 hectares of degraded areas.

These are territories that were once marked by illegal activities and degradation, and are now becoming the leading players of a new economy – that creates jobs and generates income, restores forests, sequesters carbon, and protects biodiversity and traditional peoples. In the state of Pará, the state-level public-private initiative for the concession provides for the restoration of an initial 10,000 hectares and the capture of 2.87 million metric tons of carbon credits over 40 years, creating around 4,000 jobs. The area comprises non-designated public lands that were targets of land grabbing and deforestation in the past, now regularized and undergoing a process of deintrusion to remove the intruders.

Concession models on public lands for these purposes are strategic in the land use, conservation, and climate agendas, with the challenge involving

RESTORATION VERSUS EXTENSIVE LIVESTOCK FARMING

A study conducted by TNC and IDB Invest estimates that restoring 10% of the approximately 27 million hectares of degraded areas in the Amazon would generate a significant economic return, with a large annual volume of carbon removal. This scenario could generate an income of up to US\$675/hectare/year, as a profitable alternative to extensive livestock farming.

ASSUMPTIONS IN THE PRODUCTION MODEL

RESTORATION



AVERAGE IN XINGU
TCO₂E/HA/YEAR
9.94

US\$348

ARR CARBON
CREDIT PRICE:
US\$ 35/tCO₂e

EXTENSIVE LIVESTOCK FARMING



PRICE PER ARROBA
(33.07 LB) IN PARÁ*
R\$ 292.50
(US\$48.67)

*In December 2024

WEIGHT TYPICALLY
USED FOR SALE:
20 arrobas

US\$324

YEARS NEEDED TO
REACH THE WEIGHT:
3 years

PASTURE DENSITY:
**1 head of
cattle per
hectare**

Note: ARR (Afforestation, Reforestation and Revegetation) carbon credits are generated by removing CO₂ from the atmosphere through planting forests or restoring degraded areas.
Sources: TNC and IDB Invest

initial experiences in overcoming obstacles to this new category along the way and serving as a reference for the arrival of incentive instruments and scaling up forest restoration through this concept. With technical support from TNC Brasil to the government of the state of Pará, the land and environmental regularization process to enable the concession identified the existence of 3 million hectares of public lands suitable for expanding the model as a factor of territorial development.

In addition to generating local income opportunities by increasing the value of standing forests, concessions play a significant role in facilitating the arrival and improvement of public services such as education, health, and sanitation, among other infrastructure services that are essential to quality of life. This model, however, faces challenges, such as the need for greater openness and flexibility involving other public-private partnership models applicable to the management of these areas. Along with land regularization, the effective protection of the area by the concession authority is key. Also important are instruments of guarantees and compensation related to losses for investors in the event of changes in command-and-control policies.

Continuous control by public authorities over illegal activities becomes essential, especially regarding the exploitation of illegal timber in the unfair competition with the carbon market, which is associated with conservation. Equally strategic is the creation of tax incentives for forest concessions for sustainable use and restoration, for example, within the scope of the Superintendency for the Development of the Amazon (Sudam) (*learn more about the challenges involving concessions and access to land on page 162*).

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, 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 coordination 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 CO₂ 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.



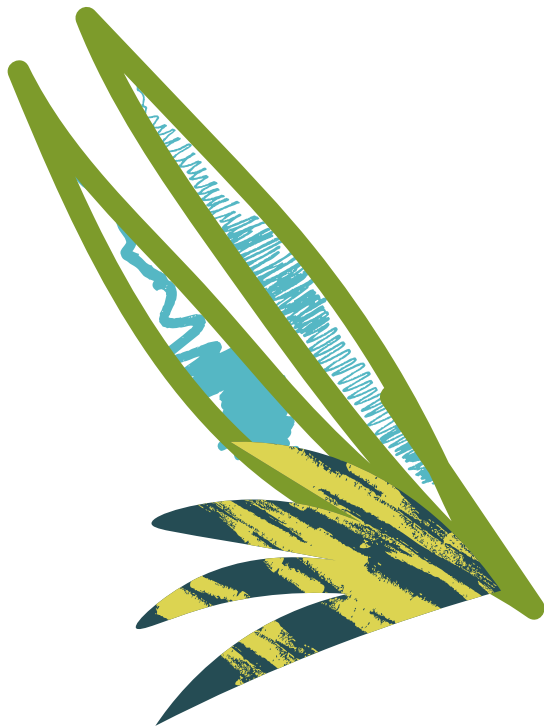
GOVERNMENT PROGRAMS RELATED TO FOREST RESTORATION

- 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



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.

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 initiative 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

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 Forest Restoration Pact and other regional restoration collectives, and the Brazilian Coalition on Climate, Forests and Agriculture.

Among its initiatives, Floraz positions itself as a knowledge hub that connects different audiences and interests around a common goal: scaling up the restoration of Brazilian biomes. Supported by companies from the sector and financial institutions, the initiative seeks to work collaboratively and strategically, mobilizing companies, investors, and partner institutions in integrated action fronts and gathering scientific articles with qualified information for decision-making.

The movement promotes solutions in Operations, Finance, Agribusiness, and Advocacy, considering these to be key agendas for unlocking investments, and scaling up and consolidating restoration as an economic and environmental asset for Brazil.

In this scenario marked by cooperation, the Forest

Restoration Observatory plays a key role in the challenge of collecting indicators and monitoring the expansion of this new frontier, thereby informing decision-making by governments, academia, civil society organizations, and companies.



MAJOR BUSINESS INITIATIVES ACCELERATE THE INDUSTRY'S LEARNING CURVE

Biomes and Carbon2Nature: In 2025, the companies Biomas and Carbon2Nature Brasil announced an unprecedented partnership to recover more than 1,200 hectares of Atlantic Forest in areas owned by Veracel Celulose, in the south of the state of Bahia. The Muçununga Project will involve the planting of 2 million seedlings by 2027. More than 100 native species have already been planted, such as araca, copaiba, 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 around 500,000 metric tons of carbon from the atmosphere, generating high-integrity credits. This initiative will contribute to the mitigation of climate change and the social transformation of the region: in addition to the direct jobs that are created, 14 nearby communities will receive initiatives aimed at generating income and social well-being.

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 CO₂ 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: A company focused on large-scale, high-integrity removal of carbon from the atmosphere. It has a portfolio of different removal solutions, including technological methodologies (such as Enhanced Rock Weathering) and nature-based methodologies (such as biodiverse reforestation). Its best-known business model is based on the reforestation of deforested areas in the Brazilian Amazon with more than 100 native species, 16 of which are threatened. Mombak has already raised about R\$ 1.5 billion, through both equity and debt, from some of the world's most sophisticated investors, including Bain Capital, CPPIB (a Canadian pension fund), Rockefeller Foundation, AXA (now part of the BNP Paribas Group), the National Bank for Economic and Social Development (BNDES), and the World Bank. Among its clients are some of the most demanding buyers in the removal market, such as Microsoft, Google, and McKinsey, and it is Google's largest supplier of removal credits in the world. Mombak has planted about 15 million trees in the Amazon to date, across 12 projects in the state of Pará.

Symbiosis: Symbiosis positions itself as a benchmark in native forestry associated with timber production, biodiversity restoration, and the carbon market in the south of the state of Bahia, and has Apple as a business partner. After a pilot project on 1,500 hectares, the planting area was expanded to 5,000 hectares across 13 ranches occupied by degraded pastures in the Atlantic Forest. The core business revolves around native wood intended for high-end uses in civil construction and other segments, and it uses carbon as a strategy to accelerate investments in initial plantations. In the 5,000 hectares planned in this partnership, the expectation is to capture 1 million metric tons of carbon over 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.



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 (*learn more in the Forestry chapter*), 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 animals².

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 se-

quencing 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.

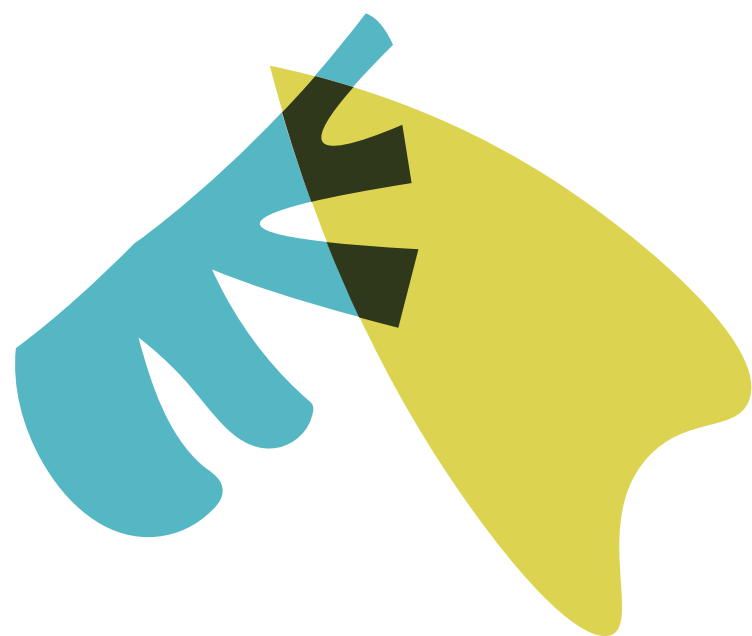
This makes the tropicalization of certification systems important, causing tropical production models to be incorporated into international systems. Furthermore, technical training for national auditors, financing for the development phase and dialogue with certification bodies should be promoted, as 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 temporalities³.

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

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.



nature of carbon assets and price volatility, drives 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 chapter*).

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 used⁴.

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 interaction 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.

In the public area concession category, the vision of the future is that the system will be more functional, developed, and consolidated. Of the total public forest area until March 2026, approximately 2.5 million hectares have been granted in concessions and 3.7 million hectares were in the structuring phase, totaling 6.2 million hectares in federal and state public concession programs, according to information from the National Registry of Public Forests (CNFP) of the Brazilian Forest Service. Of that total, almost 5 million hectares were designated for forest restoration and 1.2 million hectares for sustainable management.

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.

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.

HOW TO UNLOCK INVESTMENTS IN RESTORATION

A document by Uma Concertação pela Amazônia (Amazon Concertation) and “Amazon 2030” proposes priority actions for the region.

Recognizing the forest – both conserved and restored – as an economic and financial asset is fundamental to attract investments that are compatible with the scale of the climate challenge and biodiversity loss. Restoration, integrated into the forest continuum, contributes to structuring carbon markets, socio-biodiversity value chains, and innovative financial instruments, without deforestation.

In order to propose priority actions and guide decisions for this agenda over the next five years, a document produced in partnership with Amazon 2030 within the framework of Route 26-30 – an initiative led by the Uma Concertação pela Amazônia

(Amazon Concertation) network – presents key points regarding forest restoration and its role in consolidating a nature-based territorial development model.

This debate highlights the need to identify restoration potential, strengthen territorial governance, and structure inclusive territorial production arrangements, integrating Indigenous peoples, traditional communities, and small- and medium-sized farmers and cattle ranchers into practices for regenerating and recovering degraded areas. Integrating forest restoration with already established agricultural and livestock farming landscapes is essential.

In the financial field, the document proposes expanding the investment portfolio beyond carbon, recognizing and valuing other ecosystem services. Among the points of consensus in the agenda is the pursuit of connecting non-reimbursable resources (donations/cooperation/public funds) with reimbursable instruments (credit and private investment), reducing risk and achieving economies of scale.

In this scenario, three priority actions are recommended to unlock investments in restoration in the Amazon region:

Action 1.

Ensure a land stock and a legal and institutional framework for large-scale restoration

PROPOSALS:

- Identification of viable territories for large-scale restoration
- Land regularization and asset security as a prerequisite for investment
- Centralized coordination and creation of a National Restoration Authority within the Office of the Chief of Staff
- Implementation of PlanaVeg as a territorial instrument
- Consolidation of public forest concessions and public-private partnership models
- Restoration in Indigenous territories: direct financing, governance, and territorial protection
- Land reform settlements and small- and medium-sized entrepreneurs as the basis of the scale

Action 2.

Structure innovative economic, financial, and market instruments to value the ecosystem services of restoration.

PROPOSALS:

- Connection of non-refundable resources with the productive investment rationale, creating an integrated financial architecture
- Expansion of the base of federal financial resources and the use of climate credit and repayable capital
- Consolidation of the carbon market as a bridge between conservation and restoration
- Recognition of territorial protection and natural regeneration as eligible restoration investments

Action 3.

Develop productive, technological, and territorial capacities for the restoration industry as an economic activity.

PROPOSALS:

- Technological development for native species and restorative systems
- Sharing of knowledge, data, and open innovation for restoration
- Structural combat against illegality and strengthening of forest certification
- Diversification of business models and development of new forestry markets
- Qualification and professionalization of restoration territories
- Work fronts in restoration and fighting against poverty

The contribution of Brazilian biomes to restoration policies and initiatives

GIVEN THE DIVERSITY AMONG THEM, IT WILL BE NECESSARY TO PAY CLOSE ATTENTION TO THE PARTICULAR CHARACTERISTICS OF EACH ONE

As an economic activity, the forest restoration sector is a rising star. This is a long-term, capital-intensive agenda, but one that is already operating with large projects primarily aimed at the carbon credit market, especially in the Amazon and the Atlantic Forest biomes. For the other biomes, a closer look at the particularities of each one of them will be necessary, in addition to the production of more scientific knowledge and the reconciliation with conservation strategies.

In the Atlantic Forest, in particular, the forest restoration agenda is imposed by a combination of factors. The first of these factors is the fragmentation of forest areas, concentrated in the hands of private owners, many of whom are in violation of the Forest Code. Another reason is the existence, since 2009, of the Atlantic Forest Restoration Pact, a multi-sector coalition that works to induce the ecological restoration of ecosystems on a large scale. The third reason is the selection of this biome as one of the 10 global flagship regions of the UN Decade on Ecosystem Restoration (2021-2030).

The Atlantic Forest Restoration Pact has the ambitious target of enabling the recovery of 15 million hectares by 2050. Through its 370 members and presence in the 17 states of the biome, the Pact has been consolidating itself as a benchmark in the coordination and integration of the different social players and in the strengthening of actions to promote reforestation. It is a collaborative model involving NGOs, research institutions, the private sector, associations and joint bodies, and public bodies, which work in a collaborative way to promote restoration. In addition to multi-sector coordination, the Pact also works on the production and systematization of knowledge about the restoration of the biome and on the monitoring of activities.

One example is the Pact's geospatial platform, which, in the first quarter of 2026, totaled 135,600 registered hectares. This is a tool based on the WebGIS system for recording and monitoring restoration actions, including their geographic location and the restoration methodologies used.

According to an article recently published by researchers who are part of the Pact, 1.67 million hectares of native forest were recovered in the Atlantic Forest between 2011 and 2021 and persisted until 2023; another 568,000 hectares of forests recovered during the study period did not persist until 2023, highlighting the vulnerability of young forests and the need for effective protection after restoration processes. The research assessed forest recovery across the entire Brazilian Atlantic Forest biome using high-resolution (~30 m) annual land cover maps.

Strengthening legislation and incentive mechanisms, such as Payment for Environmental Services (PES), is fundamental for the protection of recovering forests. Since most recovered forests probably result from natural regeneration, the Pact's findings highlight its strategic role in enabling large-scale, cost-effective restoration in Brazil.

Although there are challenges to implementing the Pact's actions – including the scale of implementation, since the areas are fragmented; long-term financing, training and technical assistance – the movement remains committed to strengthening the production chains associated with restoration. In parallel, it seeks to mobilize large-scale public and private investments, maintain a communication channel for the public, and improve the registration of areas on the geospatial platform, so that the tool becomes a reference for monitoring areas undergoing restoration in the Atlantic Forest. The goal is to expand restoration to an additional 14 million hectares, so that the Pact's target can be reached within the next 24 years, and as a contribution to achieving the targets of the Paris Agreement.

The conservation and restoration of coastal environments complement forest strategies in the continent, expanding Brazil's potential for climate mitigation. Integrating mangroves and restingas into conservation policies, ecological restoration, and carbon markets represents a strategic opportunity to strengthen Brazil's role as a global leader in nature-based climate solutions.

PLAIN AND PLATEAU

In the Pantanal, the enforcement of the Pantanal wetlands conservation hinges on the challenge of restoring the protected areas of the Upper Paraguay River Basin (BAP) springs, especially in the plateau region. The biome's wetlands and floodable soils are reservoirs of organic carbon, and the conservation of these systems is independent of the presence of forests. The preservation of the Pantanal is inseparable from the global climate agenda due to its high capacity for providing ecosystem services.

On the Upper Paraguay River Basin plateau, restoration strategies can – and should – be reconciled with productive activities. Degraded pasture areas can be replaced by productive forestry systems. Sustainable livestock farming, integrating traditional methods and maintaining native vegetation, allows access to high-integrity and sustainable markets, and ecotourism has the potential to generate direct income for local communities.

Furthermore, Payment for Environmental Services (PES) projects and mechanisms that compensate producers for maintaining conserved natural areas are extremely important for preserving natural areas within the biome. Maintaining connectivity through ecological corridors between natural areas is consid-



ered essential to allow wildlife movement in the face of changes caused by climate change.

“RECAATINGIZATION”: A NEW ECOLOGICAL VISION FOR THE SEMI-ARID REGION

The deepening of scientific knowledge and socio-environmental mobilization make the conservation and sustainable use of the Caatinga biome strategic for mitigating the growing impacts of global warming, which already threaten water availability and food and energy security in the region. Practices that combine agroforestry systems, sustainable management of forest resources, ecotourism, and the preservation of traditional knowledge and cultures are proving to be fundamental to valuing the standing biome.

Investing in the creation of new Conservation Units and in the restoration of the Caatinga, therefore, not only protects its unique biodiversity and scarce natural resources, but also promotes inclusive socio-economic opportunities for the reduction of poverty and inequality. Protecting and restoring this biome is a crucial measure for Brazil’s environmental, climate, and socioeconomic security, and key to reconciling regional development with biodiversity conservation and coexistence with the dry climate.

Thus, the ecological restoration of the Caatinga, which has been called “recaatingamento” (“recaatingization”) should make use of different social technologies developed over time for the existence of the backwoodsmen and their traditional practices, such as the use of cisterns, damming, traditional seed banks, among others. The concept of “recaatingization” arises from the need to encompass the different views of popular and traditional knowledge aligned with agroecological technical-scientific

knowledge, under the logic of coexistence with the semi-arid environment.

Thus, Caatinga restoration efforts can be divided into two types: ecological restoration, composed of actions aimed at restoring degraded areas and re-establishing essential ecosystem services; and productive restoration, which seeks to align economic activities with vegetation recovery. Ideally, the two restoration methods should work together, so that actions integrate the dimensions of economic production, environmental protection, and social inclusion.

One of the biggest challenges for the restoration of the Caatinga biome is the lack of technical, scientific, and practical knowledge about preparation and replanting techniques. It is undeniable that there has been a historical lack of investment in the restoration of the biome throughout Brazil’s history. Most current research on the topic of restoration focuses on humid forest areas, such as the Atlantic Forest and the Amazon. Therefore, a gap in scientific knowledge regarding appropriate ways to restore the Caatinga is to be expected.

Simply replicating reforestation strategies used in other biomes would not be able to encompass the full scope of the challenges posed by the semi-arid region. Typical climate factors and water scarcity, exacerbated on a large scale due to the effects of the climate crisis, coupled with land conflicts and the lack of productive infrastructure of inputs for restoration, increase the cost of restoration practices and make actions logistically difficult.

The solution to these issues is not simple, but involves some fundamentals, such as prioritizing

the most relevant locations for restoration – a mapping carried out in 2015 by the Ministry of the Environment and Climate Change (MMA) indicated some of these regions.

Another fundamental aspect is working together with organizations that are already active on the subject, such as the Northeast Environmental Research Center (Cepan), mainly located in the state of Pernambuco and in the Chapada do Araripe region in the state of Ceará; and the Regional Institute for Small Appropriate Agriculture (Irapaa), which provides technical and scientific support to farmers in the states of Pernambuco, Paraíba, and Bahia.

Furthermore, the monitoring and maintenance of restoration efforts must follow rules that are inherent to the biome. Data collection in the field, for example, should preferably take place during the rainy season to facilitate botanical identification, since some Caatinga species lose their leaves in the dry season.

CERRADO: UNCERTAINTIES IN RESTORATION

Home to 42% of Brazil's cultivated land and having undeniable agricultural aptitude, the Cerrado biome harbors uncertainties when it comes to its ecological restoration. Unlike the Amazon and the Atlantic Forest biomes, which are tropical forests with a high capacity for natural regeneration, the Cerrado has some characteristics that make this process more delicate – requiring further studies and knowledge production. One of these characteristics is the soil which, once compacted by mechanized agriculture, has its capacity for restoration reduced. Another ele-

ment is fire, which can be beneficial or harmful to the biome, depending on its use.

The third element that impacts the restoration of the Cerrado is water availability. Deforestation, expansion of the agricultural frontier, and changes in rainfall patterns have led to drastic reductions in surface water in the biome over the last 40 years – between 1985 and 2024, the Cerrado lost 53% of its water surface, equivalent to 249,000 hectares of rivers and lakes. According to the Amazon Environmental Research Institute (IPAM), 91% of river basins suffered this impact, which directly affects the regenerative capacity of natural vegetation.

Therefore, the priority agenda in the Cerrado is conservation, combined with strategies to connect massive fragments of Cerrado existing in Conservation Units (CUs) with the native vegetation present on private properties (APPs, RLs). It is also imperative to adopt public and private policies, linked to agribusiness production chains, that discourage rural producers from deforesting, even if legally.

A successful example, although it has suffered wear and tear and a weakening process, was the Soy Moratorium, which can serve as inspiration for other production chains. Payment for Environmental Services (PES) mechanisms that also compensate beyond carbon (water, pollination) may also be solutions. It will be necessary to establish a new productive paradigm in order to engage agribusiness so that the Cerrado is seen from a different perspective: no longer as a liability, but as an asset related to natural capital.



Financing: how to increase the sector's capacity

TO MAKE FOREST RESTORATION VIABLE, IT IS ESSENTIAL TO TREAT IT AS AN EMERGING PRIORITY INFRASTRUCTURE SECTOR, REQUIRING SPECIFIC CREDIT LINES, INSURANCE, AND FINANCIAL INSTRUMENTS ADAPTED TO ITS RISK AND RETURN REALITY

The scale of Brazil's restoration agenda reinforces the need for a solid financial architecture. Within the scope of the Paris Agreement, Brazil has committed to restoring 12 million hectares of forests by 2030, operated under Planaveg.

Cost estimates vary according to the method, biome, and intensity of restoration, but studies by the World Resources Institute (WRI) and the Climate Policy Initiative (CPI) indicate orders of magnitude that are consistent with investments of tens of billions of dollars to meet the national target. The agenda also carries economic and social weight. In a recent study, Brancalion et al. estimate that restoration activities can create 0.42 jobs per hectare, which would correspond to the creation of 1 million to 2.5 million direct jobs over the course of implementing Brazil's 12-million-hectare target.

In other words, large-scale forest restoration and the forestry of native species are capital-intensive activities, with technical maturity and a growing capacity to deliver results – even with the still small set of finan-

cial instruments adapted to their reality. The absence of secured guarantees, combined with the intangible nature, for example, of carbon assets and their price volatility, drives traditional financial institutions away, which intensifies the challenge of approving funds that finance forest carbon removal projects.

In addition, the emerging native tree industry in Brazil currently does not benefit from any tax incentive or fiscal benefit available to other sectors, even with regard to inclusion in the corporate income tax exemption hypotheses provided for strategic sectors that develop the Amazon region (in the scope of the Superintendency for the Development of the Amazon (Sudam)) and the Northeast region (in the scope of the Superintendency for the Development of the Northeast (Sudene)) – precisely where ecological restoration projects and native forestry are highly active.

There are still other challenges. Beyond foreign exchange rate risk, restoration projects face climate and social risks that require catalytic capital to absorb

losses and ensure continuity. Wildfires, invasions, and the absence of insurance make the sector vulnerable. The inclusion of risk mitigation instruments and impact financing is essential to attract institutional investors and ensure scale.

Another source of performance risk is intrinsically linked to the regions where restoration companies operate, which have historical social inequalities. These areas require significant investments in social infrastructure and territorial security to prevent invasions and illegal activities that compromise the integrity of the projects. Catalytic capital becomes essential in this context, both due to the lack of a consolidated history of large-scale ecological restoration and the need to promote long-lasting socio-environmental improvements.

And, without insurance protection, companies and producers are fully exposed to financial losses caused by natural disasters (such as the climate crisis in agribusiness). It can be said that there is a risk aversion toward the native forest sector. In a recent quote for asset protection, rate quotes between 6% and 8% were received for coverage, compared to a 0.5% rate for complex projects or critical energy distribution networks.

A solution to this would be to create parametric insurance, a mechanism widely used in agribusiness as protection against climate risks, which triggers payment quickly when the contracted index is reached. For example, if the policy establishes that the appropriate temperature for cocoa cultivation is between 28 and 35 degrees Celsius, a period with an average of 38 degrees Celsius would be considered a "loss event," generating an automatic payment⁵.



OBSTACLES:

- Scarcity of financial instruments adapted to the sector's risk and maturation
- Difficulty in accessing credit without secured guarantees
- Lack of climate and performance risk mitigators

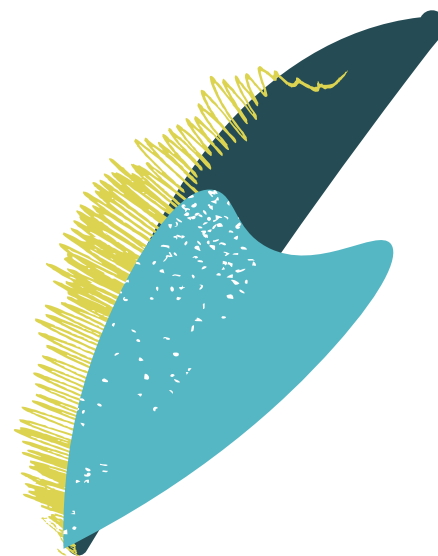


SOLUTIONS:

- Structure guarantee funds dedicated to restoration, to share risks with creditors
- Create specific credit lines, parametric insurance – including with regard to foreign exchange hedging – and blended finance instruments
- Structure financial rules that allow the use of carbon credits as collateral in operations
- Include the native tree industry among the strategic sectors covered by Sudam and Sudene benefits, in addition to other possible tax incentives

The development of insurance instruments will be a natural stage in the maturation of this market. Today, however, the Brazilian insurance market is still not very sophisticated for native restoration projects: existing products were designed for short cycles, such as annual crops or commercial plantations, and not for assets with high ecological heterogeneity and long maturation periods.

Restoration projects may take decades to reach full maturity, whereas available insurance typically operates with short-term contracts and annual renewal. This misalignment makes it difficult to consolidate operations compatible with long-term financing.



TAX INCENTIVES AND RESEARCH PROMOTED ADVANCES IN THE SECTOR

Until the end of the 1950's, forestry activity in Brazil was considered merely extractive and itinerant (Bacha and Antonangelo, 1998)⁶. At the beginning of the 1960's, the sector began to receive a more technical focus, with the creation of the Brazilian Institute for Forest Development (IBDF, later absorbed by the Brazilian Institute of the Environment and Renewable Natural Resources (Ibama)), the emergence of the first forest engineering schools, and the implementation of tax benefits that turned reforestation into a large-scale activity.

In the 1970's and 1980's, there were tax incentives for reforestation and afforestation, and Brazil implemented programs that allowed individuals and companies to direct investments into these activities, being able, in return, to deduct part of the income tax due. At the time, such tax incentives granted to producers during the period from 1966 to 1988 covered almost the totality of the costs of implementing and managing the first years of planted forests. Thanks to those practices and incentives, the reforested area in Brazil increased from 500,000

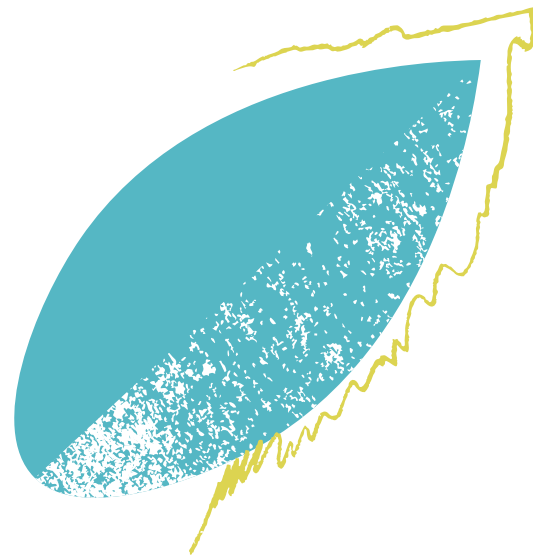
hectares (1964) to 5.9 million hectares (1984).

It was also during this period that modern forestry in Brazil was formed, with a major impact on research – 1% of the resources allocated as incentives to the activities was used to fund forestry research. Data that analyzed the technological evolution of Brazilian forestry showed that, during the years 1968-1988, eucalyptus productivity grew 129% and pine 62.5% (*learn more on exotic forestry in the next chapter*).

Additionally, the scarcity of operational data limits the construction of appropriate actuarial models. At this point, the connection with risk mitigation mechanisms is direct: larger and more standardized portfolios can generate the database needed for the development of insurance products that are better suited to the sector. dificulta a consolidação de operações compatíveis

The cultivated tree sector carries out planting or vegetation regeneration activities to increase carbon sequestration from the atmosphere through reforestation, revegetation, or the creation of new forests. These projects, called Afforestation, Reforestation, and Revegetation (ARR) Projects, can generate carbon removal credits and range from productive systems to projects focused exclusively on environmental recovery. ARR is a broad category that includes different approaches, among them ecological restoration and forestry with native and exotic species (combined or not), making vegetation recovery activities feasible, whether legally required or carried out voluntarily.

The incentive for the native restoration and forestry sector is also justified from the national strategy for biome restoration standpoint, such as the target of restoring 12 million hectares established by the National Plan for the Recovery of Native Vegetation (Planaveg), necessary to achieve Brazil's Nationally Determined Contributions under the Paris Agreement, as well as by the Restoration Arc Program, a partnership between the National Bank for Economic and Social Development (BNDES) and the Ministry of the Environment (MMA) aimed at restoring forests in the Amazon biome, precisely the one relevant to



Sudam's area of operation and, partially, to Sudene's area of operation⁷.

For these reasons, although the existing regulations addressing Sudam's and Sudene's priority activities are close to restoration and forestry activities, there must be an express provision for these activities in order to provide legal certainty and ensure the necessary prominence for the dissemination and expansion of these activities.

A LEVER FOR THE ECONOMY WITH POSITIVE SOCIAL IMPACTS

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. Restoration is not just about planting seedlings or seeds. It is also about promoting a new economy based on businesses that accelerate our country's sustainable transition. The social impacts include the following:



Local job creation: ARR projects transform areas of extensive livestock activity – which employs very few workers per hectare – into hubs of economic activity intensive in skilled and diversified labor. The restoration chain creates jobs across 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 through restoration go beyond planting techniques – they strengthen local suppliers such as seed collectors, nursery operators, and fire brigade members, while also providing skills in entrepreneurship, administrative management, and environmental practices. This way, they encourage both professional and personal development, expanding career horizons in the regions where we operate.

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

THE ROLE OF BNDES AS A FIRST MOVER

In the past few years, BNDES has come to occupy a central position in the development of the forest sector. The BNDES Forests platform has already mobilized around R\$ 7 billion in initiatives related to restoration, conservation, and bioeconomy, and BNDES Forests reports 14 approved or contracted projects under the forest line, totaling approximately R\$ 1.9 billion in credit and R\$ 5.7 billion in associated total investment, in addition to a pipeline exceeding R\$ 4 billion across about 26 operations.

Within this strategy, the Climate Fund, especially through the Native Forests and Water Resources line, offers extraordinarily concessional conditions for the sector: funding cost of 1% per year (cap of 3.5% p.a.) for native forests, terms of up to 25 years, grace periods of up to 8 years, and ticket sizes between R\$ 10 million and R\$ 250 million per economic group.

The role of BNDES is therefore twofold: financing operations and creating precedents. In emerging markets, this first-mover role is decisive in reducing uncertainty, generating an operational track record, and attracting new investors (*learn more on page 176*).

PILLARS OF TRANSFORMATION

Forest carbon removal projects are an innovative activity, not necessarily because of their techniques — such as planting seedlings and seeds or assisted natural regeneration — but rather due to their scalability, new financing models, and technological integration aimed at recovering entire biomes. In the Brazilian context, restoration has evolved from isolated initiatives on small properties into highly complex industrial and financial operations, grounded in ARR (Afforestation, Reforestation and Revegetation) projects. The pillars of this transformation include:

1. CONVERSION OF DEGRADED PASTURES INTO ECONOMIC ASSETS:

Brazil has approximately 110 million hectares of pastures with some degree of degradation. The innovation lies in a paradigm shift: forest restoration starts to treat these areas not as an economic liability, but as carbon sequestration infrastructure. In exhausted soils, where natural regeneration would be slow, large-scale projects use precision fertilization and genetic selection of native species. This accelerates biomass accumulation and enables economic recovery through carbon credits.

2. COMPLIANCE WITH LAW NO. 12,651/12 AND RECOVERY OF LIABILITIES:

With an estimated deficit of 20 million hectares of Legal Reserves (RLs) and Permanent Preservation Areas (APPs), ARR projects emerge as the main pathway for complying with the Forest Code and global climate commitments. In addition to legal compliance, large-scale operations enable the creation of ecological corridors, an outcome that fragmented restoration on small properties would not be able to achieve.

3. TECHNOLOGICAL INNOVATION AND GEOSPATIAL MONITORING:

The restoration of thousands of hectares requires unprecedented

technological precision. The operational scale demands the use of drones for direct seeding (the “muvuca” technique) and Artificial Intelligence for monitoring. LiDAR sensors and high-resolution satellite imagery are employed to ensure the additionality and permanence of stored carbon, transforming the forest into a geographic intelligence asset that ensures socio-environmental compliance and mitigates risks for international investors.

4. NATIVE FORESTRY AND BIOECONOMY:

While national forestry has historically consolidated around eucalyptus and pine — with significant impacts on the trade balance and job creation — ARR projects foster the forestry of native species. The development of seed supply chains and nurseries capable of providing millions of seedlings of diverse species (such as Ipê and Jequitibá trees) represents a fundamental logistical and botanical innovation for the new green economy.

5. SOCIOECONOMIC IMPACT:

This new model creates “green jobs” in rural areas, stimulating local economies and offering a sustainable, higher value-added alternative to low-productivity extensive livestock farming.



THE ROLE OF DEVELOPMENT BANKS IN THE FOREST RESTORATION AGENDA: THE CASE OF BNDES

BNDES is the Brazilian national development bank, an institution with 74 years of existence that operates with multiple financial instruments and is the main source of long-term funding in the economy. By incorporating forest restoration at the center of its development strategies, BNDES signals the importance of this productive sector for Brazil's development and elevates this agenda to priority status, with the creation of a number of initiatives and financial instruments to promote the advancement of this economic sector.

From credit under special conditions to non-reimbursable resources, the operations translate into various investment fronts that, in less than three years, amount to around R\$ 7 billion allocated to projects already contracted and under execution. These operations drive new projects with the potential to unlock private capital in order to significantly increase the scale of this reconstruction, with impacts on climate mitigation and the economy.

The forest sector is not exactly a new development agenda for the bank, which since its inception has leveraged the development of planted forests with pine and eucalyptus in Brazil, now one of the global leaders in pulp and paper production. In the current context, beyond this already consolidated

story of success (*learn more in the Forestry chapter*), attention is turning to the economic chain of recovering degraded areas, with the adoption of native species and the maintenance of conserved forests, in expectation of long-lasting opportunities for communities and investors.

In the new agenda, the BNDES Forests initiative targets assets of the forest economy such as sociobiodiversity products, carbon, and other ecosystem services. The investments already mobilized in various categories, such as ecological restoration, agroforestry systems, management, and forestry with native species, drive the agenda and the bioeconomy and are already becoming concrete actions, through the planting of 280 million trees, 70,000 green jobs, and 54 million metric tons of carbon captured – equivalent to removing all vehicles from circulation in the city of São Paulo for three years.

The initiative brings together a set of actions that are interconnected and strengthen each other. The focus is on activating the forest economy with productive inclusion, income generation, and the empowerment of local communities. The model combines financial instruments, technical support, technological innovation, institutional coordination, and engagement of private capital.

Through the Climate Fund, coordinated by the Ministry of the Environment (MMA), BNDES offers subsidized credit for companies to invest in reforestation and forest management, attracting large-scale initiatives in deforested and degraded areas in the Amazon. Since 2023, 14 credit operations have been approved totaling R\$ 1.9 billion and have attracted R\$ 3.4 billion in private investment, unprecedented figures in the sector.

Another notable initiative is ProFloresta+, which seeks to connect the supply of carbon credits derived from forest restoration with demand from companies, including in the energy sector – such as Petrobras, a pioneer in the initiative. Through an auction for the purchase of carbon credits, two essential pieces of information will be provided: prices and a 25-year robust contract for the purchase and sale of carbon credits, including environmental safeguards, which brings legal certainty and greater attractiveness for investors. ProFloresta+ is the first step toward attracting a stable flow of carbon credit purchases in Brazil.

There is also a capital markets front, with a public call to support equity and credit funds. In the case of Nature-Based Solutions funds, BNDES selected two funds and allocated R\$ 1 billion for

investments that will leverage volumes three times greater in private capital.

This category is complemented by non-reimbursable resources – concessional capital, with no expectation of financial return, arising from sources such as the Amazon Fund and part of BNDES's profits directed to its Socio-environmental Fund. These resources are mainly allocated to non-business operations led by Indigenous and traditional communities, for example.

These resources are concentrated in the Restaura Amazônia (Restore Amazon) initiative, which is aimed at creating the Restoration Arc, involving R\$ 450 million from the Fund and BNDES' Floresta Viva (Living Forest) initiative (which has R\$ 500 million, half from BNDES and half from 15 other private and government partners). Through this, more than 100 projects are supported across all Brazilian biomes.

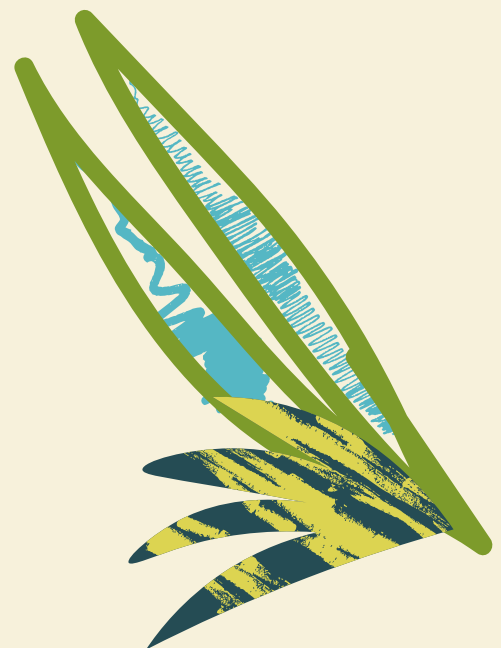
BNDES's own non-reimbursable resources are also applied to leveraging technological innovations through BNDES' Florestas Inovação (Innovation Forests) – a joint initiative between BNDES, the Brazilian Agricultural Research Corporation (Embrapa), the Federal University of São Carlos (UFSCar), and

companies – to promote the development of up to 30 native species for restoration of the Atlantic Forest and the Amazon, in order to generate more efficient and resilient clones, seedlings, and seeds, among other actions.

In the field of forest concessions (*learn more on page 162*), the bank maintains a project hub for investor access, expecting a potential R\$ 9.2 billion in investments in new contracts, including the forest restoration of 400,000 hectares of degraded areas and sustainable management of 3.7 million hectares.

In this scenario, with Brazil's return to a central position in the climate and development debate, BNDES Florestas emerges as the structuring strategy to transform forest restoration and the bioeconomy of native species into pillars of Brazilian sustainable development, building pathways for Brazil to become a leading player in global forest restoration and the forest chain.

More than a set of actions, BNDES Florestas is an umbrella of initiatives that contribute to the development of a new, dynamic, and strong sector of the Brazilian economy, which is already born on the path of environmental and social sustainability.





THE BOTTLENECK OF GUARANTEES

Despite the existence of credit lines with favorable financing conditions, scaling up investments in forest restoration still faces structural obstacles related to how risk is handled in credit operations.

Although the Climate Fund line offers highly concessional credit, effective access to the funds often depends on meeting collateral requirements that are not always compatible with the economic profile of restoration projects. In practice, the explicit cost of the operation ends up incorporating not only the financial cost of the credit, but also the cost of the bank guarantee or other guarantee instruments required to make the operation viable.

There is also a significant implicit component: the requirement for cash collateral to issue these bank guarantees. In practice, this may require tying up own capital as counter-guarantee, increasing the opportunity cost and reducing the economic efficiency of the structure, especially in restoration projects, which are characterized by long maturation cycles, high capital intensity in the initial phase, and deferred revenue generation.

The central point is that the assets underlying restoration, such as developing forests, future revenue associated with carbon, timber, agroforestry systems, or other ecosystem services, still face low acceptance as credit support within the financial system. As a result, transactions with a long-term profile and risk essentially tied to implementation

end up being structured according to typical corporate credit requirements, with strong dependence on secured or bank guarantees provided outside the economic logic of the project itself.

The result is a mismatch between the risk profile of forest restoration and the guarantee instruments that are currently available on the market. Even when credit is available under favorable conditions, the guarantee structure can substantially increase the cost of the operation and limit effective access to resources.

EVOLUTION OF FINANCING STRUCTURES

The experience of other sectors in Brazil suggests that overcoming these bottlenecks depends on the gradual evolution of financing structures, as the market builds an operational track record, standardizes performance metrics, and develops risk mitigation instruments that are better suited to the characteristics of the financed assets.

In the case of wind energy, for example, the first ventures relied heavily on corporate support and robust collateral requirements during the implementation phase. As the sector matured, greater predictability of cash generation, the consolidation of performance history, and improvements in contracts enabled a progressive migration toward structures closer to project finance, in which the operational risk increasingly comes to be analyzed based on the project's own cash flows and on specific mitigation mechanisms.

The Brazilian forest sector is currently at a similar stage. There is already a pipeline of projects, growing interest of investors, and significant participation by public development institutions, but the financial structure still operates with a strong dependence on corporate guarantees, traditional secured guarantees, and short-term banking instruments that are poorly suited to the time horizon and nature of forest assets.

The transition toward more sophisticated structures will therefore require the development of instruments that are capable of addressing more precisely the risk of the initial project phase, especially implementation and pre-operational risk, and of creating conditions so that, gradually, asset quality and project performance can support an increasing part of the financing structure. In this process, de-risking mechanisms and, subsequently, insurance instruments are likely to play a central role in reducing risk perception and expanding the appetite of private creditors.

RISK MITIGATION MECHANISM FOR FOREST RESTORATION

Recognizing the central role of secured and personal guarantees in access to credit, the Nature Investment Lab (NIL) has structured a risk mitigation mechanism aimed at enabling financing operations for large-scale forest restoration. The proposal seeks to address the mismatch between the risk profile of projects and the guarantee instruments that are currently available on the market.

The mechanism is being designed as a Financial Investment Fund (FIF), regulated by the Brazil's

Securities and Exchange Commission (CVM), with a mandate to provide guarantees for credit operations directed to the sector. Its logic is based on blended finance, combining different sources of capital in a structure with differentiated risk and return tranches. The proposal that is being structured considers capitalization in the amount of R\$ 2 billion, with capital participation in the subordinated tranche from the restoration companies themselves, alongside mezzanine capital (hybrid financing that combines elements of debt and equity) and senior capital from other investor profiles – multilateral and commercial/impact investors, respectively.

The structure was conceived to operate during the pre-completion period, the initial phase in which the risks of implementation, execution, and establishment of restoration are higher. It is precisely at this stage that financing tends to face greater resistance, given that the assets are still being formed, revenue generation is incipient, and the financial system struggles to accept developing forests, future cash flows, or environmental attributes as credit support. By offering partial risk coverage during this period, the mechanism seeks to reduce dependence on bank guarantees and cash counter-guarantees, facilitating project access to long-term credit under conditions more suited to the sector.

The proposal's design also responds to the scale already observed in the market. In view of the pipeline currently identified by BNDES for forest restoration, the mechanism seeks precisely to create a bridge between this existing pipeline and a financial



structure that is capable of absorbing the initial risks that currently limit effective access to credit.

More than enabling individual operations, instruments of this nature have structural potential. In nascent sectors such as restoration, de-risking mechanisms play a transitional role: they create precedents, reduce information asymmetries, help standardize contractual solutions, and generate operational history and performance data that, over time, allow the market to price risk more efficiently. This effect tends to facilitate the entry of multilateral banks, development finance institutions, and private investors into a still-emerging market, reducing entry barriers and expanding the capacity to mobilize capital at scale.

Ultimately, de-risking mechanisms such as the one proposed by NIL are essential for the sector's maturation. By allowing the market to start operating, build portfolios, and generate track records, these mechanisms help create the conditions for restoration financing to depend less on concessional support in the future and become increasingly sustained on market-based foundations.

ECO INVEST AND THE TRANSITION IN LAND USE: CATALYTIC CAPITAL FOR DEGRADED AREAS

Eco Invest Brasil is one of the major recent innovations in the Brazilian climate finance architecture. Launched under the Ecological Transformation Plan, the program uses blended finance and currency hedge instruments to mobilize private capital, espe-

cially international capital, for agendas related to the ecological transition.

In the second auction, aimed at the recovery of degraded areas, there was a demand of R\$ 17.3 billion, participation from 11 financial institutions, and an estimated potential to generate R\$ 31.4 billion in investments. The government announcement linked the round to the initial recovery of 1 million hectares of degraded land, with an initial focus outside the Amazon and a provision for a specific design for the Amazon biome.

The strategic importance of the program is twofold. First, because it can reduce pressure for expansion over native vegetation by increasing productivity in already opened areas. Second, because it can make room for productive restoration, including agroforestry systems and integrated crop-livestock-forestry (ICLF), provided that part of the resources is effectively directed toward these arrangements. NIL has been supporting the improvement of the program's design, including the development of operational and financial instruments to increase its support to restoration, the bioeconomy, and low-carbon agriculture.

The main challenge for Eco Invest lies in implementation at scale. Monitoring environmental and production gains across large areas requires integration between territorial monitoring, Rural Environmental Registry (CAR), and remote sensing. Additionally, due to the financial design itself, financial institutions tend to allocate resources to larger-scale operations with lower transaction costs, which may make it difficult to reach small producers.

SMALL PRODUCERS AND THE DISTRIBUTED SCALE OF RESTORATION

Maintaining the forest continuum in Brazilian territory will depend not only on large projects, but also on the participation of millions of small producers. The Rural Environmental Registry shows the enormous landholding capillarity of the agenda, and a significant portion of the restoration needed to comply with the Forest Code is distributed among small and medium-sized properties.

Here, the role of public policies is decisive. The 2025/2026 Family Farming Harvest Plan allocated R\$ 78.2 billion to the National Program for Strengthening Family Farming (Pronaf), the largest volume in the program's history, showing the scale of public credit that can be mobilized through agricultural policy. Redirecting part of this flow toward productive restoration, agroforestry systems, and the recomposition of native vegetation can materially change the scale of Brazil's environmental recovery.

The National Productive Forests Program, from the Ministry of Agrarian Development, is already moving in this direction by supporting agroforestry systems, the recovery of degraded areas, and the strengthening of family farming and socio-biodiversity. Even so, important barriers remain: guarantees for access to credit, limited availability of specialized technical assistance, and land tenure problems in part of the rural territory.

PRIVATE INITIATIVES AND NEW FINANCIAL MODELS

On the private side, complementary initiatives are emerging. The Innovative Finance for the Amazon, Cerrado and Chaco (IFACC, an initiative focused on accelerating investments and loans for sustainable agriculture) operates mainly in larger-scale agro-industrial supply chains, mobilizing capital for deforestation-free supply chains. In parallel, structures such as the Kawa Fund and organizations like Tabôa Fortalecimento Comunitário explore models that are more closely tied to the bioeconomy and productive restoration in forest territories. The challenge remains the same: developing instruments that are capable of also reaching the distributed scale of small producers, without which there will be no territorial restoration at scale.

TROPICAL FOREST FOREVER FACILITY (TFFF): A NEW GLOBAL ARCHITECTURE TO FINANCE TROPICAL FORESTS

An initiative led by Brazil to create a permanent financing mechanism for tropical forest conservation, the TFFF was presented internationally at COP 16 to the Convention on Biological Diversity, in Cali, Colombia, and gained political traction up to COP 30. Its starting point is simple: tropical forests generate global benefits, but the countries that host them still receive few permanent incentives to conserve them (*learn more on page 136*).



The proposal expects a capitalization of around US\$125 billion, combining about US\$25 billion in public and philanthropic resources and approximately US\$100 billion in private capital. During COP 30, the mechanism recorded more than US\$5.5 billion in support announcements, including US\$1 billion from Brazil. The political target discussed by the Brazilian government is to reach at least US\$10 billion in public capital in the initial phase to leverage the rest of the structure.

The TFFF was designed to make recurring payments based on the area of conserved forest, with an initial payment estimated at around US\$4 per hectare per year. The official concept also provides that at least 20% of payments be directed to Indigenous peoples and local communities. More than 70 tropical countries are eligible for the TFFF, as they are home to more than 1 billion hectares of tropical and subtropical humid forests, which gives a sense of the initiative's potential scale.

The World Bank was designated as the manager and fiduciary administrator of the mechanism. The next steps include consolidating governance, expanding the base of donors and investors, and defining the final rules for eligibility, monitoring, and operation. If implemented at scale, the TFFF could represent a significant shift in the international architecture for forest financing by creating a predictable and permanent flow of funding for conservation.



CONCLUSION

The body of evidence analyzed above converges toward a clear diagnosis: forest financing remains insufficient and structurally misaligned with the scale of today's climate, environmental, and economic challenges. Although there is growing recognition of the role of forests in climate stability, water security, biodiversity, and productive resilience, positive financial flows directed toward conservation, restoration, and sustainable use are still limited, especially in tropical forests. At the same time, significantly larger volumes of capital continue to be directed toward activities associated with deforestation and land-use degradation.

This imbalance undermines forests' ability to fulfill their potential as essential natural infrastructure and shows that the challenge is not only to increase resources, but also to redirect financial flows that are currently incompatible with climate and biodiversity targets. This requires transforming the financial ar-

chitecture that guides investment decisions in the territory, combining credit instruments, collaterals, risk mitigation mechanisms, blended finance, and public incentives that are more suited to the nature of forest assets.

In the Brazilian case, this agenda takes on a strategic character. Brazil brings territorial scale, climate relevance, and institutional capacity to lead the construction of a new generation of instruments aimed at forest financing, including planted forests and the entire economy associated with products derived from Forestry. The recent progress of initiatives around the BNDES Forests agenda, Eco Invest, de-risking mechanisms for restoration, and the TFFF point in this direction, but also reinforce that the consolidation of this market will depend on the ability to align public policies, private capital, and financial instruments with the economic logic of conservation and restoration at scale.

The background is a complex abstract composition. It features several overlapping geometric shapes in various shades of teal and black. On the left side, there are several large, overlapping triangles and rectangles. A prominent black shape with a white, irregular, organic pattern resembling a tree trunk or a textured surface is positioned in the lower-left quadrant. A jagged, white, lightning-bolt-like line cuts across the composition from the top left towards the center. The overall aesthetic is modern and graphic.

/B

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. AN EXAMPLE OF THIS IS FOREST MOSAIC FARMING, WIDELY ADOPTED BY THE SECTOR, WHICH INTEGRATES PRODUCTIVE AREAS WITH ENVIRONMENTAL CONSERVATION AREAS

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.

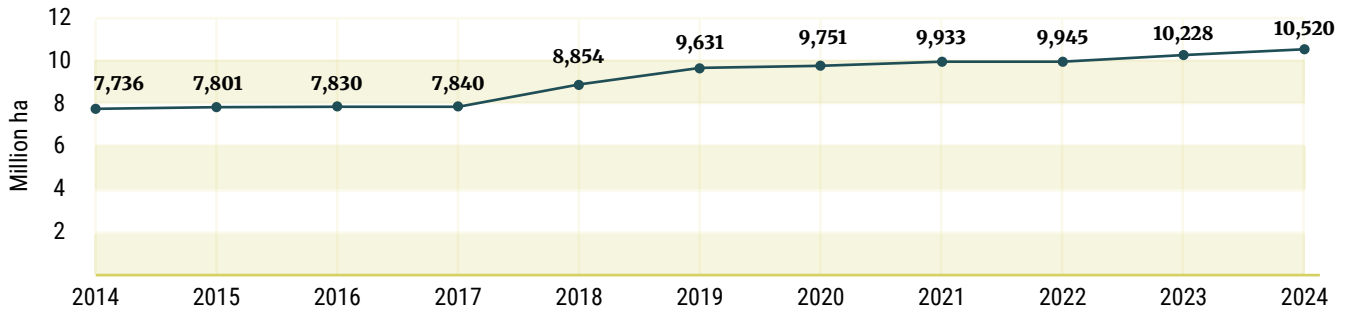
The planted forest sector offers one of the most comprehensive Nature-based Solutions (NbS) models. Planting can be integrated into agroforestry systems, livestock activity and other crops, adapting to the social, productive and environmental needs of each area. These arrangements allow for the combination 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: CO₂ 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.

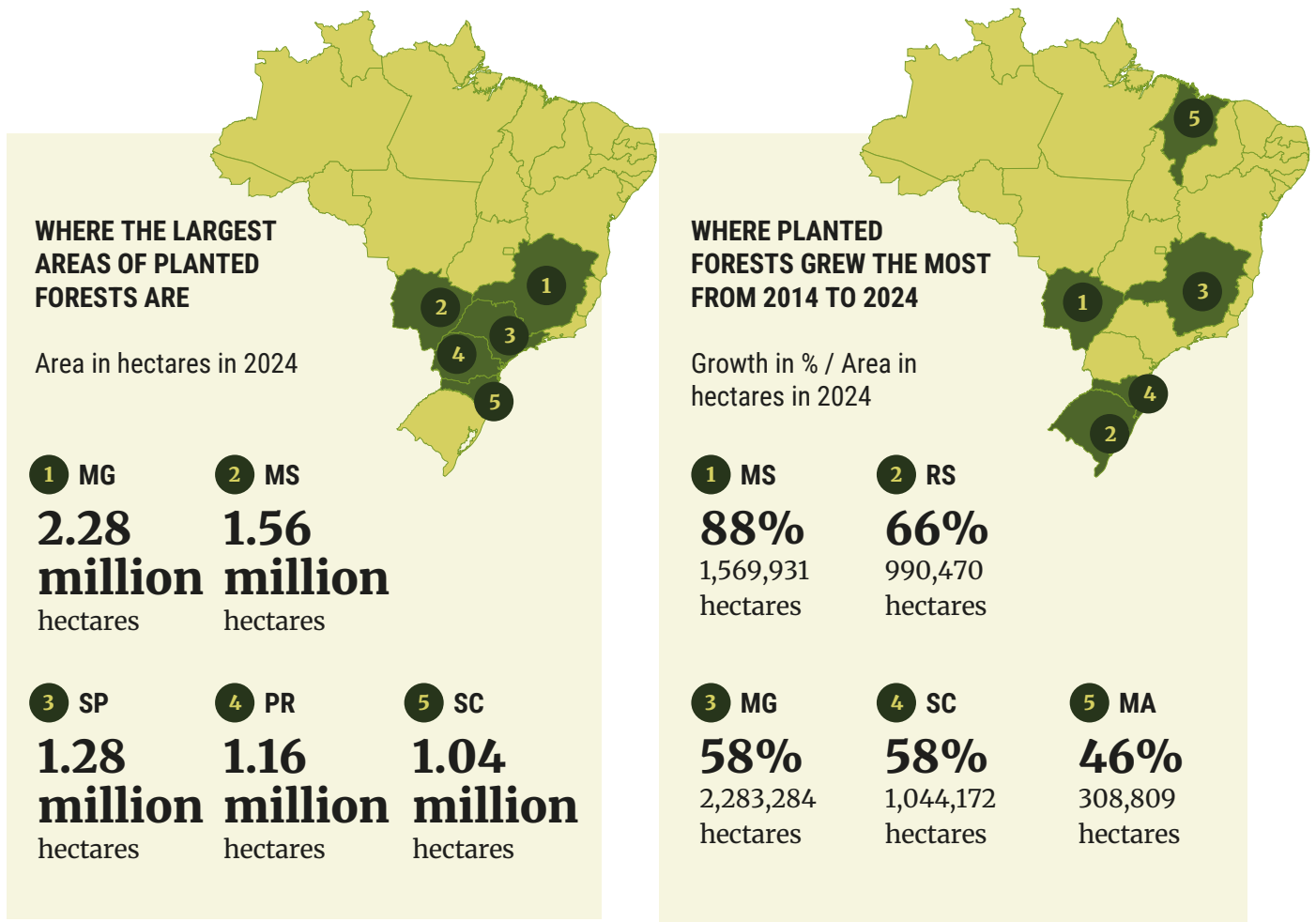


PLANTED FORESTS GROW CONTINUOUSLY

Evolution of the planted area in Brazil



Source: Ibrá



Source: Ibrá

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*).

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.



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.

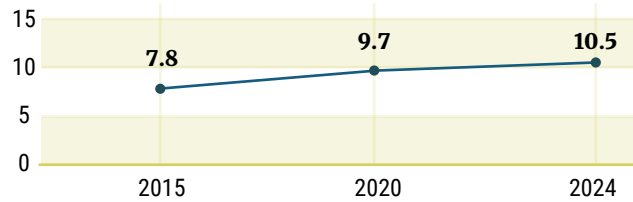
Among other large global producers, MAI is in the range of 10 to 15 m³/ha/year in the United States, of 5 m³/ha/year in Scandinavia, and of 3 of 5 m³/ha/year in Canada. Given the variety of biomes in Brazil, the country's average advantage over other producers could occur thanks to an extraordinary performance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



A STORY OF HIGH PRODUCTIVITY

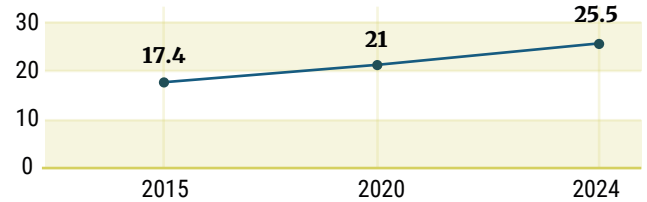
Evolution of the planted area and pulp production

In millions of ha planted



Source: Prévía do Relatório Iba 2025

In millions of metric tons produced



Source: Relatório Iba 2015-2016

35%

was the expansion of the planted area from 2015 to 2024

46%

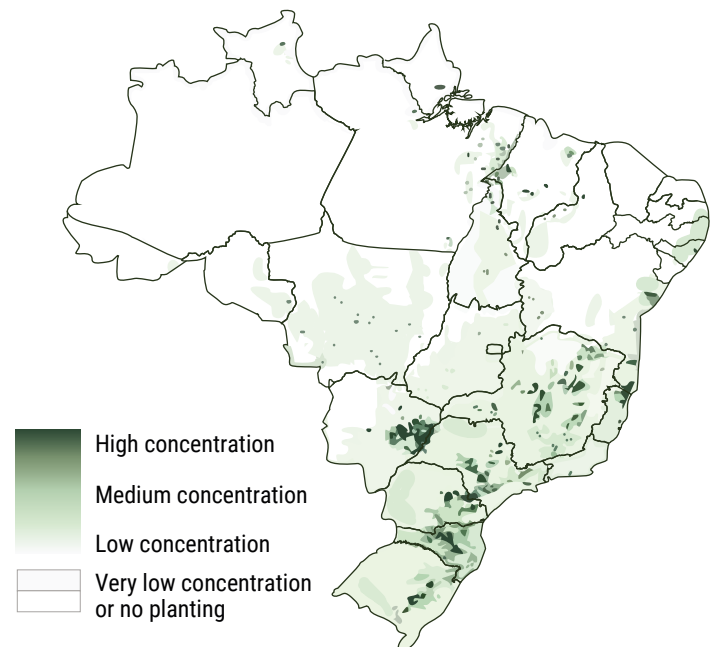
was the increase in the production of pulp in the same period

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 Canada¹.

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.

DISTRIBUTION OF THE PLANTED AREA IN 2024



Source: Iba

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 1960².

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 Brazil³ 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 tCO₂e 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 considered⁴.

CONTRIBUTING TO ADAPTATION

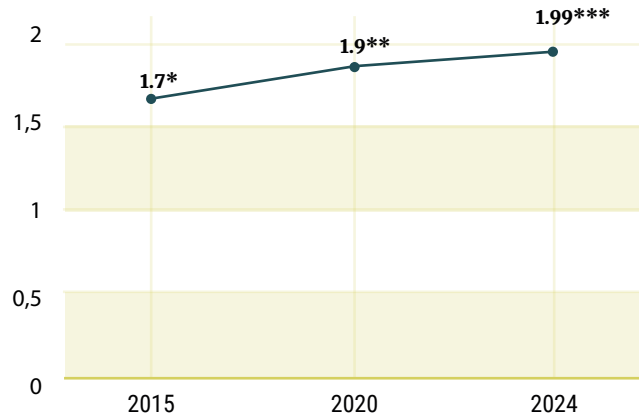
Forest cultivation is characterized by offering a rare and valuable combination of carbon removal, forest conservation, provision of environmental services, and intensive production with high value generation and job creation. Furthermore, it integrates the set of Nature-based Solutions, contributing not only to mitigation but also to adaptation to climate change by strengthening the resilience of territories and ecosystems.

Accordingly, through genetic improvement of species, creation of ecological corridors and undergrowth of native species, forestry plays an important role in the climate adaptation of biodiversity and its effects as ecosystem services for the benefit of the human population.



CARBON STOCK

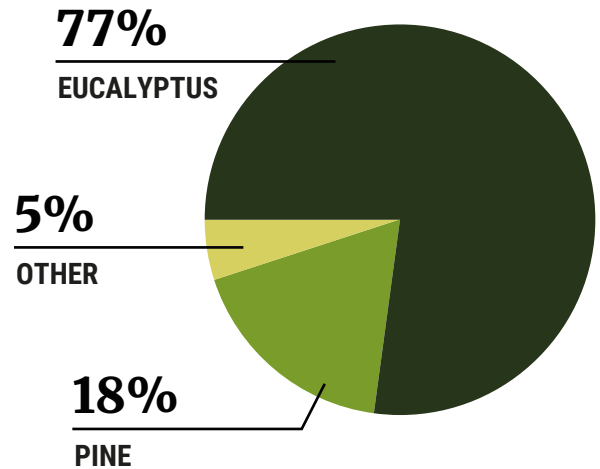
How much planted forests store
In billions of metric tons



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

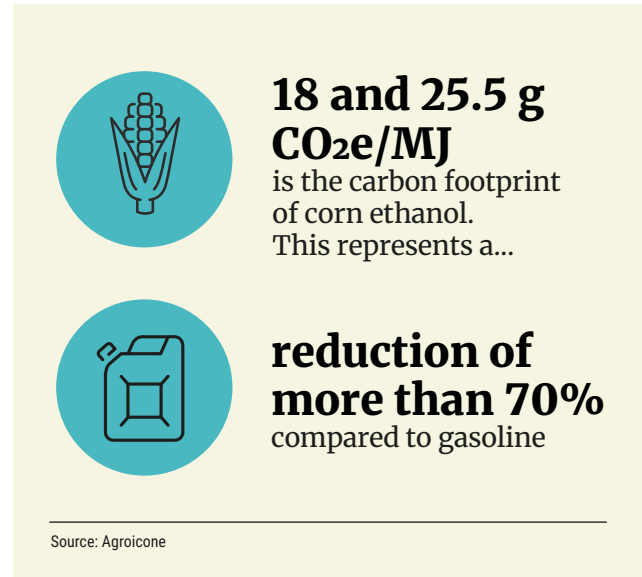
How much forest products store
In % of carbon in the mass

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

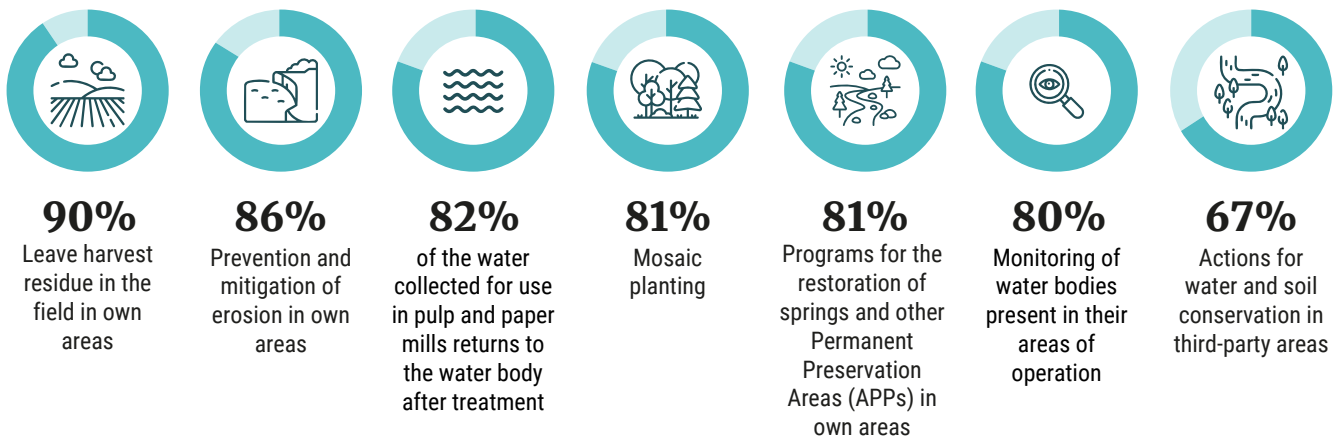
SUPPLYING THE NEW CARBON MARKET

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.

Like a two-way street, the activity itself, however, monitors risks of climate impacts that require adaptation, according to the study *O Eucalipto e a Embrapa: quatro décadas de pesquisa e desenvolvimento* (Eucalyptus and Embrapa: four decades of research and development), with the participation of researcher Eduardo Assad. The study analyzes, among other points, a trend of increasing water scarcity toward the Mid-West region, with the potential to reduce eucalyptus productivity. To reverse this situation and expand the areas suitable for eucalyptus cultivation, it will be necessary to reduce greenhouse gas emissions, relocate productive areas, or seek clones that are more tolerant to water deficit.



MAIN ACTIONS FOR WATER RESOURCES CONSERVATION (%)





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 chapters on Conservation and Restoration*).

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.

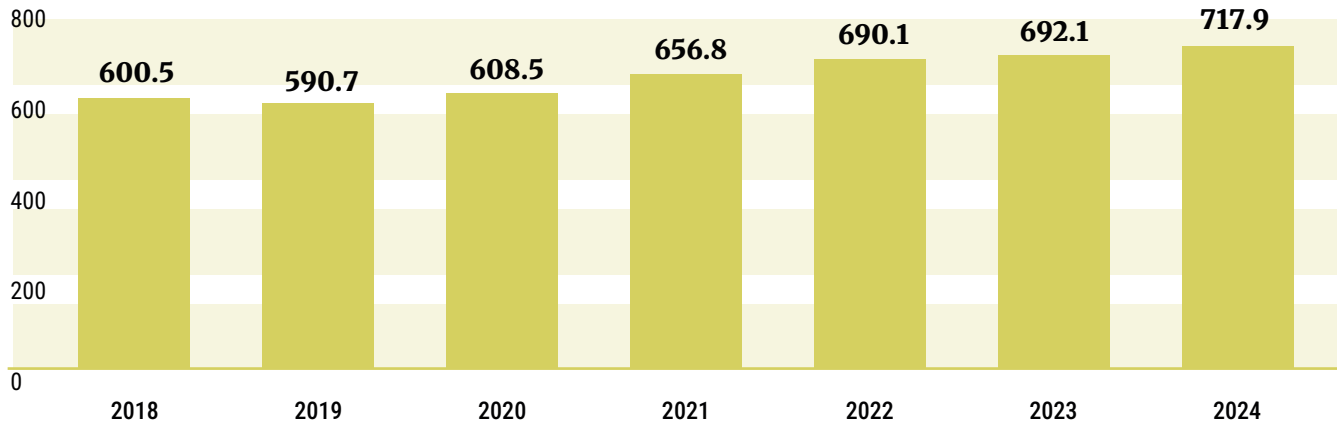
In two years (2022-2024), the ICLF project area increased 80%. The significant progress may be linked to the strengthening of institutional support and the growing recognition, by producers, of the benefits provided by the system, which favors product diversity and sustainability in the production of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

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

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.

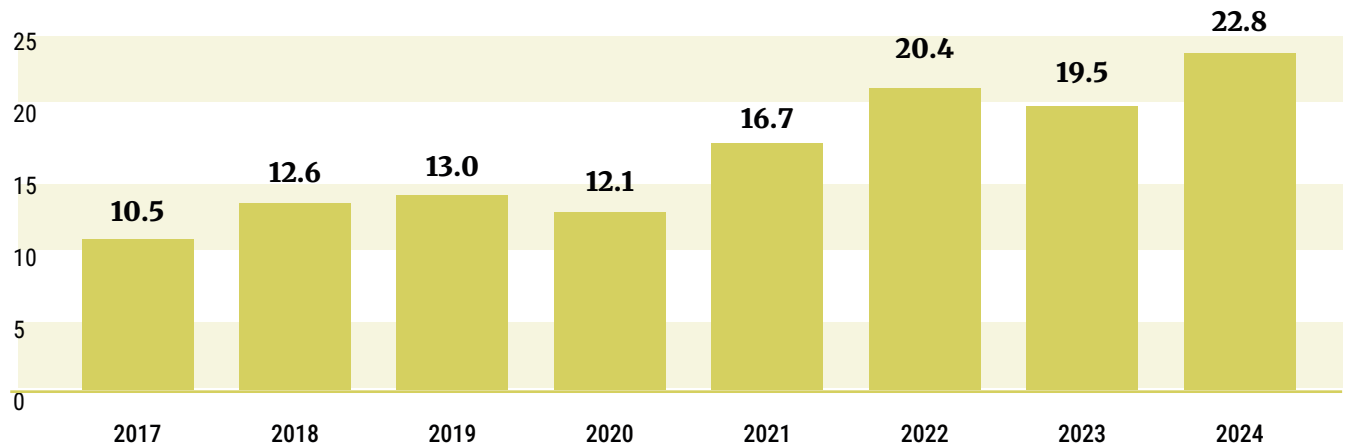
As a result of public development policies to make the pulp and metallurgy industries viable in Brazil, forestry of planted species has enabled globally competitive activities, in particular eucalyptus pulp. Brazil is the world's largest producer and exporter of eucalyptus pulp, as well as the largest 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 rep-



FORESTS THAT MOVE THE ECONOMY

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



Sources: Federal Revenue Service and Iba

resents 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.

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).



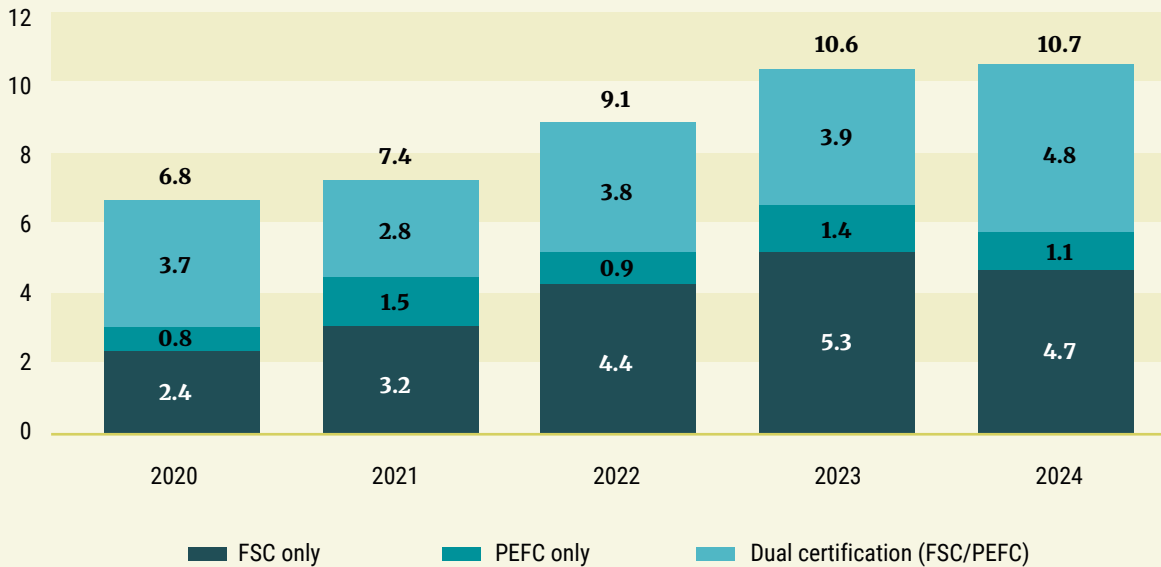
A total of 297 environmental and social projects received R\$ 115.2 million from companies from the sector last year. Around 389,000 people benefited from initiatives covering education, childhood and adolescence, infrastructure and equipment, the environment and environmental education, certification,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

In 2025, an Iba 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 chapter*).

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 (**PNDP**): 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 (**PNCPP**) – 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.

Solutions implemented, 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 38*), 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.

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
- The Forest Code protects a significant portion of the forest, although full implementation of the Rural Environmental Registry (CAR) is necessary.
- Advanced technological apparatus for monitoring and inspecting deforestation using satellite imagery, territorial intelligence, and inspection
- Institutional capacity to fight deforestation through command-and-control public policies, as exemplified by the effectiveness of the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm) actions
- The publication of the Atlantic Forest Law in 2006 resulted in a dramatic reduction in deforestation in this biome

Conservation

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
- Ensure the effective and complete implementation of the Forest Code throughout Brazil
- Advance land-use planning, particularly in non-designated areas, with emphasis on priority regions for conservation and sustainable use, while also reducing uncertainties in private areas, is essential for investments in the region to be made within a predictable and secure institutional environment
- 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 its conservation. This presupposes the consolidation of financial models based on rewards for avoided emissions or carbon removals through planting and forest regeneration. Examples such as TFFF and Jurisdictional Reed+ are being developed and could be part of a set of financial mechanisms aimed at the economic recognition of ecosystem services provided by forests
- Expansion of legal timber management, forest bioeconomy, and biobusinesses associated with innovative agroforestry systems that are beginning to be developed in the Amazon.
- Consolidate the legal framework for the protection of the Atlantic Forest
- Implement a national climate adaptation strategy, with emphasis on the role of forests in resilience to changing climate patterns and the occurrence of extreme weather events. Identify and promote, within the strategy, economic opportunities for ventures and new technologies

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
- Establishment of multi-sectoral coalitions to plan and implement restoration, such as the Floraz movement and the Atlantic Forest Restoration Pact. Launch of a pre-competitive Native Species Forestry program to boost the sector with timber production and carbon credits
- High natural regeneration across all biomes. In the Atlantic Forest alone, 4.9 million hectares of forest were regenerated, but their maintenance presents a challenge
- 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
- Launching a diverse set of specific financial mechanisms aimed at leveraging the forest restoration segment, combining public initiatives (Eco Invest, BNDES) with private banks and philanthropy
- Launching mechanisms and areas for public land concessions for forest restoration
- 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

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
- It is necessary to accelerate the implementation of the Forest Code, aiming at restoring Permanent Preservation Areas and Legal Reserves
- There are several challenges to overcome in scientific and technological pillars, production models, product development (timber and non-timber), services (ecosystemic), markets, financial instruments, social integration, and access to land. The sector, however, has the elements to become a specific asset class
- Consolidating and expanding of financial instruments, particularly regarding collaterals and insurance
- Developing a regulatory framework for recognition, indication of metrics, valuation, and incentive mechanisms for the provision of ecosystem services associated with forest restoration, including climate, biodiversity, water resources, resilience, and others
- Eliminating the market of illegal tropical timber, a situation that fosters unfair competition and discourages investment in restoration focused on native species forestry
- Developing integrated production systems for forest restoration and food production, such as Agroforestry System (SAF) and Integrated Crop-Livestock-Forestry (ICLF)
- Strengthening the integration of forest restoration with agribusiness, including addressing environmental liabilities, but also optimizing land use in areas that are suitable for food production



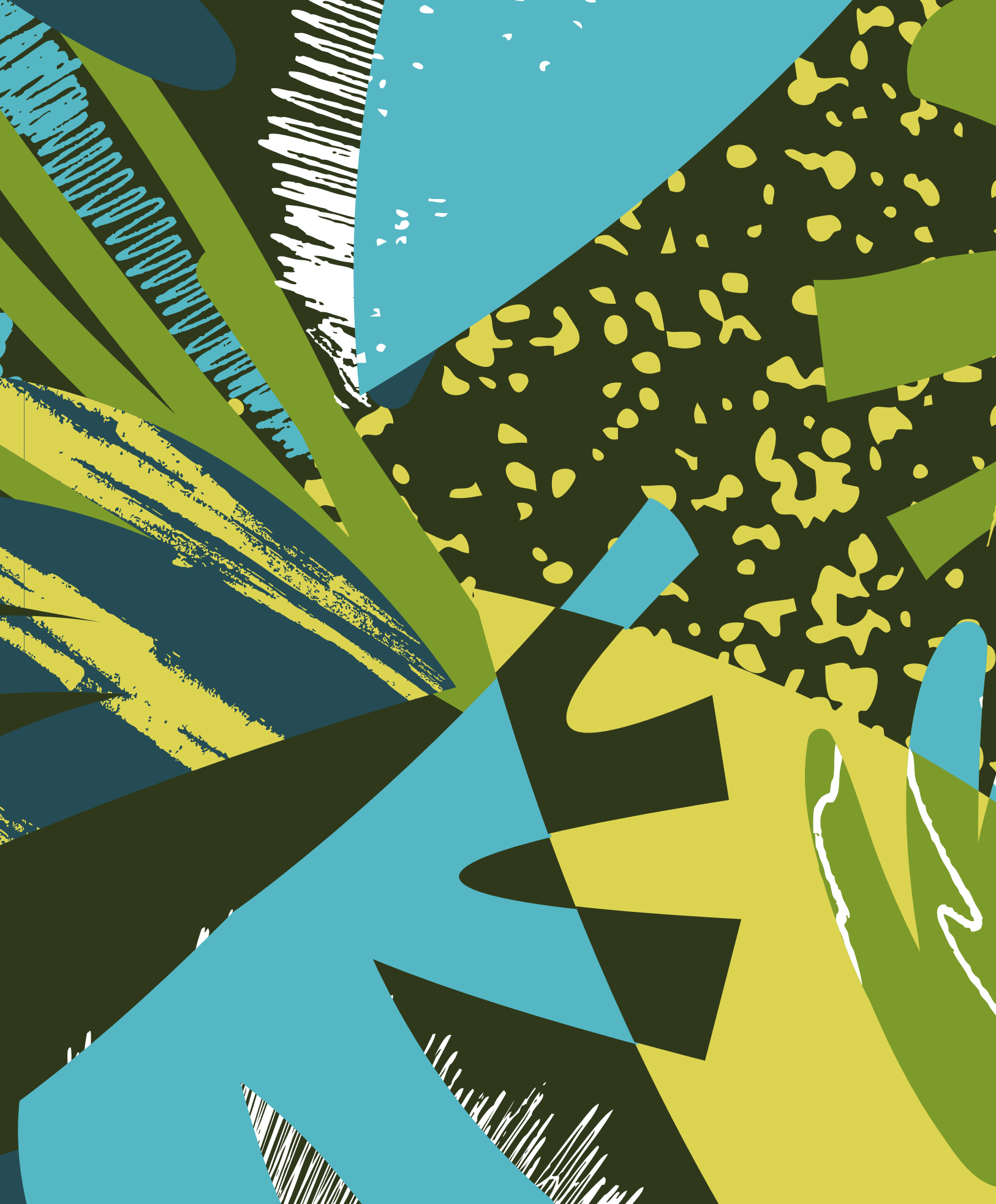
Forestry

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



Notes

INTRODUCTION

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EXECUTION



EXECUTION

