Reducing threats to a global biodiversity hotspot

Tracing baselines for the GBF implementation in the Brazilian Atlantic Forest

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Realization

SOS MATA ATLÂNTICA

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Summary

The Atlantic Forest

Brazil is the world's most biodiverse country, with six terrestrial biomes and a large coastal-marine system. Among the Brazilian biomes, the Cerrado and the Atlantic Forest are considered as two of the world's biodiversity hotspots[1]. The Atlantic Forest was also defined as one of the 10 first flagships of the UN Decade on Ecosystem Restoration.

Covering 15% of Brazil's territory, the Atlantic Forest is also the most degraded and threatened biome in the country. Its restoration and conservation bring an important contribution to reversing the world's biodiversity loss and the climate crisis, but the Brazilian Atlantic Forest is still little known to the international community.

In this document, we present a dialogue between the CBD's Global Biodiversity Framework targets 1 to 8 (reducing threats to biodiversity) and recent data about the Brazilian Atlantic Forest, aiming to raise awareness about its relevance, to trace the current status of the biome, and to make a call for action for the biodiversity and for the nature's benefits for more than 145 million people living in and depending on the ecosystem services of the Atlantic Forest.

Serra da Bocaina National Park

Target 01

Plan and manage all areas to reduce biodiversity loss

Ensure that all areas are under participatory, integrated, and biodiversity inclusive spatial planning and/or effective management processes addressing land and sea use change, to bring the loss of areas of high biodiversity importance, including ecosystems of high ecological integrity, close to zero by 2030, while respecting the rights of indigenous peoples and local communities.

The Atlantic Forest has an elevated number of ecosystems, species, and genetic variability, while facing the threat of being the most devastated biome in Brazil, with only 24% of its remaining forests and 30% of its native ecosystems, which includes a variety of forms such as mangroves, grasslands, savannahs, and others.

Most of the forest fragments in the Brazilian Atlantic Forest are small and isolated, 97% are smaller than 50 hectares[2]. This situation leads to biodiversity and biomass erosion even inside the remaining fragments. Data from more than 1800 field surveys in the biome shows that, on average, forest fragments have 25-32% less biomass and 23–31% fewer species than expected[3]. Thus, strengthening policies and plans to reduce the biodiversity loss and to favor restoration in the Atlantic Forest is urgent.

Limits of the biome according to its federal law (light green) and the distribution of forest remnants (dark green)

The Atlantic Forest is recognized as a national heritage by the Brazilian Federal Constitution and is the only biome in the country that has a specific law for its protection and sustainable use (Federal Law no. 11,428, from December 2006). This law should be applied by 3429 municipalities in 17 States, according to the appliance map elaborated by the Brazilian Institute of Geography and Statistics (IBGE), an agency linked to the Ministry of Finance. This map should set the basis for spatial planning in the biome.

SOS Mata Atlantica Foundation had a major role for the approval of this Law in the Brazilian Congress, and since then there have been a steady decrease in deforestation rates, as shown by data produced in a partnership between SOS and the National Institute for Space Research (INPE), that monitor deforestation by satellites since the mid-1980s[4].

But the rhythm of deforestation had bounced back, especially during the years 2016, and 2020 to 2022. Currently, deforestation data from 2022 to 2023 shows that the Atlantic Forest lost 81,356 hectares during that year, especially in transition regions with other biomes[5].

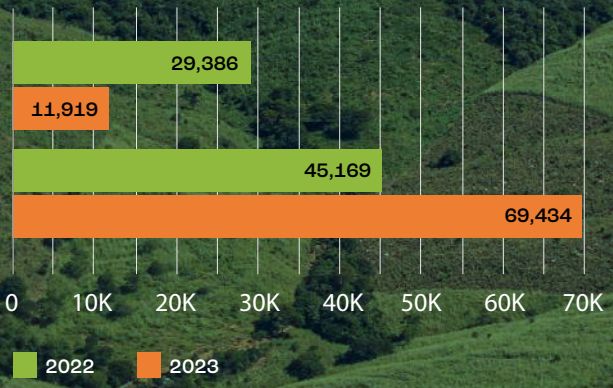
The current scenario in the Atlantic Forest is a relative stability in total forest cover, but due to different dynamics of losses (deforestation) and gains (mainly natural regeneration) of forest formation. Nearly 11% of the Atlantic Forest cover is less than 20 years old, and approximately one-third of the existing regenerating forest is less than 10 years old, while older and more developed forests are still being lost especially in areas more suited for intensive agriculture and forestry[6]. Considering the irreplaceability of older forests for biodiversity conservation, deforestation in the Atlantic Forest is still a major concern.

The Brazilian government made a pledge for zero deforestation by 2030. Governance lessons from past experiences in the Atlantic Forest may be considered for public policies for the Amazon and other biomes[7], as the Atlantic Forest has the institutional frameworks and legislation, data, monitoring and ongoing spatial management actions, thus, attaining zero deforestation in the most degraded Brazilian biome is feasible and it should be achieved even faster than by the end of this decade.

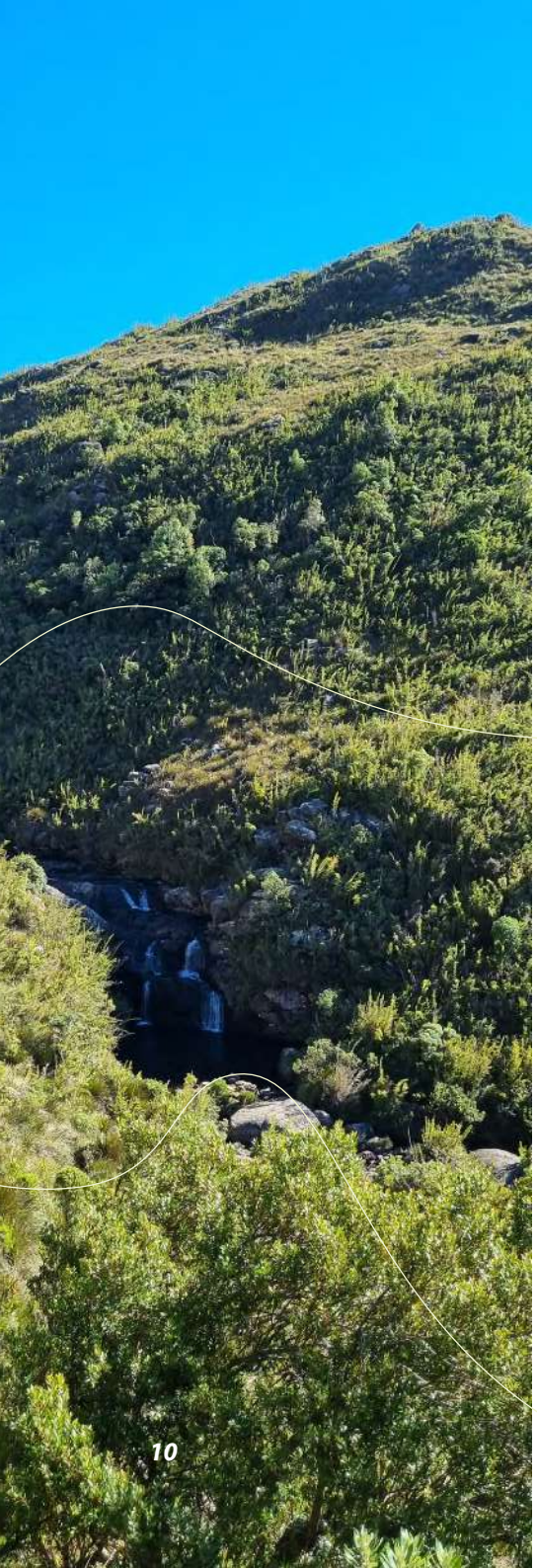
Deforestation events and deforested areas in the Atlantic Forest during 2022 and 2023

	2022	2023
Total events	9,782	7,270
Deforested area	74,556ha	81,353ha
Mean area of deforestations	7.6ha	11.2ha

Deforested area per ecosystem (in hectares)



Atlantic Forest Deforestation Alert System



Target 02

Restore 30% of all degraded ecosystems

Ensure that by 2030 at least 30 percent of areas of degraded terrestrial, inland water, and coastal and marine ecosystems are under effective restoration, in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity.

The 2020 – 2030 period was designated as the Decade of Ecosystems Restoration by the UN[8]. The Atlantic Forest, having lost most of its original forest cover, is the Brazilian biome where restoration is more urgent.

A study published in Nature showed that the Atlantic Forest should be among global priorities for ecosystem restoration. Restoring 15% of these priority areas could avoid 60% of expected species extinction while also sequestering 30% of the total CO2 increase in the atmosphere since the Industrial Revolution.

Restoration in Brazil is also a way to strengthen bioeconomy, studies estimate that 0.42 jobs are generated by each hectare under restoration. Taking in account the Brazilian pledge to restore 12 million hectares, the potential for jobs generation could be 1 to 2.5 million direct jobs[10]. Restoration targets in Brazil, especially in the Atlantic Forest, may be even more ambitious. The National Plan of Native Vegetation (Planaveg) is under review by the Brazilian government and there's an expectation that the targets could be bolder considering the context of climate and biodiversity crisis.

PACTO
PELA RESTAURAÇÃO DA
MATA ATLÂNTICA

The Atlantic Forest Restoration Pact is a movement that gathers the main Brazilian organizations working with forest and ecosystem restoration, that made a public commitment to restore and monitor 15 million hectares of degraded land by 2050. Studies show that this target can be achieved with good governance, public policies, and monitoring systems[11].

SOS Mata Atlântica's forest restoration project in Piranguçu, Minas Gerais

The Atlantic Forest was selected as a flagship ecosystem of the UN Decade on Ecosystem Restoration and forest restoration is an ongoing process. In fact, 85% of the restoration jobs are currently concentrated in the Atlantic Forest.
SOS Mata Atlântica has already restored 24.000 hectares which corresponds to more than 40 million trees planted.

An essential policy that is still poorly implemented in Brazil is the country's Forest Code. This law, which had its latest updates in 2012, demands for conservation and restoration of areas such as riparian vegetation and areas to mitigate natural and climate risks, such as vegetation in steep terrain, mangroves and coastal scrub. A survey by SOS Mata Atlântica and the Brazilian NGO Imaflora revealed that only in the Atlantic Forest biome there are more than 2.7 million hectares of riparian forests to be restored[12], which could provide substantial gains in forest connectivity and biodiversity corridors.

The Forest Code's legal obligation may be further complemented with incentives for the bioeconomy development and a regenerative agriculture, matching food and bioenergy production with conservation and equity goals. Strengthening the restoration potential in Brazil, with the development of seed collection, seedlings production, recovery of degraded areas and further research in restoration practices needs to take place to bring back part of the forest that was lost.

Target 03

Conserve 30% of land, waters and seas

Ensure and enable that by 2030 at least 30 percent of terrestrial, inland water, and of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures, recognizing indigenous and traditional territories where applicable, and integrated into wider landscapes, seascapes and the ocean, while ensuring that any sustainable use, where appropriate in such areas, is fully consistent with conservation outcomes, recognizing and respecting the rights of indigenous peoples and local communities, including over their traditional territories.

Almost 19% of Brazil's land and over 26% of the country's marine territory are designated as Protected Areas. In Brazil, the National System of Protected Areas established 12 categories of Conservation Units, such as National Parks, Biological Reserves and others. The National Plan of Protected Areas also considers Indigenous people and Quilombolas territories.

But to attain ecological representativeness, these numbers must be broken down at least in the biome level. **While the Protected Areas coverage in the Amazon is around 28%, only 10% of the Atlantic Forest is conserved by some category of Protected Area.**

These Protected Areas are also not evenly distributed, more than one-third of them are concentrated in the south-southeast Brazil, at the Serra do Mar biogeographical sub-region[13]. There are several conservation gaps in the Atlantic Forest, including known areas of endemism that still have low conservation efforts[14].

Thus, the creation of more federal protected areas in ecologically important areas will be crucial for the Atlantic Forest's biodiversity. Several processes for creating or expanding federal Protected Areas in the Atlantic Forest have been paralyzed for more than a decade and these efforts must be resumed to comply with the Brazilian National Biodiversity Strategy.

The Brazilian Atlantic Forest is also a biome with a complex governance since it covers 17 states and more than 3.400 municipalities, thus, federal Protected Areas alone won't be effective. A recent study by SOS Mata Atlântica identified more than 1,5 thousand Protected Areas that were created in the municipal level[15]. These local protected areas may contribute with 5 million hectares of protected land to the Atlantic Forest, but most of these areas are still not included in the national protected areas database and are lacking adequate implementation.

It is also important to note that almost 80% of the land in the Atlantic Forest is in private domain[16]. Taking this into account, SOS Mata Atlântica Foundation supported the creation and implementation of 494 privately protected areas, which represents 57 thousand hectares of protected land. There are a total of 1350 private reserves that sums 250 thousand hectares in the Atlantic Forest, with the potential to grow if incentive policies were applied.

The need for expansion of Protected Areas must also be met with adequate financing. Estimates show that the current funding deficit for the Atlantic Forest's Protected Areas is 15 to 20 million USD/year[17]. The implementation and effectiveness of these areas falls short and may lead to several fragilities and discredit by Brazilian politicians and part of the society.

Since 2007 SOS Mata Atlântica Foundation has been celebrating partnerships between donors, companies and Protected Areas' managers to contribute to channeling resources for this conservation strategy. Examples of recent partnerships involve the Serra da Bocaina National Park and the Itatiaia National Park (the first Brazilian National Park, established in 1937). Other partnerships more than 10 years long are with the Costa dos Corais Environmental Protected Area and the Atol das Rocas Biological Reserve.

Conserving the Atlantic Forest demands integration of systems of protected areas and other area-based strategies into broader spatial plans through different government levels, as well as public and private sectors, and a national pact for surpassing conservation gaps in the biome.

Serra da Bocaina National Park

Itatiaia National Park

Atol das Rocas Biological Reserve

Target 04

Halt species extinction, protect genetic diversity, and manage human-wildlife conflicts

Ensure urgent management actions to halt human induced extinction of known threatened species and for the recovery and conservation of species, in particular threatened species, to significantly reduce extinction risk, as well as to maintain and restore the genetic diversity within and between populations of native, wild and domesticated species to maintain their adaptive potential, including through in situ and ex situ conservation and sustainable management practices, and effectively manage human-wildlife interactions to minimize human-wildlife conflict for coexistence.

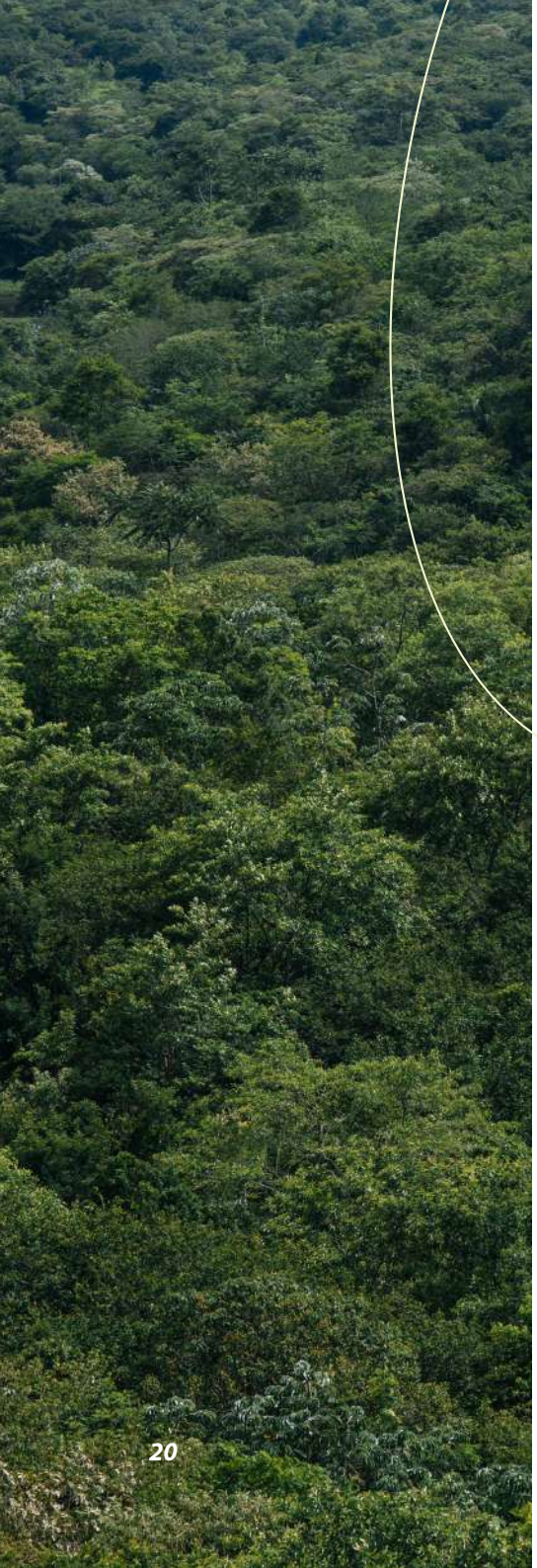
The Atlantic Rainforest is considered a world biodiversity hotspot, with more than 20.000 known species, nearly 6.000 are endemic. **Forestry inventories in some regions of the biome found more than 400 tree species per hectare, which may be considered the highest tree diversity in the world.**

More than 11 thousand animal species from the biome had their conservation status already assessed, and 24% of them are under some risk of extinction. From all the threatened fauna known in Brazil, more than 43% occurs in the Atlantic Forest[18].

Defaunation indexes in the Atlantic Forest are high, even in regions with considerable forest cover and especially for medium and large-sized mammals[19]. These animals, such as the South American tapir *(Tapirus terrestris)*, the Jaguar *(Panthera onca)*, the Southern muriqui *(Brachyteles arachnoides)* and other threatened species are crucial for the ecosystem's functioning.

The conservation status of Atlantic Forest trees may be even more worrisome. A recent study that considered multiple IUCN Red List criteria to evaluate extinction risks and millions of herbariums and forest inventory records found that about 44% of all species and 82% of endemic species are classified as threatened[20]. Western, central and northern regions had the worst threat indexes.

Considering the high incidence of threatened species in the Atlantic Forest, halting extinction in Brazil demands urgent actions for strengthening conservation and restoration measures in the biome.



Target 06

Reduce the Introduction of Invasive Alien Species by 50% and Minimize Their Impact

Eliminate, minimize, reduce and or mitigate the impacts of invasive alien species on biodiversity and ecosystem services by identifying and managing pathways of the introduction of alien species, preventing the introduction and establishment of priority invasive alien species, reducing the rates of introduction and establishment of other known or potential invasive alien species by at least 50 per cent, by 2030, eradicating or controlling invasive alien species especially in priority sites, such as islands.

In Brazil there are more than 500 known invasive species. From years 1984 to 2019, 16 invasive alien species were responsible for an estimated economic loss of 77 to 105 billion dollars in damages to agriculture and human health[21].

Biological invasions in Brazil reflect the country's colonization and economic cycles, thus, while the Amazon has the least number of invasive species among the Brazilian biomes, **the Atlantic Forest has the worst situation, with more than 150 invasive plants and nearly 100 invasive animal species[21].**

Coastal and marine ecosystems associated with the Atlantic Forest are also threatened by invasive species, such as the Orange cup coral[22] *(Tubastraea coccinea)* and the Lionfish[23] *(Pterois volitans)*. Invasive tree species such as *Leucaena leucocephala* and invasive grasses such as *Brachiaria sp*. poses several obstacles for effective forest restoration projects in the biome[24].

Leucaena leucocephala

Measures for controlling biological invasion in Brazil are still poorly enforced. The GBF and Brazil's NBSAP must guide the development of adequate public policies for the management and control of invasive alien species in the country's biomes, which will be crucial for the Atlantic Forest's ecosystem conservation and restoration.

Tubastraea coccinea

Target 07

Reduce Pollution to Levels That Are Not Harmful to Biodiversity

Reduce pollution risks and the negative impact of pollution from all sources, by 2030, to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects, including: reducing excess nutrients lost to the environment by at least half including through more efficient nutrient cycling and use; reducing the overall risk from pesticides and highly hazardous chemicals by at least half including through integrated pest management, based on science, taking into account food security and livelihoods; and also preventing, reducing, and working towards eliminating plastic pollution.

Land-use changes and pollution are among the main pressures for aquatic habitats, and the Atlantic Forest concentrates the highest indexes of threats for aquatic biodiversity[25]. Riparian vegetation along rivers is considered as areas of permanent protection (APP) in the Brazilian Forestry law, but the Atlantic Forest has a deficit of more than 2.8 million hectares of APP[12] that should be restored and could contribute to pollution mitigation, especially by minimizing fertilizers and pesticides runoff.

Ensuring access to water and sanitary conditions in Brazil is still an unresolved task. More than 35 million Brazilians don't have access to clean water, poor people and vulnerable communities being the most affected. A recent study by SOS Mata Atlântica, that sampled more than a thousand analyses from 129 rivers along the biome, showed that only 8% of them could be considered of good quality while 15% are considered as bad or terrible conditions, according to water quality indexes that comprehends values for nitrate, dissolved oxygen and other variables[26].

Brazil is also the largest pesticide consumer in the world[27], ahead of the United States of America and China. This leads to several concerns to public health[28] as multiple toxic effects were reported in more than 50 published studies[29] and contamination of water bodies is widely reported in different regions in the country[30–32]. Pesticide use in Brazil also affects pollinators and the resilience of ecosystems[33–35].

Integrating water, sanitation infrastructure, environment and nature-based solutions in public policies is still a challenge in Brazil. **Programs to tackle this in the Atlantic Forest biome could benefit 70% of the Brazilian population and minimize aquatic biodiversity extinction risks.**

Target 08

Minimize the Impacts of Climate Change on Biodiversity and Build Resilience

Minimize the impact of climate change and ocean acidification on biodiversity and increase its resilience through mitigation, adaptation, and disaster risk reduction actions, including through nature-based solution and/or ecosystem-based approaches, while minimizing negative and fostering positive impacts of climate action on biodiversity.

The Atlantic Forest is the biome of restoration and it should bring a great contribution for the climate crisis as an effective strategy for CO^2 sequestration and nature-based solutions for climate mitigation[9], but if in one hand the Atlantic Forest is part of the solution for the climate crisis, on the other it is also threatened by climate change.

Recent review of risk projections in climate change scenarios among the Brazilian biomes puts the Atlantic Forest as the second most impacted domain[36]. Endemic and threatened species are expected to have their habitat's climatic suitability decreased, even inside protected areas that should provide more favorable conditions for biodiversity.

Extreme climatic events in the biome affect the lives of people. For example, severe rainfall events took place in the southeast coastal region of the Atlantic Forest during the summer of 2020 and then again in 2023, which caused landslides that led to further deforestation and affected thousands of families. The anthropogenic contribution to changes in rainfall during the 2020 event accounted for up to 42% of the total losses and damages[37].

Flooding in Rio Grande do Sul State, southern Brazil, May 2024.

The most recent climate tragedy in the Brazilian Atlantic Forest related to extreme rainfall affected more than 2 million people in the state of Rio Grande do Sul, floods contributed to the spread of various water-borne diseases and the extent of the damage to biodiversity is still unknown[38].

During the 2014-2015 period, southeastern Brazil experienced one of the most severe droughts caused by changes in regional atmospheric circulation and a mid-troposphere blocking that lasted 45 days, a phenomenon not seen in the last five decades[39], main water reservoirs reached levels of only 5% of their capacity. Prolonged drought events were also observed in the Pantanal region during 2019-2020 which contributed to large wildfires with terrible consequences for biodiversity[40].

The year 2024 was characterized by the anticipation and extension of the dry season, in addition to high temperatures. These conditions facilitated the occurrence of unprecedented large fires. In the Atlantic Forest alone, between January and August 2024, more than 615 thousand hectares were hit by wildfires.

Expanding Protected Areas to allow for species adaptation, using these areas as risk mitigation strategies near urban areas and enhancing forest restoration for providing connections between protected areas while also contributing to climate stability are urgent needs for the Atlantic Forest.

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