For more information please access **mapbiomas.org**

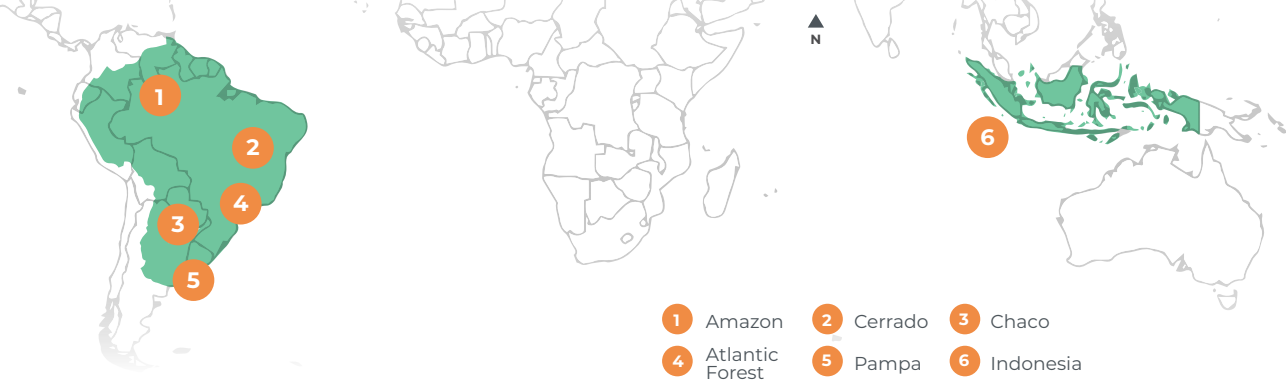
Land use change on threatened biomes in South America and Indonesia

Pressing challenges in the face of climate change

MAPBIOMAS

2022

Fast loss of native vegetation in South America and Indonesia



1 Amazon
2 Cerrado
3 Chaco
4 Atlantic Forest
5 Pampa
6 Indonesia

Land use and land cover in South America has been changing in the last three decades. Large-scale conversions, mainly from native vegetation to agriculture and pasture, are increasing the GHG emissions due to land use change, affecting ecosystems climate resilience and depleting carbon stocks, which is concerning in a climate change scenario.

This scenario is observed in two of the greener regions in the world, (Amazon and Indonesia) as shown by the MapBiomas Initiative. Nevertheless, restoration and maintenance of protected areas are paramount to mitigate the effects of climate change.

While around 80% of the native vegetation is still preserved in the Amazon and Chaco, other biomes such as Atlantic Forest, Pampa and Cerrado have less than or close to half of its native vegetation left. Also, the Amazon is the only biome with more than half of its native vegetation inside protected areas, where Indigenous Lands are the most efficient in hindering deforestation. All the other biomes have less than 20% of their native vegetation protected, the Pampa biome is the least protected (only 3%).

MapBiomas is a collaborative network that involves local institutions to map land use and land cover in most of the threatened biomes of South America, as well as Indonesia, making knowledge about land use accessible to seek conservation and mitigate changes in climate. The MapBiomas' approach allows to efficiently and rapidly generate similar monitoring information where needed, including forest and non-forest natural ecosystems. All MapBiomas data is freely available and transparent and has the potential to be taken into account for building legislation, public policy and supporting decision making to evaluate the impacts on these biomes for their long-term protection.



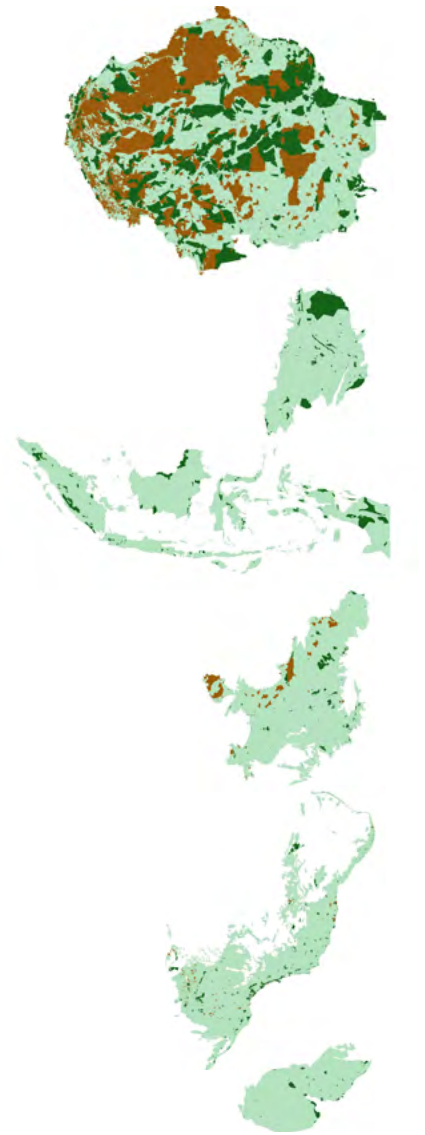
Mostly converted into pasture/agriculture

Native vegetation loss in the last two decades in South America and Indonesia, an area larger than Somalia

68 Mha

Loss of **5.8%** of native vegetation compared to 2000

How protected is the native vegetation in the threatened biomes in South America and Indonesia?



Amazon
439 Mha

63%

⅓ 231.9 Mha of the Amazon native vegetation is inside Indigenous Lands

- Indigenous Lands
- Protected areas
- Rest of the biome

Chaco
14 Mha

16.5%

Indonesia
17.1 Mha

15%

Cerrado
14.9 Mha

13.5%

Atlantic Forest
4.8 Mha

9.3%

Pampa
1.3 Mha

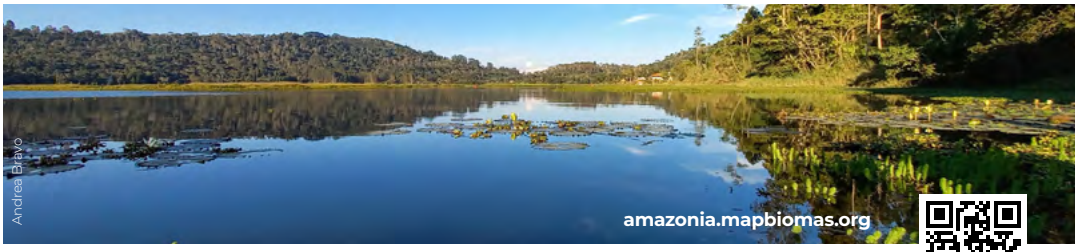
2.9%

THE IMPORTANCE OF INDIGENOUS LANDS IN THE AMAZON

90.6% Of the deforestation was outside Indigenous Lands or other Protected Areas in the Amazon

1.2% Indigenous Lands are the most protected areas in the Amazon, 1.2% (2.9 Mha) of their native vegetation was lost since 1985

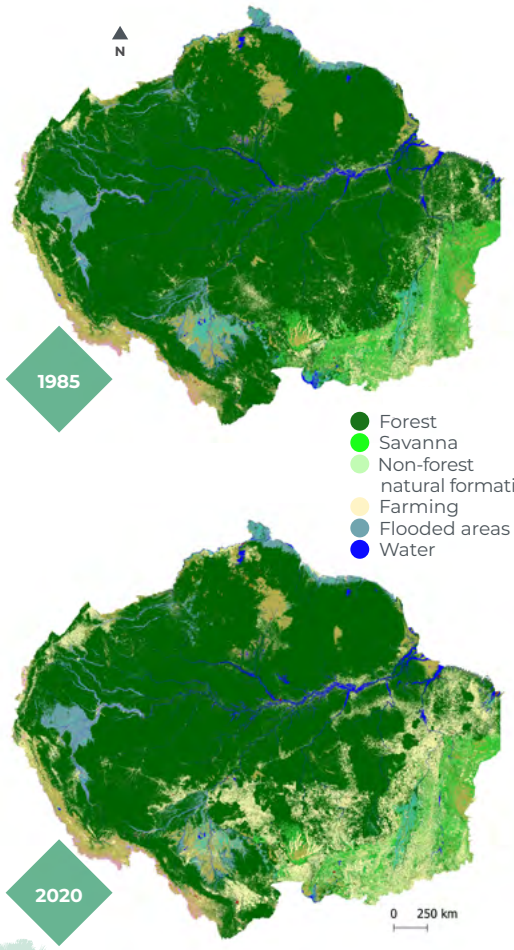
1.7% Other Protected Areas in the Amazon lost only 1.7% (3.7 Mha) of their native vegetation cover

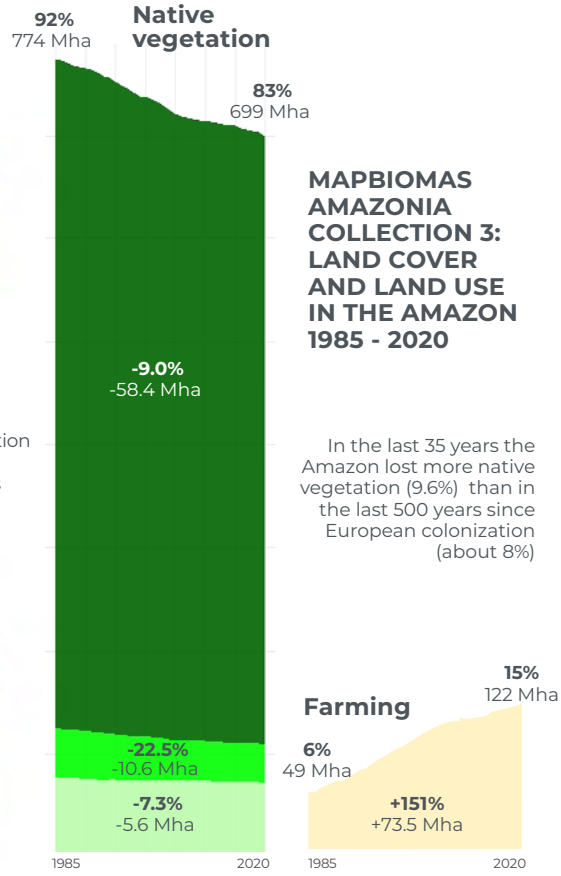


The recent and fast anthropization in the **Amazon Forest** in the last three decades

The Amazon hosts the Earth's largest tropical forest, covering 47% of South America, and is one of the most important carbon sink. However, deforestation and fire threaten the forest's resilience to climate change.

The remaining native vegetation in the Amazon of 83% is close to the tipping point (20-25% of forest loss) for Amazon's ecosystem services provision. If we keep with this deforestation trend, the tipping point could be reached in this decade.





MAPBIOMAS AMAZONIA COLLECTION 3: LAND COVER AND LAND USE IN THE AMAZON 1985 - 2020

In the last 35 years the Amazon lost more native vegetation (9.6%) than in the last 500 years since European colonization (about 8%)

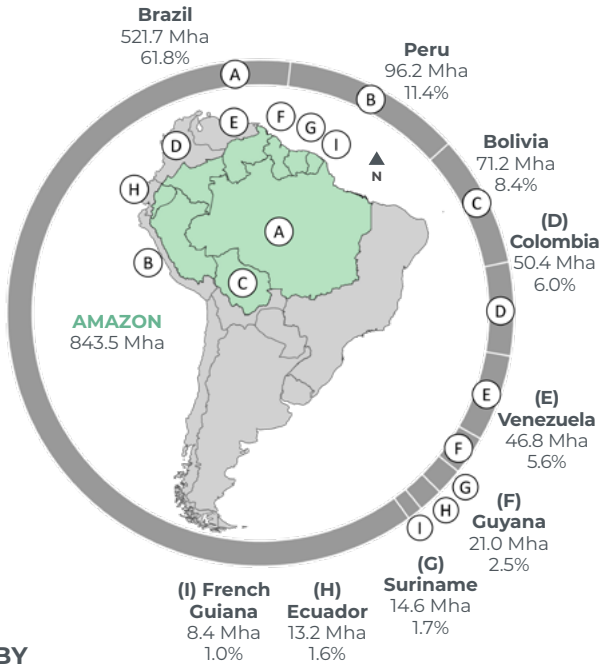
74.6 Mha — Native vegetation loss between 1985 and 2020, equivalent to Zambia

45.1 $GtCO_2$ — emitted since 1985 due to deforestation

Loss of **9.6%** of native vegetation compared to 1985

Brazil leads Amazonian forest loss due to agriculture expansion

Brazil is the most deforested country in the Amazon biome, representing 81% of the native vegetation loss. French Guiana, Guyana and Suriname are the most preserved, losing less than 1% of their native vegetation cover since 1985.



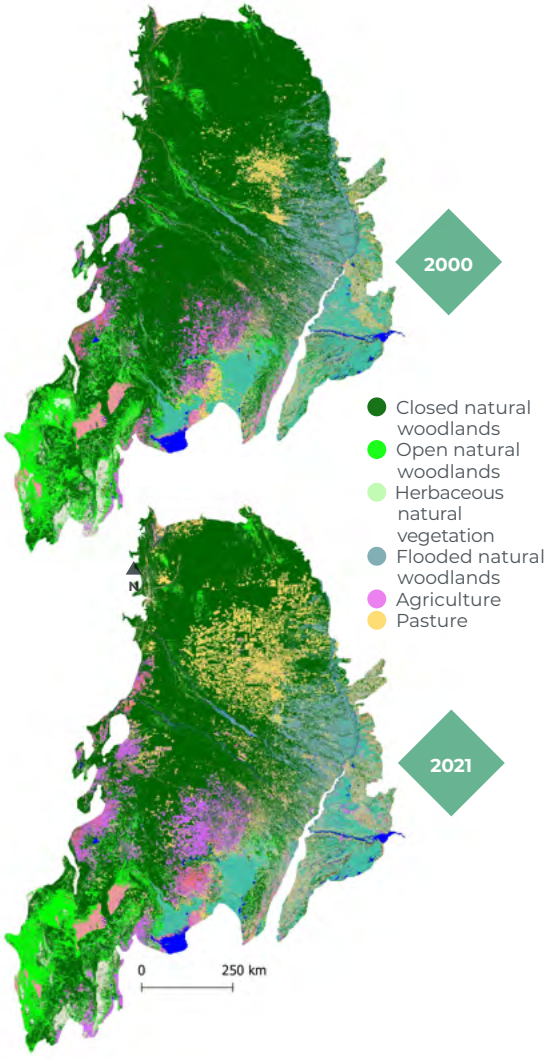
LAND COVER AND LAND USE BY COUNTRY IN THE AMAZON 1985 - 2020

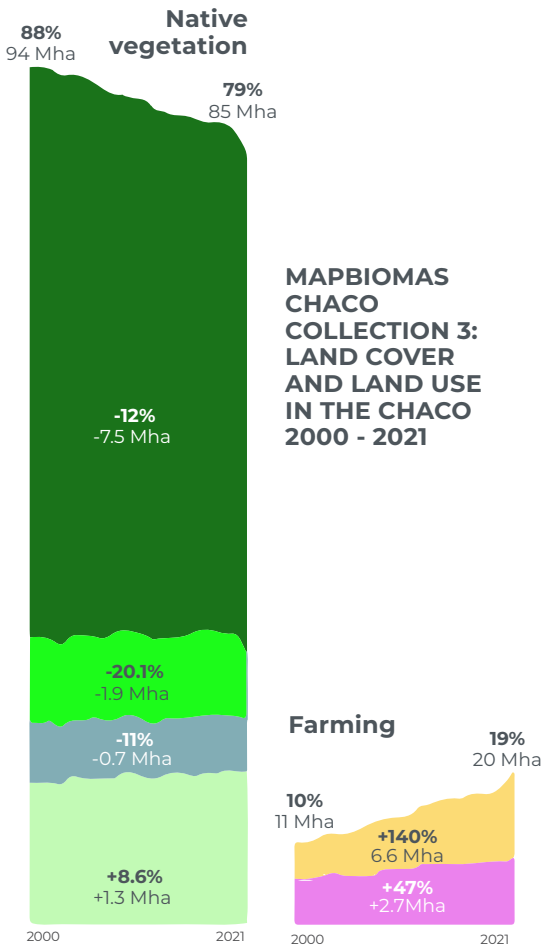




The conversion of **Chaco** forests into farming in South America

The Chaco is a semi-arid lowland covered by mixed dry forests, grasslands and wetlands. In South America it covers 6.1% of the territory. With slight less than 80% of its native vegetation still preserved, it has nonetheless one of the world's highest conversion rates, due to large scale cattle and soy expansion.





MAPBIOMAS CHACO COLLECTION 3: LAND COVER AND LAND USE IN THE CHACO 2000 - 2021

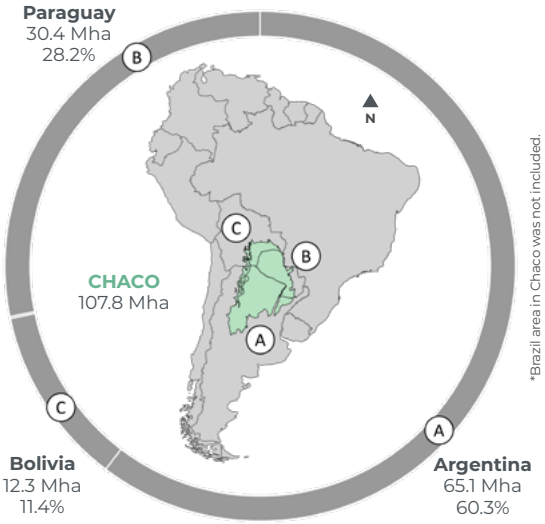
9.5 Mha — Native vegetation loss between 2000 and 2021, equivalent to Liberia

3.8 $GtCO_2$ — emitted since 2000 due to deforestation

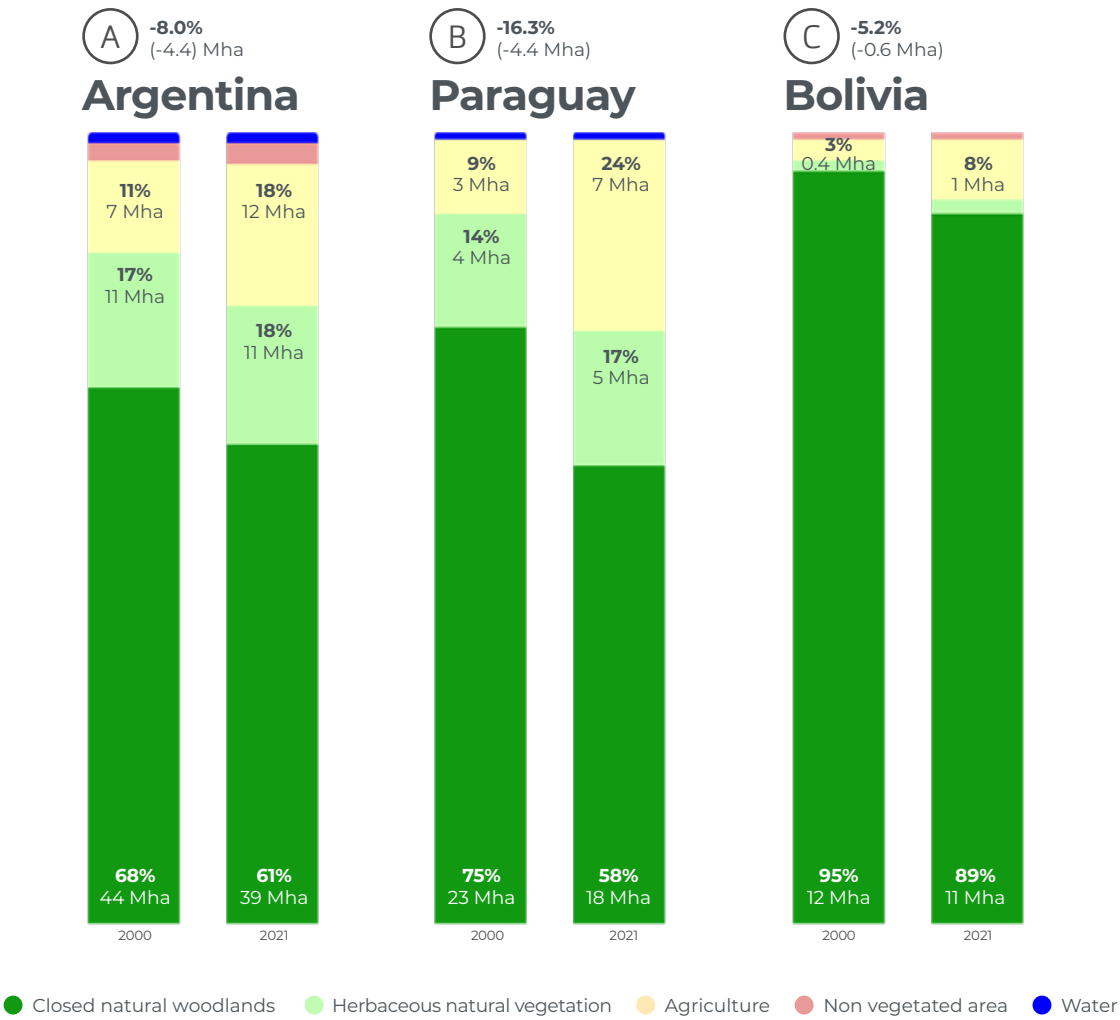
Loss of **10%** of native vegetation compared to 2000

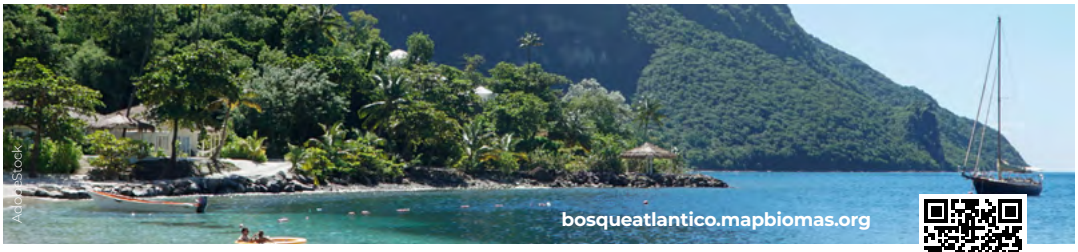
Farming expansion in Chaco native vegetation in Paraguay and Argentina

While Bolivia has 90% of the Chaco native vegetation, Paraguayan and Argentinean Chaco native vegetation lost more than 8 Mha in the last two decades to farming expansion.



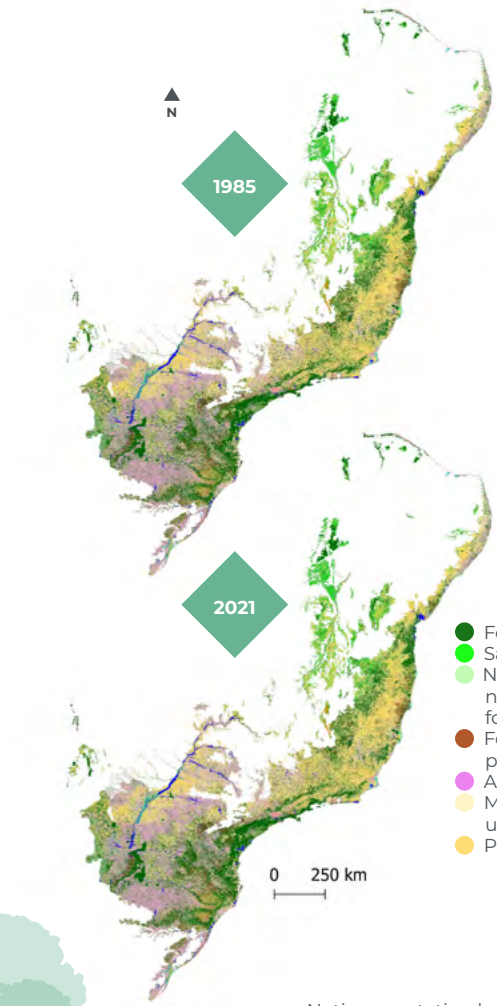
LAND COVER AND LAND USE BY COUNTRY IN THE CHACO 2000 - 2021





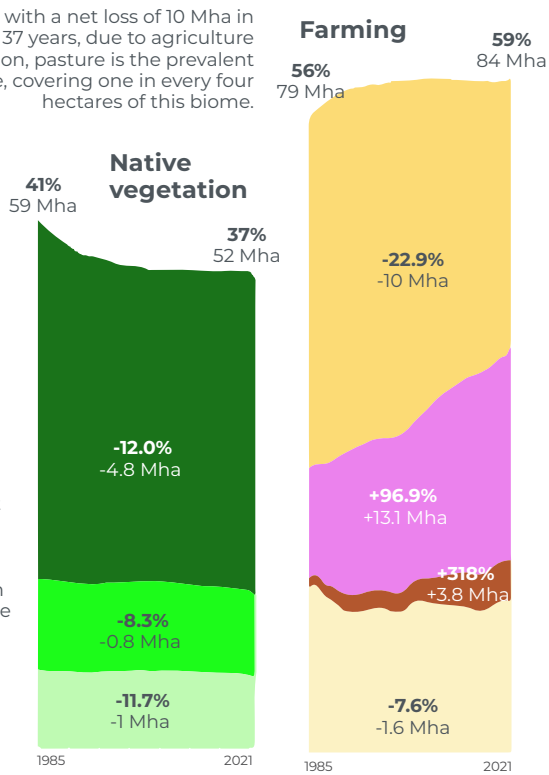
Atlantic Forest: The highly threatened and fragmented biome in South America

The Atlantic Forest occupies 8% of South America and it is the most deforested biome, being one of the most threatened topical biodiversity hotspot. In Brazil, the biome hosts 70% of the human population and 80% of the economy. Native vegetation now covers 37% of the biome's extent, with highest rate of secondary vegetation and fragmented landscapes. Thus, primary forest protection and restoration is critical in the context of climate mitigation.



MAPBIOMAS ATLANTIC FOREST COLLECTION 2: LAND COVER AND LAND USE IN THE ATLANTIC FOREST 1985 - 2021

Even with a net loss of 10 Mha in the last 37 years, due to agriculture expansion, pasture is the prevalent land use, covering one in every four hectares of this biome.



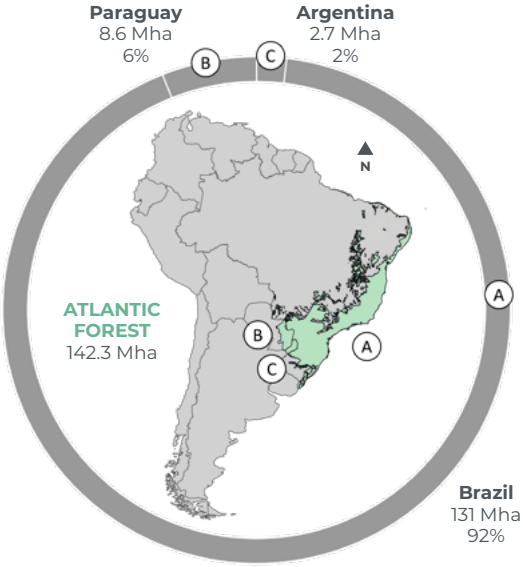
6.6 Mha — Native vegetation loss between 1985 and 2021, a bigger area than Togo

3 $GtCO_2$ — emitted since 1985 due to deforestation

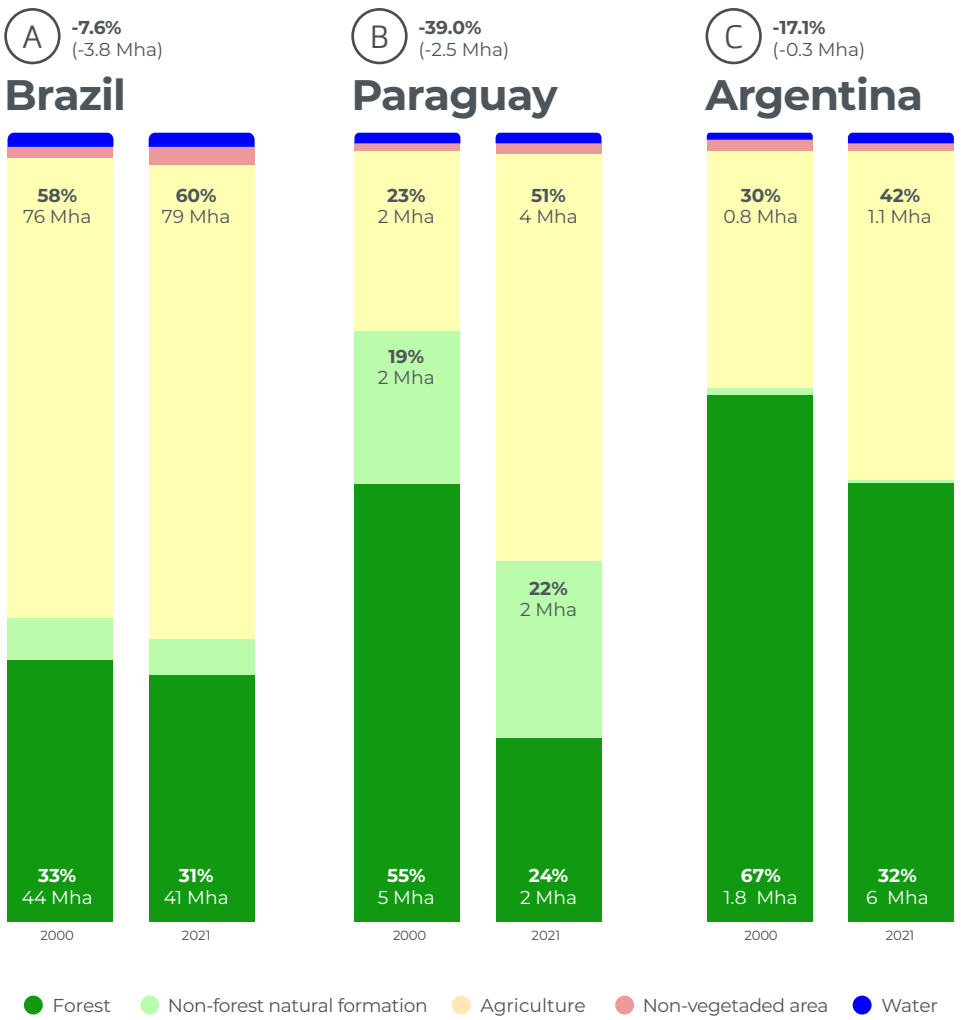
Loss of **11.3%** of native vegetation compared to 1985

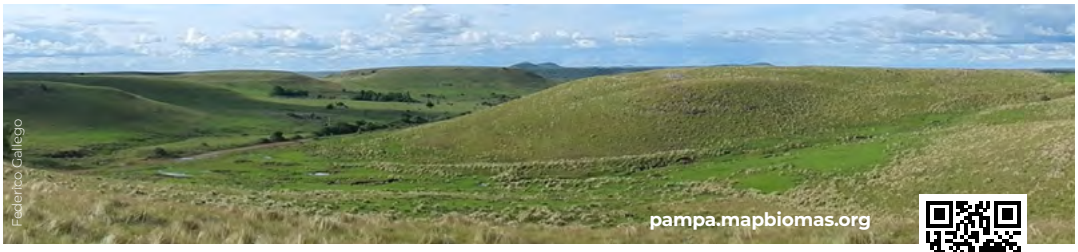
Rapid loss of Atlantic Forest remnants, mainly in Paraguay but still in Brazil

Despite its long land use history, the Brazilian Atlantic Forest showed the largest area of native vegetation loss (3.8 Mha). However, in recent years, Paraguay proportionally lost more, almost 40% of its native vegetation (2.5 Mha).



LAND COVER AND LAND USE BY COUNTRY IN THE ATLANTIC FOREST 1985 - 2021

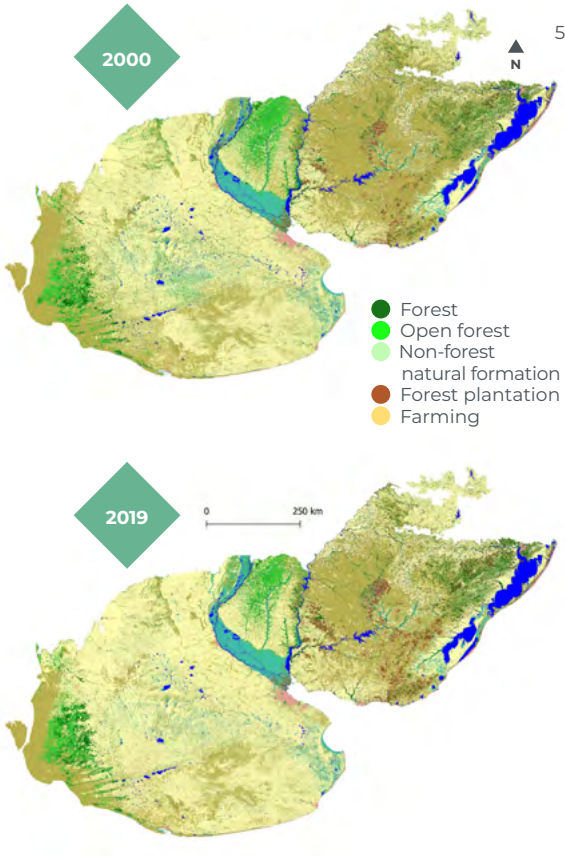




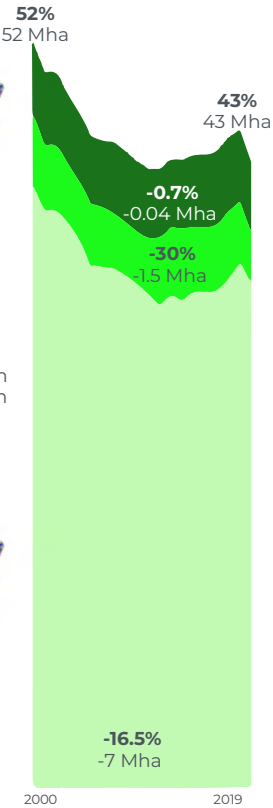
The loss of **Pampa** grasslands to large-scale agriculture and planted pastures

The Pampa is a vast region formerly dominated by natural grasslands. In South America it covers 5.6% of the territory. Nearly half of it has already been converted to farming, mostly to large-scale crop production, which grew 17.4% in the last two decades. At the same time, protected areas are less than 0.5% of the biome.

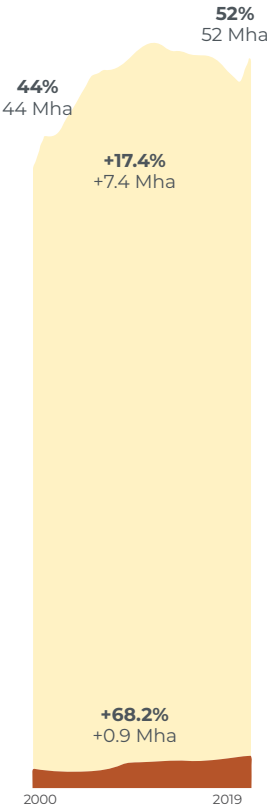
MAPBIOMAS PAMPA COLLECTION 1: LAND COVER AND LAND USE IN THE PAMPA 2000 - 2019



Native vegetation



Farming



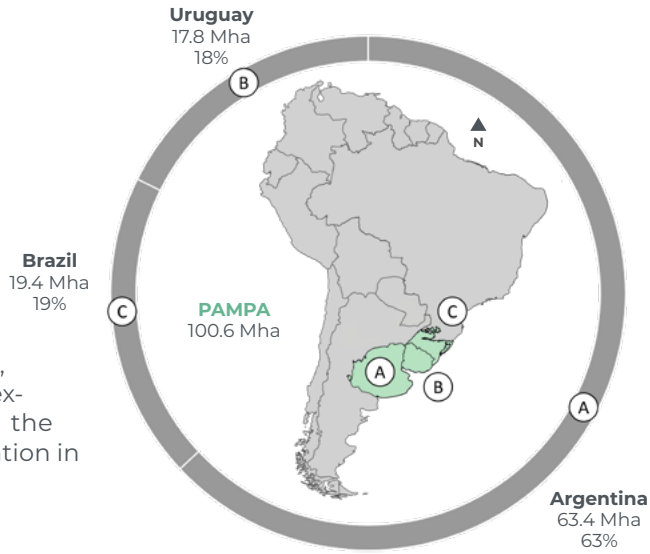
8.5 Mha — Native vegetation loss between 2000 and 2019, a bigger area than Sierra Leoni

700 $MtCO_2$ — emitted since 2000 due to deforestation

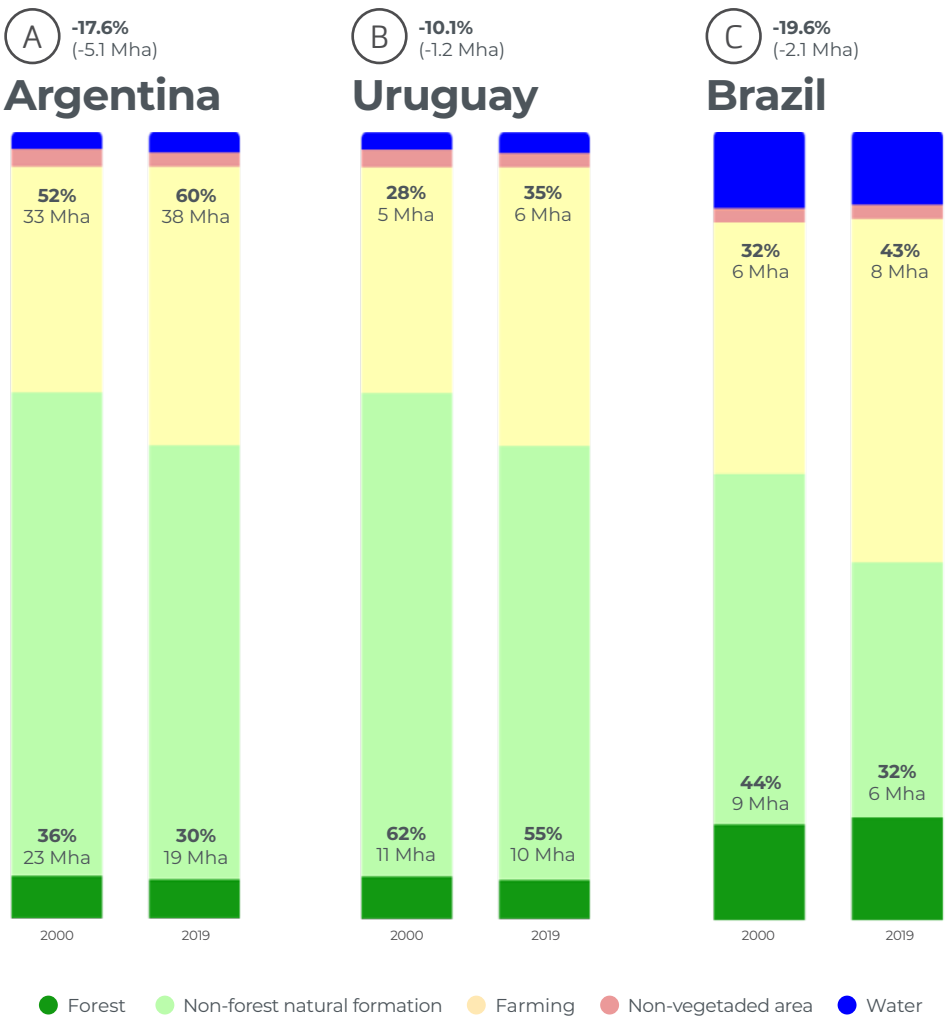
Loss of **16.3%** of native vegetation compared to 2000

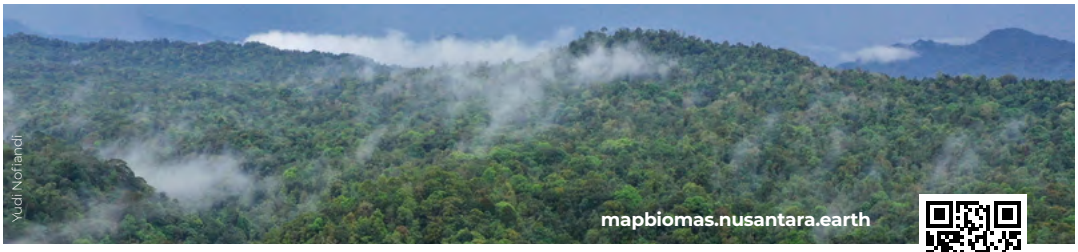
Argentina's Pampa lost in the last two decades

While Brazil had the greatest proportional loss of Pampa's native vegetation (19.6%), mainly due to soy plantation expansion, Argentina suffered the greatest loss of native vegetation in absolute terms (5.1 Mha).



LAND COVER AND LAND USE BY COUNTRY IN THE PAMPA 2000 - 2019

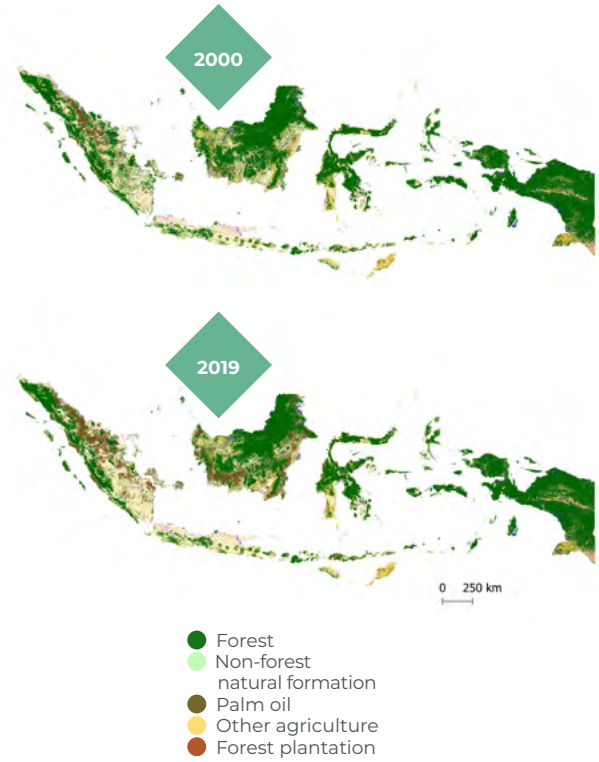


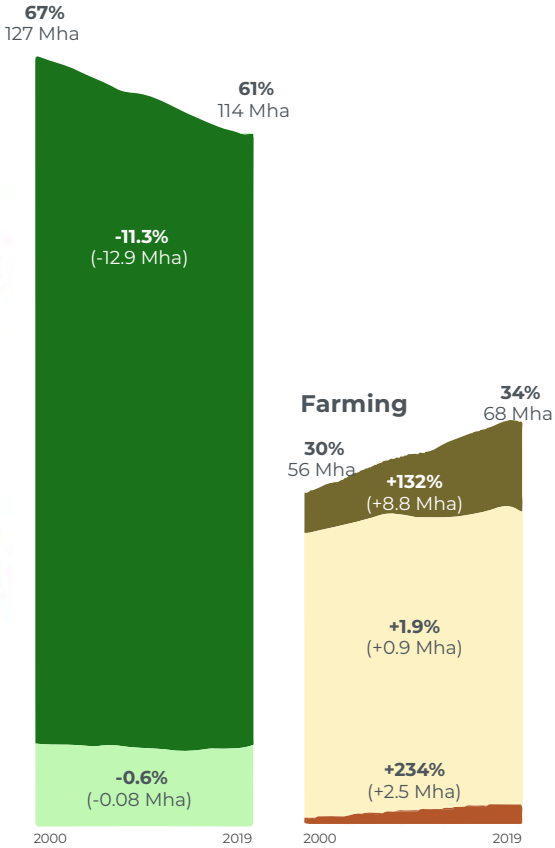


MapBiomas **Indonesia:** A biome imperiled by palm oil expansion

Indonesia is the biggest country in Southeast Asia. These archipelago comprises more than 17 thousand islands with many different types of habitats, encompassing two of the world's biodiversity hotspots. Of the 12.9 Mha of forest lost in the last two decades, 60.4% has been converted to agriculture, oil palm plantations, and pulpwood.

MAPBIOMAS INDONESIA COLLECTION 1: LAND COVER AND LAND USE IN INDONESIA 2000 - 2019





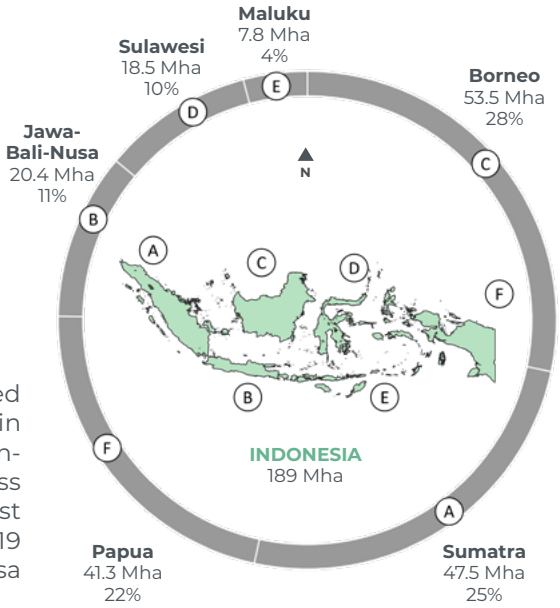
13 Mha — Native vegetation loss between 2000 and 2019, bigger than Malawi

5.9 $GtCO_2$ — emitted since 2000 due to deforestation

Loss of **10.2%** of native vegetation compared to 2000

Every island of Indonesia, specially Sumatra, lost forest cover in the last two decades

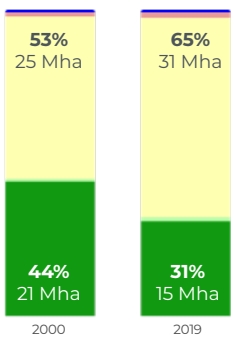
Sumatra is the region that suffered the most native vegetation loss in the last two decades (6.1 Mha), mainly converted into farming. This loss made it the region with the highest coverage of farming lands in 2019 (65%), surpassing the Jawa-Bali-Nusa region (59% of farming).



LAND COVER AND LAND USE BY REGION IN INDONESIA 2000 - 2019

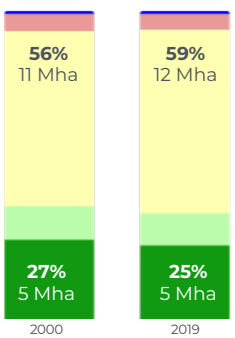
A Sumatra

-28.3% (-6.1 Mha)



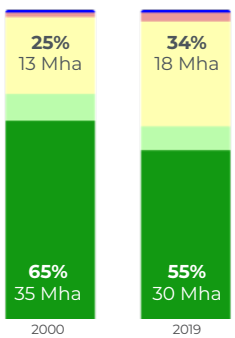
B Jawa-Bali-Nusa

-5.5% (-0.4 Mha)



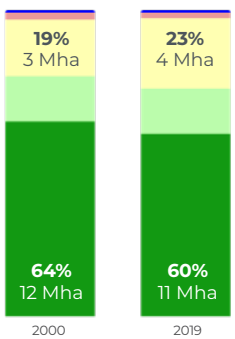
C Borneo

-13.9% (-5.4 Mha)



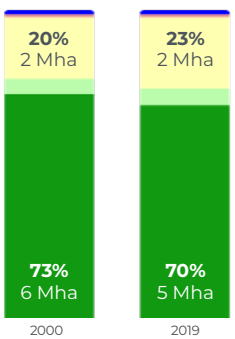
D Sulawesi

-4.8% (-0.7 Mha)



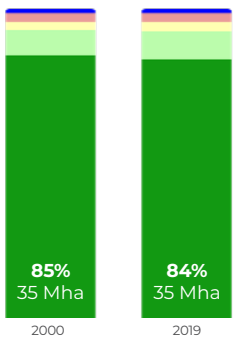
E Maluku

-4.2% (-0.3 Mha)



F Papua

-0.3% (-0.1 Mha)

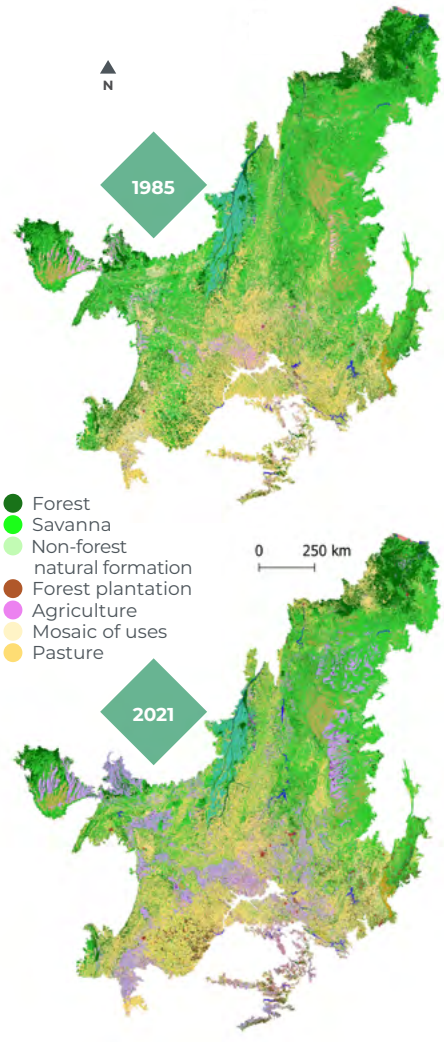


Forest · Non-forest natural formation · Agriculture · Non-vegetaded area · Water

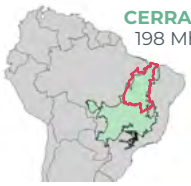


Cerrado lost almost half of its native vegetation

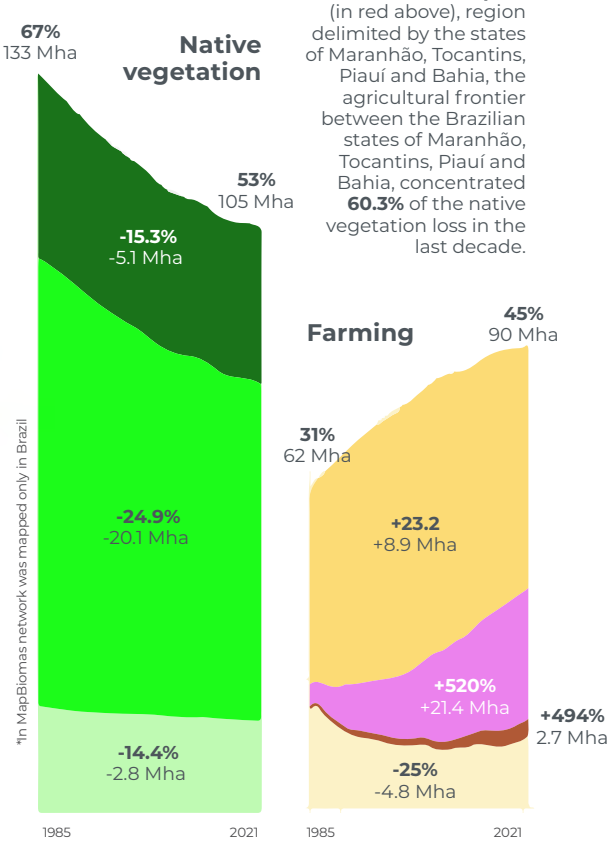
The Cerrado is the most diverse savanna in the world, being a biodiversity hotspot with a unique heterogeneous vegetation composed by forests, savannas, and grasslands. It is also key region for the water supply in Brazil and one of the hottest agriculture expansion frontiers in the world - the biome has already lost almost half of its original extension, mainly to pasture and soy.



MAPBIOMAS BRAZIL COLLECTION 7: LAND COVER AND LAND USE IN THE CERRADO 1985 - 2021



Matopiba (in red above), region delimited by the states of Maranhão, Tocantins, Piauí and Bahia, the agricultural frontier between the Brazilian states of Maranhão, Tocantins, Piauí and Bahia, concentrated **60.3%** of the native vegetation loss in the last decade.



27.9 Mha — Native vegetation loss between 1985 and 2021, larger than Burkina Faso

4.2 $GtCO_2$ — emitted since 1985 due to deforestation

Loss of **21%** of native vegetation compared to 1985

ABOUT MAPBIOMAS NETWORK

MapBiomas is a multi-institutional and collaborative network of universities, NGOs and tech startups mapping the land cover and land use time series in a fully transparent and free access data. The purpose is to reveal transformations in the territories through science, with precision, agility and quality and to make knowledge about land use accessible, in order to pursue conservation and sustainable management of the natural resources as a way to fight climate change.

Initiatives

Initiative	Collection	Period	Classes	Website
Brazil	7.0	1985-2021	27	mapbiomas.org
Chaco	3.0	2000-2021	15	chaco.mapbiomas.org
Atlantic Forest	2.0	1985-2021	18	blosqueatlantico.mapbiomas.org
Amazon	3.0	1985-2020	15	amazonia.mapbiomas.org
Pampa	1.0	2000-2019	8	pampa.mapbiomas.org
Indonesia	1.0	2000-2019	10	mapbiomas.nusantara.earth

Main characteristics of the method

Using artificial intelligence and processing satellite images at 30 m resolution in the cloud, the MapBiomas network involves 44 local institutions in the mapping of land use and land cover in 14 countries. Other new initiatives and collections are underway in Chile and completing the countries Peru, Bolivia, Colombia, Venezuela, Ecuador.

Processing of all available Landsat images in 37 years

30m resolution



Collaborative networking

270+ researchers from universities, NGOs and technology companies

Cloud processing using artificial intelligence algorithms

Google Earth Engine Platform

Annual information on land cover and land use from 1985 to 2021

Up to 27 classes mapped

MAPBIOMAS

For more information please access **mapbiomas.org**