BRAZILIAN FOREST SERVICE

BRAZILIAN FORESTS
at a glance

Ministry of Environment

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Foreword

Brazilian Forests fulfil important social, economic and environmental functions through a variety of goods and services they provide at national and global level. While comprising 61.5% of the Brazilian territory, they are distributed in biomes whose particular characteristics also determine their contribution on a local scale, providing shelter for wildlife and contributing to water resource conservation; biodiversity and soil conservation; production of timber and non-timber products; climate stability; and a range of cultural values.

Conserving and managing our forests to rationally produce goods and services in a sustainable way is a challenge and an opportunity for the society as a whole. An important aspect to enhance the value of our forests is however quantifying their breadth, quality and socioeconomic importance through updated and reliable information.

Brazilian Forests – at a glance provides a concise and updated overview of natural and planted Brazilian forests and their importance for the country. It is based on data gathered from national sources produced by the main stakeholders involved in the management, use and conservation of forest resources.

We believe that this pocket book will be very useful for those who take an interest in the conservation and management of forest resources in Brazil.

Antônio Carlos Hummel
General-Director of the Brazilian Forest Service

National Statistics

	Year of Reference 2008
Total population	184 million
Total land area	851 million ha
Total forest area	524 million ha
Percentage of forest area compared to the total area	61.5%
Forest area per capita	2.85 ha
Natural forest area	517 million ha
Plantation forest area	6.6 million ha
Federal Conservation Units (protected areas)	77 million ha
Indigenous Land Areas	106 million ha
Registered public forests (2009)	239 million ha
Federal Community Forests	123.6 million ha
Exports by the forest sector	7.9 billion US$ FOB
Imports by the forest sector	1.4 billion US$ FOB
Main importers of forest products	
United States	1.8 billion US$
Netherlands	925 million US$
China	835 million US$

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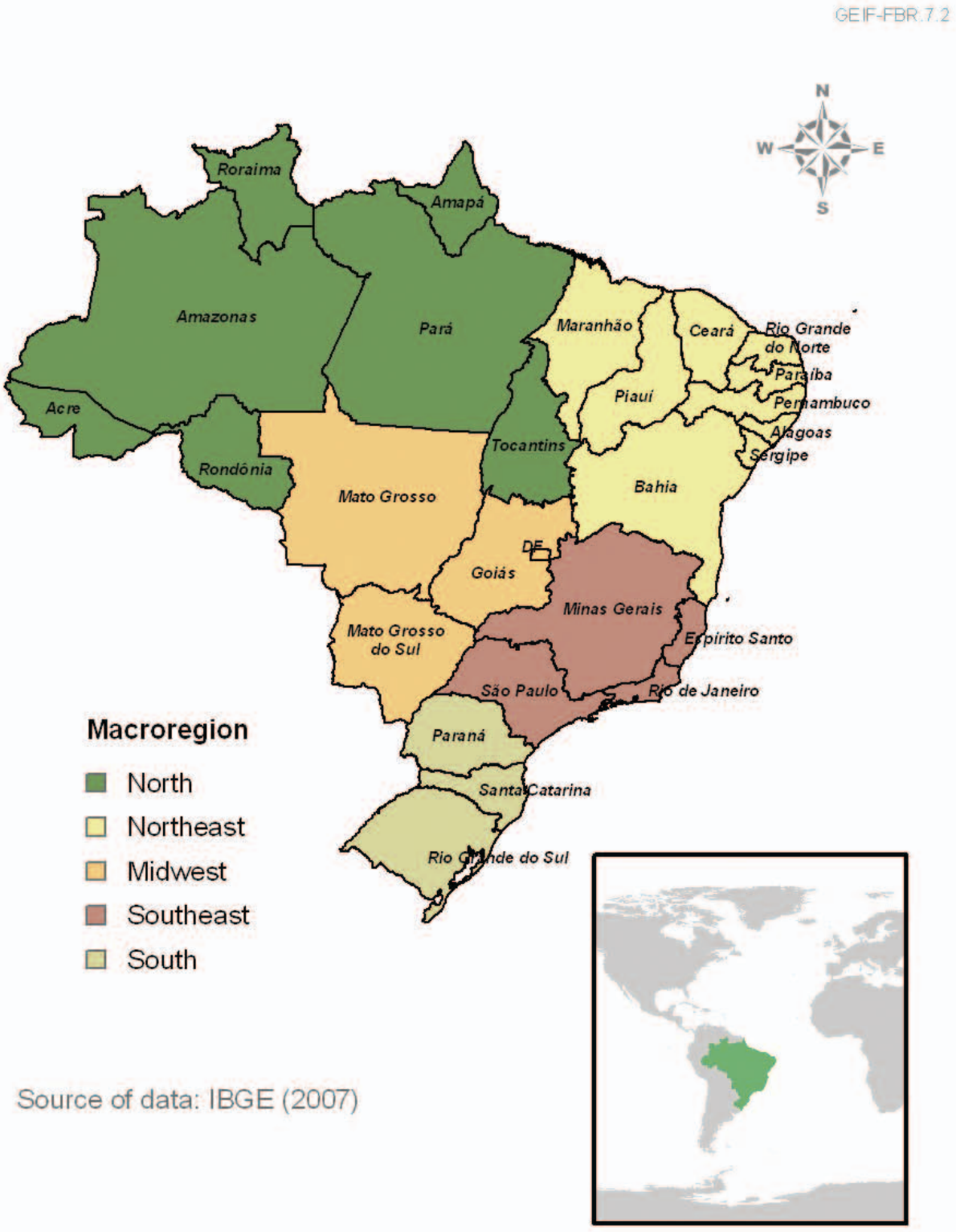
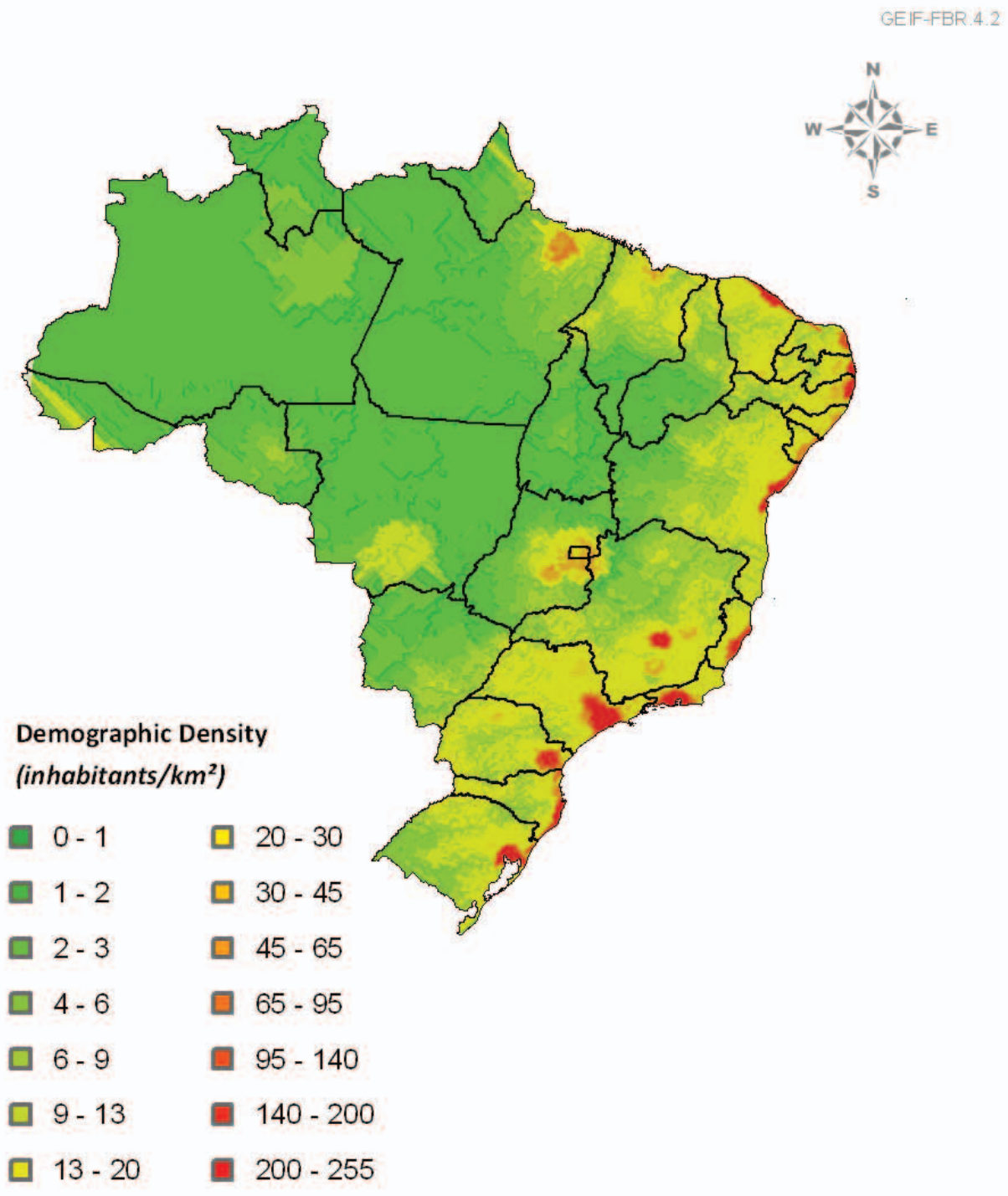


Climate

GEIF-FBR 9.2

Source of data: IBGE (2002)

Demographic Density



Source of data: IBGE (2007)

Soils

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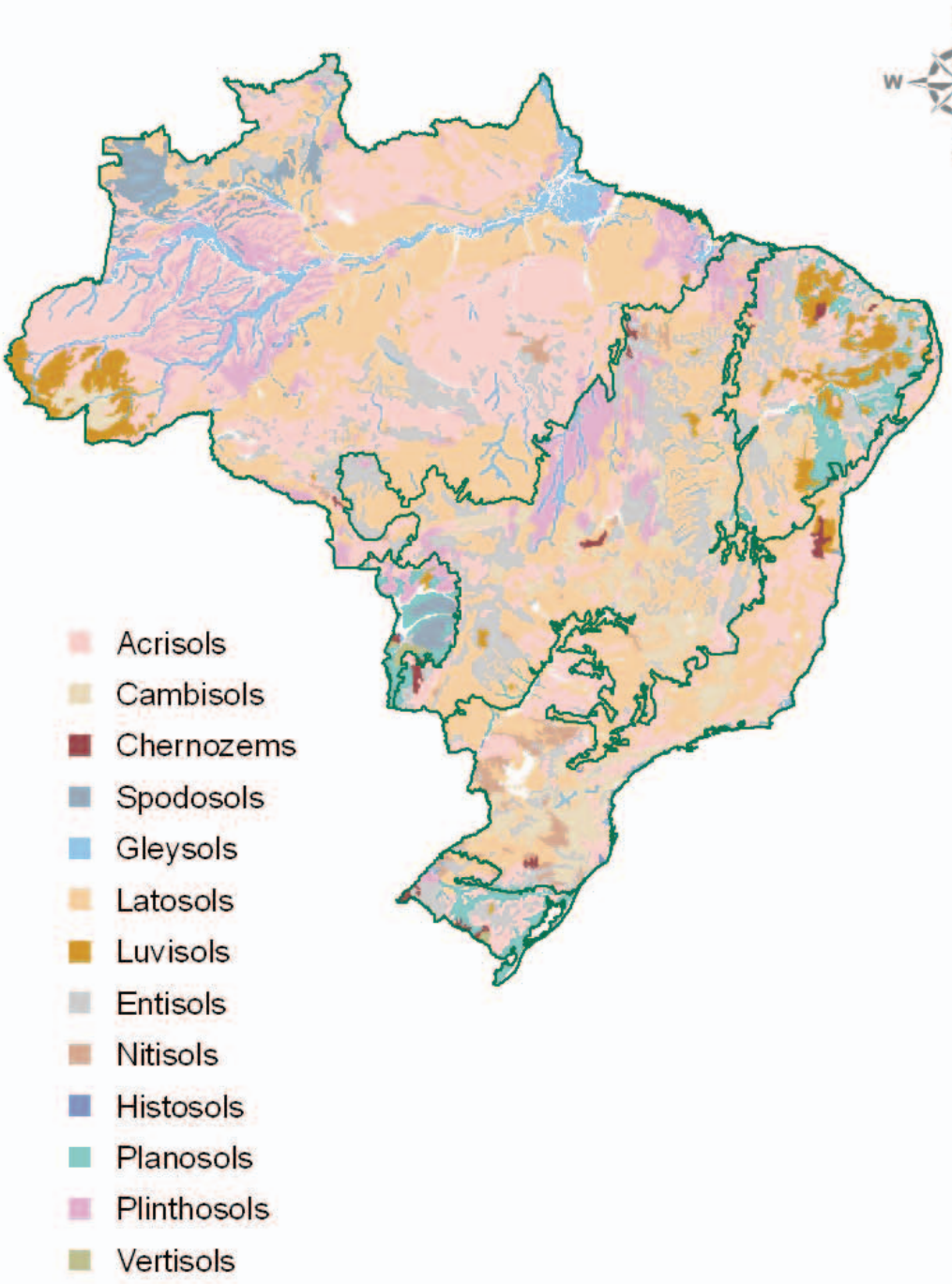
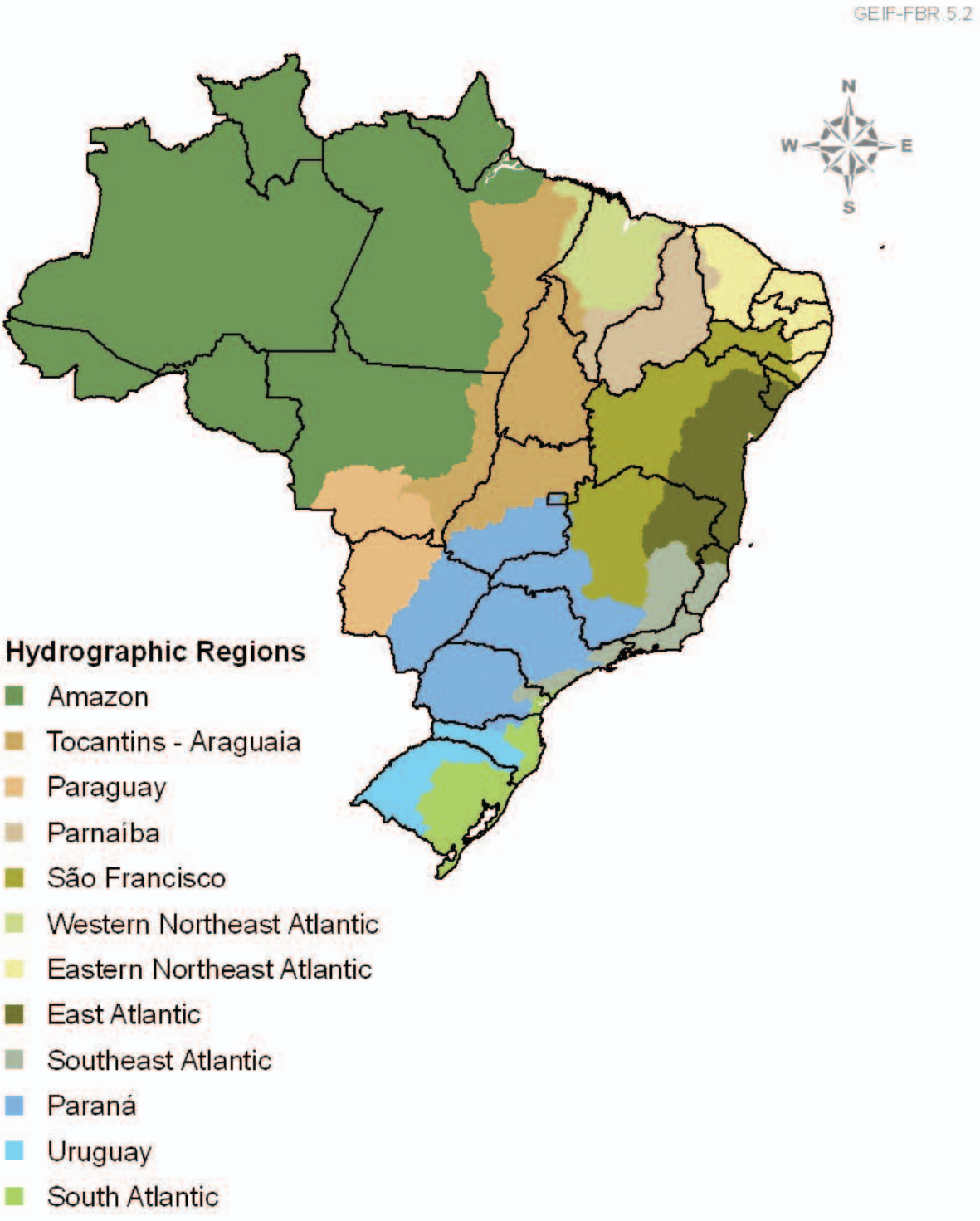


Sources of data: EMBRAPA and IBGE (2001).

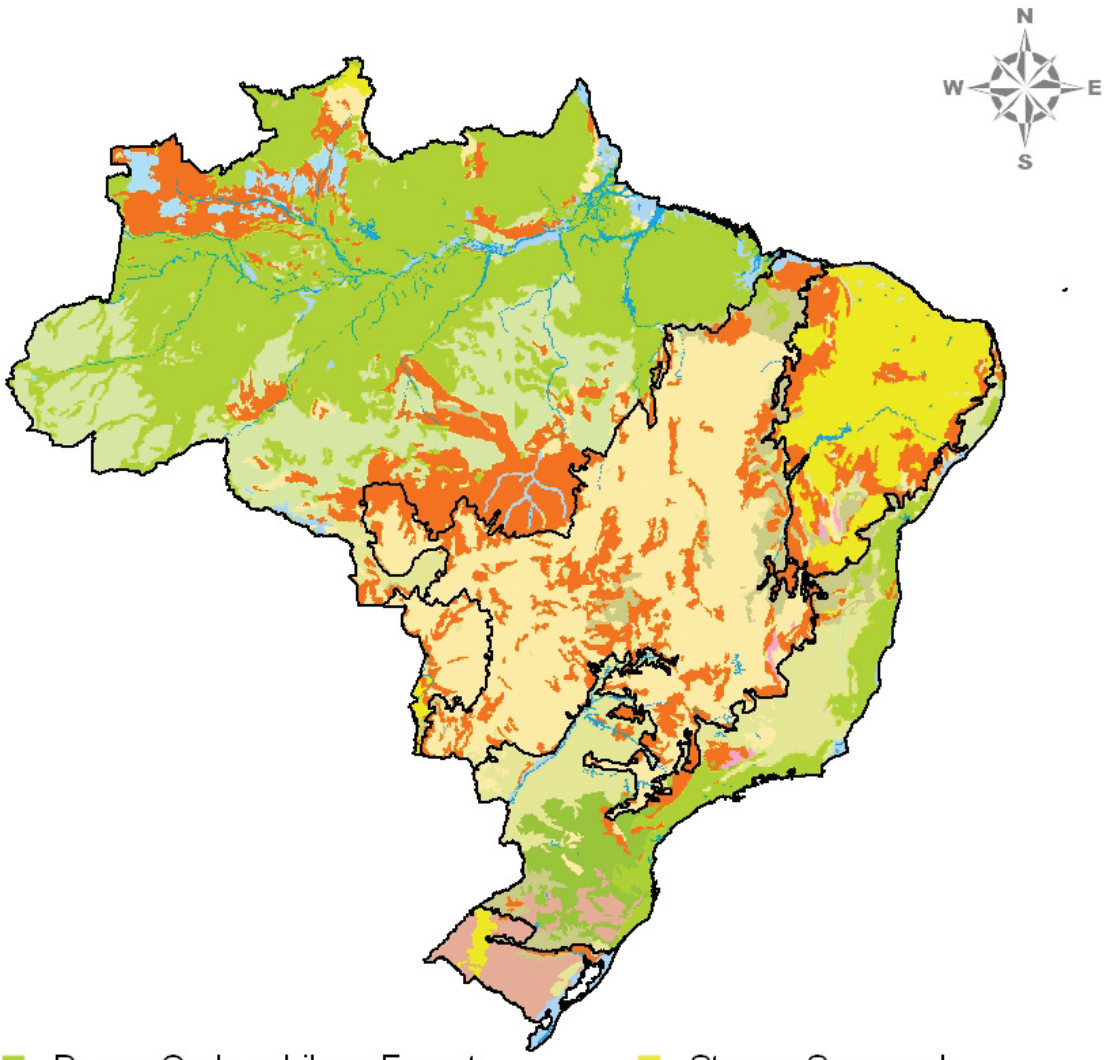
Hydrographic Regions



Source of data: ANA (2003).

Vegetation Cover

GEIF-FBR.8.2



- Dense Ombrophilous Forest
- Open Ombrophilous Forest
- Mixed Ombrophilous Forest
- Semi-deciduous Seasonal Forest
- Deciduous Seasonal Forest
- Campinarana heath forest
- Savannah
- Steppe Savannah
- Steppe
- Pioneer Formations
- Ecotone
- Ecological refuge
- Water

Source of data: IBGE (2006).

Brazilian Forests

What is forest?

For the purpose of elaborating national and international reports on forest resources in the country as well as carrying out its regular activities, the Brazilian Forest Service considers as forest the typologies of woody vegetation that most closely fit the definition of forests by the United Nations Food and Agriculture Organization (FAO). They correspond to the following categories of vegetation according to the Classification System of the Brazilian Institute of Geography and Statistics (IBGE):

- ✓ Dense Ombrophilous Forest;
- ✓ Open Ombrophilous Forest;
- ✓ Mixed Ombrophilous Forest;
- ✓ Semi-deciduous Seasonal Forest;
- ✓ Deciduous Seasonal Forest;
- ✓ Forested and Arboreal Campinarana
- ✓ Forested and Arboreal Savannah - Cerradão and Campo-Cerrado;
- ✓ Forested and Arboreal Steppe Savannah – Arboreal Caatinga;
- ✓ Arboreal Steppe;
- ✓ Fluviomarine, sea-, river- and/or lake-influenced vegetation (arboreal);
- ✓ Remnant vegetation in contact zones with at least one forest formation;
- ✓ Secondary vegetation in forest areas;
- ✓ Reforestation.

Definition of Forest adopted by FAO

"Forest: Land spanning more than 0.5 ha with trees higher than 5 meters and a canopy cover of more than 10%, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use."

FAO - Food and Agriculture Organization of the United Nations

Terms and Definitions, FRA 2010
http://www.fao.org/forestry/media/7797/1/0/

Definition of Forest adopted by UNFCCC

"Forest is a minimum area of land of 0.05-1.0 ha with tree crown cover (or equivalent stocking level) of more than 10-30% with trees with the potential to reach a minimum height of 2-5 metres at maturity in situ. A forest may consist either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground or open forest. Young natural stands and all plantations which have yet to reach a crown density of 10-30% or tree height of 2-5 metres are included under forest, as are areas normally forming part of the forest area which are temporarily unstocked as a result of human intervention such as harvesting or natural causes but which are expected to revert to forest."

UNFCCC – United Nations Framework Convention on Climate Change

Marrakesh Accord and Marrakesh Declaration
http://unfccc.int/cop7/documents/accords_draft.pdf

Forest Area

Forests in Brazil cover approximately 524 million hectares (61.5% of its territory) of natural and planted forests – which makes it the second largest forest area in the world, only surpassed by Russia.

Area of forests in Brazil (2008)

Forest type	Total area (ha)	% Area of forest	% Area of Brazil
Natural Forest	517,088,567	98.7	60.7
Planted Forest	6,615,288	1.3	0.8
Total	**523,703,855**	100	61.5

Source: Brazil/MMA (2009), ABRAF (2009).

Natural Forests

Using the mapping surveys of the Brazilian vegetation, carried out by the Ministry of Environment (Brazil/MMA, 2007) through LANDSAT satellite images captured in 2002, the area of natural forests for the years 1990, 2000, 2005 and 2008 was estimated based on the available deforestation rates observed in each biome.

Estimated area of natural forest in Brazilian biomes

(ha)

Biomes	2008
Amazon	356,429,362
Caatinga	47,376,398
Cerrado	71,829,731
Pantanal	8,731,839
Atlantic Forest	29,132,040
Pampa	3,589,197
Total	**517,088,567**

Source: Brazil/MMA (2009) with adaptations.

Forest Plantations

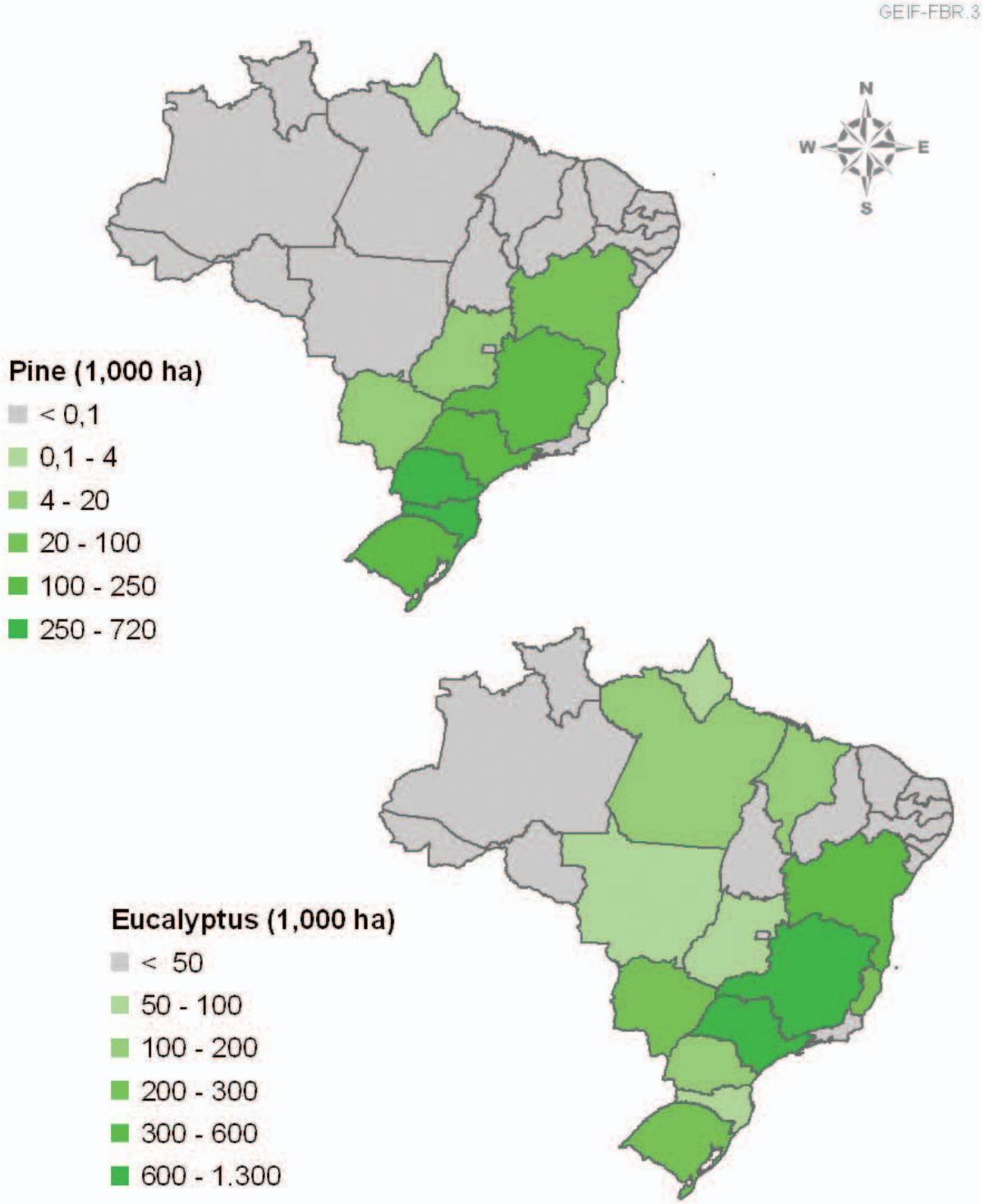
Brazil has around 6.6 million hectares of forest plantations, especially with species of Eucalyptus and Pinus, which represent 93% of the total of such forests.

Composition of forest plantations in Brazil (2008)

Species	Scientific name	Area (ha)	%
Eucalyptus	*Eucalyptus* spp	4,259,000	64.38
Pine	*Pinus* spp	1,868,000	28.24
Black Wattle	*Acacia mearnsii* / *Acacia angium*	181,780	2.75
Rubber tree	*Hevea brasiliensis*	149,104	2.25
Paricá	*Schizolobium amazonicum*	80,177	1.21
Teak	*Tectona grandis*	58,813	0.89
Araucaria	*Araucaria angustifolia*	12,525	0.19
Poplar	*Populus* spp	4,022	0.06
Others		1,867	0.03
Total		**6,615,288**	**100**

Source: ABRAF (2009).

Forest plantations with Pine and Eucalyptus



Source of data: ABRAF (2009).

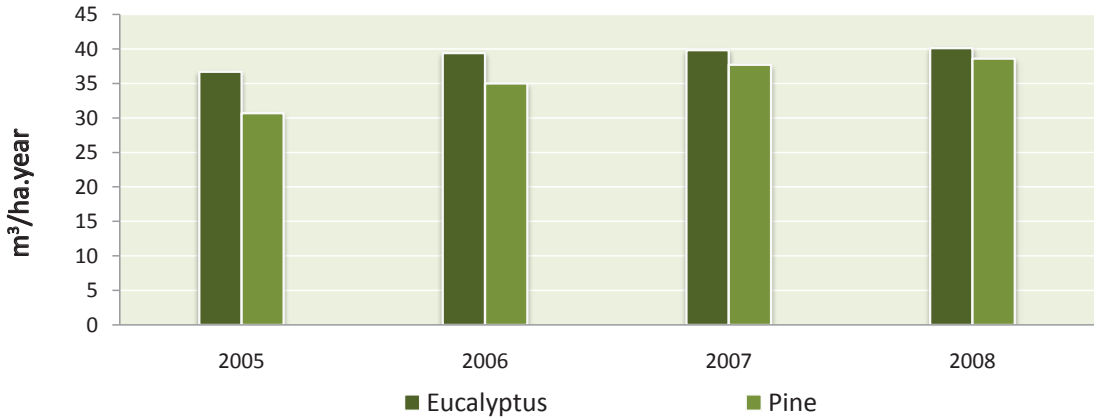
Distribution of forest plantations with Pine or Eucalyptus in Brazil

(ha)

State	Eucalyptus	Pine	Total
Minas Gerais	1,278,212	145,000	**1,423,212**
São Paulo	934,360	207,840	**1,142,200**
Paraná	142,434	714,893	**857,327**
Santa Catarina	77,436	551,219	**628,655**
Bahia	587,606	35,090	**622,696**
Rio Grande do Sul	277,316	173,163	**450,479**
Mato Grosso do Sul	265,254	18,797	**284,051**
Espírito Santo	210,409	3,991	**214,400**
Pará	136,294	11	**136,305**
Maranhão	111,117	0	**111,117**
Amapá	63,309	1,620	**64,929**
Goiás	56,881	15,198	**72,079**
Mato Grosso	58,580	7	**58,587**
Others	59,496	850	**60,346**
Total	**4,258,704**	**1,867,680**	**6,126,384**

Source: ABRAF (2009).

The productivity of the Brazilian forest plantations has been increasing. In addition to environmental factors favouring forestry, new technologies are being used to enhance productivity, such as the genetic manipulation of seeds and the cloning of forest species. Such improvement makes Brazil stand out in forest productivity for both softwoods and hardwoods.



Evolution of the average productivity in forest plantations by companies associated to ABRAF (2005-2008)
Source: ABRAF (2009).

Institutional Framework for Forest Management

The responsability of managing the Brazilian forests involves different institutions and the three levels of government: federal, state and municipality. With regard to the Federal Government, direct responsibility for Forest Management lies with four institutions:

The **Ministry of the Environment (MMA)** is responsible for the formulation of forest policies. It is the institution that may award rights in the sustainable forest production sector, as it is responsible for signing forest concession contracts (www.mma.gov.br).

SERVIÇO FLORESTAL BRASILEIRO

The **Brazilian Forest Service** is the body that manages federal public forests for the sustainable production of goods and services. It also has the duty of providing information, training, and fostering the forest sector (www.florestal.gov.br).

IBAMA
MMA

The **Brazilian Institute of Environment and Renewable Natural Resources (IBAMA)** is responsible for the environmental control, law enforcement, and licensing of the Brazilian forests (www.ibama.gov.br).

The **Chico Mendes Institute of Biodiversity Conservation (ICMBio)** is responsible for proposing, implementing, managing, protecting, inspecting and monitoring 'Conservation Units': protected areas instituted by the Federal Government (www.icmbio.gov.br).

Social Participation in National Forest Management

In addition to the public hearings and consultations that take place in local communities according to the specific situations established by law, there are three collegiate institutions that enable social participation in the forest management decision-making process.

The National Environmental Council (CONAMA) is the consulting body that deliberates on the National Environmental System (SISNAMA). It is a collegial group of representatives from federal, state and municipality environmental institutions, representing the private sector and from civil society.

The National Forest Commission (CONAFLOR) provides guidelines to implement the National Forest Program activities and enables coordinating the participation of different groups concerned with the development of public policies for the Brazilian forest sector.

The Public Forest Management Commission (CGFLOP) is a consultative body under the Brazilian Forest Service whose purpose is to advise, assess and propose guidelines for public forest management in Brazil, and to issue their opinion on the Annual Forest Concession Plan.

State and Municipality Forest Management

At State level, despite some variations in the institutional arrangement for forest management, in general the state environmental department are responsible for elaborating forest policies and regulation, and state environmental department are responsible for licensing, control, and inspection of forestry and conservation activities. Some states have created specific institution for public forest management. At municipalities level, the arrangement is similar.

Social participation in forest management in states mostly happens within the scope of state environmental councils.

Institutional arrangement for Forest Management at different government levels

Main tasks	Federal	States	Municipalities
Forest Policy/Grantor	MMA	Environmental State Department	Environmental Municipality Department
Environmental control and law enforcement	IBAMA	Environmental State Department or Institution	Environmental Municipality Institution
Forest conservation	ICMBio	Environmental State Institution	Environmental Municipality Institution
Public Forests Management and Concessions	Brazilian Forest Service	Public Forest Management State Institution	Public Forest Management Municipality Institution
Collegiate Institutions participating of the Forest Management	CONAMA CONAFLOR/CGFLOP	Environmental State Council	Environmental Municipality Council

National Forest Inventory

The National Forest Inventory (NFI) is coordinated by the Brazilian Forest Service and aims at periodically produce information on the area and conditions of the Brazilian forest cover both natural and plantations. The NFI results are inform government and society actions to develop and assess public policies and projects on the use and conservation of forests.

The sampling system for field data collection is based on the systematic distribution of clusters over a national grid of sample points lying at an equidistance of approximately 20 km between sample points. All sample points are going to be visited regardless of whether they are in forest areas or not.

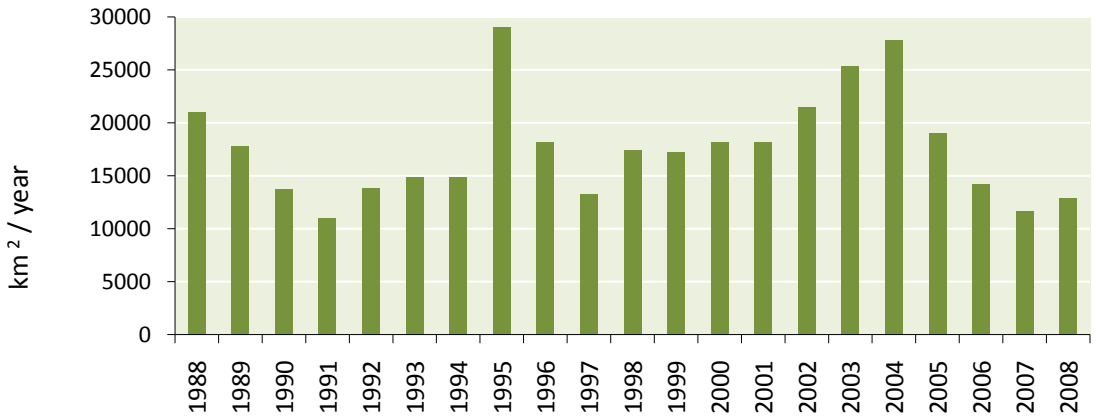
To assess forest-related attributes, data will be gathered from measurements of dendrometric variables, identification of tree species, and other qualitative and quantitative variables that will enable the characterization of the forest ecosystem in each sample point. While clusters are measured, people who are related to the forest are going to be interviewed, so as to produce information that can characterize how local communities perceive and use forest resources.

Monitoring of the Amazon Region

The Brazilian Government conducts satellite monitoring of the forest cover of the Amazon area through the National Institute of Space Research (INPE), which has four operational systems: PRODES, DETER, DEGRAD and DETEX. Such systems complement each other and were conceived to meet different purposes.

PRODES

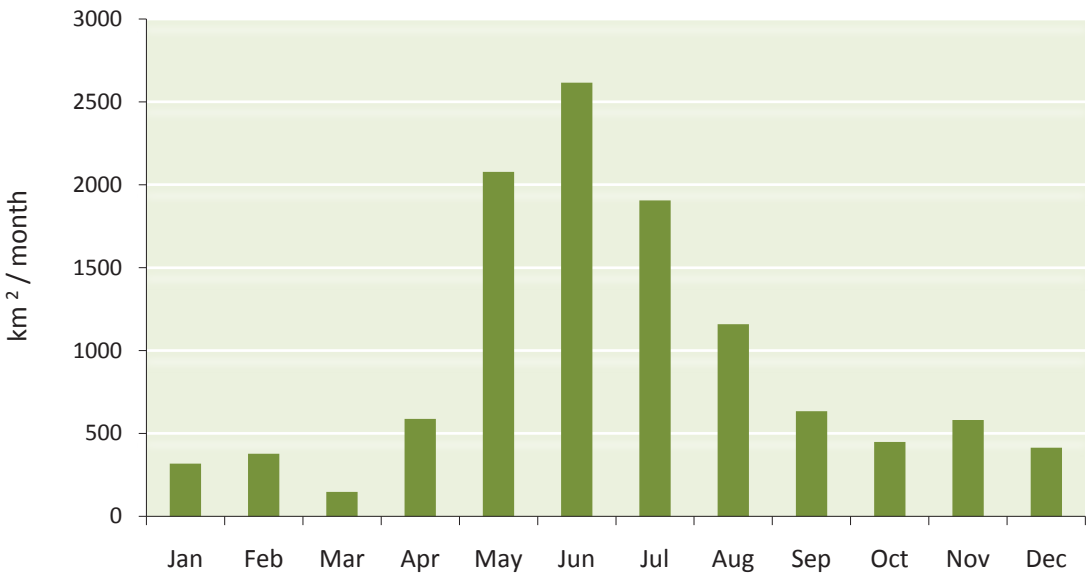
The Program do Calculate Deforestation in the Amazon Region (PRODES) uses LANDSAT satellite images to measure annual clear-cutting rates for periods ranging from August of the preceding year to July of the year of calculation, since 1988, considering deforested areas of over 6.25 ha.



Annual deforestation rate for the Brazilian Amazon Region (PRODES)
Source: INPE (2009b).

DETER

The Real-Time Deforestation Detection System (DETER), developed by INPE in 2004, uses data from the MODIS sensor in the Terra/Aqua satellite and from the WFI sensor of the CBERS satellite, to monthly publish a map of deforestation warning areas over 25 hectares size, which outlines both cleared areas and areas in process of deforestation due to progressive forest degradation.



Average monthly deforestation rate for the Brazilian Amazon region (DETER)
Source: INPE (2009c).

DEGRAD

The DEGRAD system, developed by INPE in 2007, uses LANDSAT and CBERS satellite images to annually map areas in process of deforestation, where forest cover has not been completely removed and which thus are not computed by the PRODES system. Out of 15,987.10 km² mapped as degraded forest areas in 2007, 1,982 km² have turned into cleared areas in 2008 and were, therefore, reported by PRODES. In this same year, 27,417.10 km² were mapped as degraded forest areas.

Forest degradation in the Brazilian Amazon area (DEGRAD)

(km²)

State	Area in 2007	Area in 2008
Acre	122.80	121.34
Amazonas	257.60	412.42
Amapá	50.42	63.18
Maranhão	1,976.75	4,230.70
Mato Grosso	8,951.14	12,987.74
Pará	3,899.23	8,264.82
Rondônia	412.32	643.32
Roraima	137.28	171.39
Tocantins	179.71	522.18
Total	**15,987.25**	**27,417.10**

Source: INPE (2009a).

DETEX

The main purpose of the Monitoring System for Selective Logging Detection (DETEX), developed by INPE in 2007 with Brazilian Forest Service support, is to provide some input to effectively inspect management plans for forest concessions established by Law No. 11,284 of 2006, and for public forests in general.

DETEX multitemporal studies have been conducted in National Forests under consideration for forest concession, as well as in the regions around the BR-163 and BR-319 highways, for the purpose of identifying the occurrence of logging activities, using LANDSAT and CBERS satellite images. From 2008 on, all public forests in the Brazilian Amazon Region is being monitored by this system.

Areas monitored by DETEX in 2009:

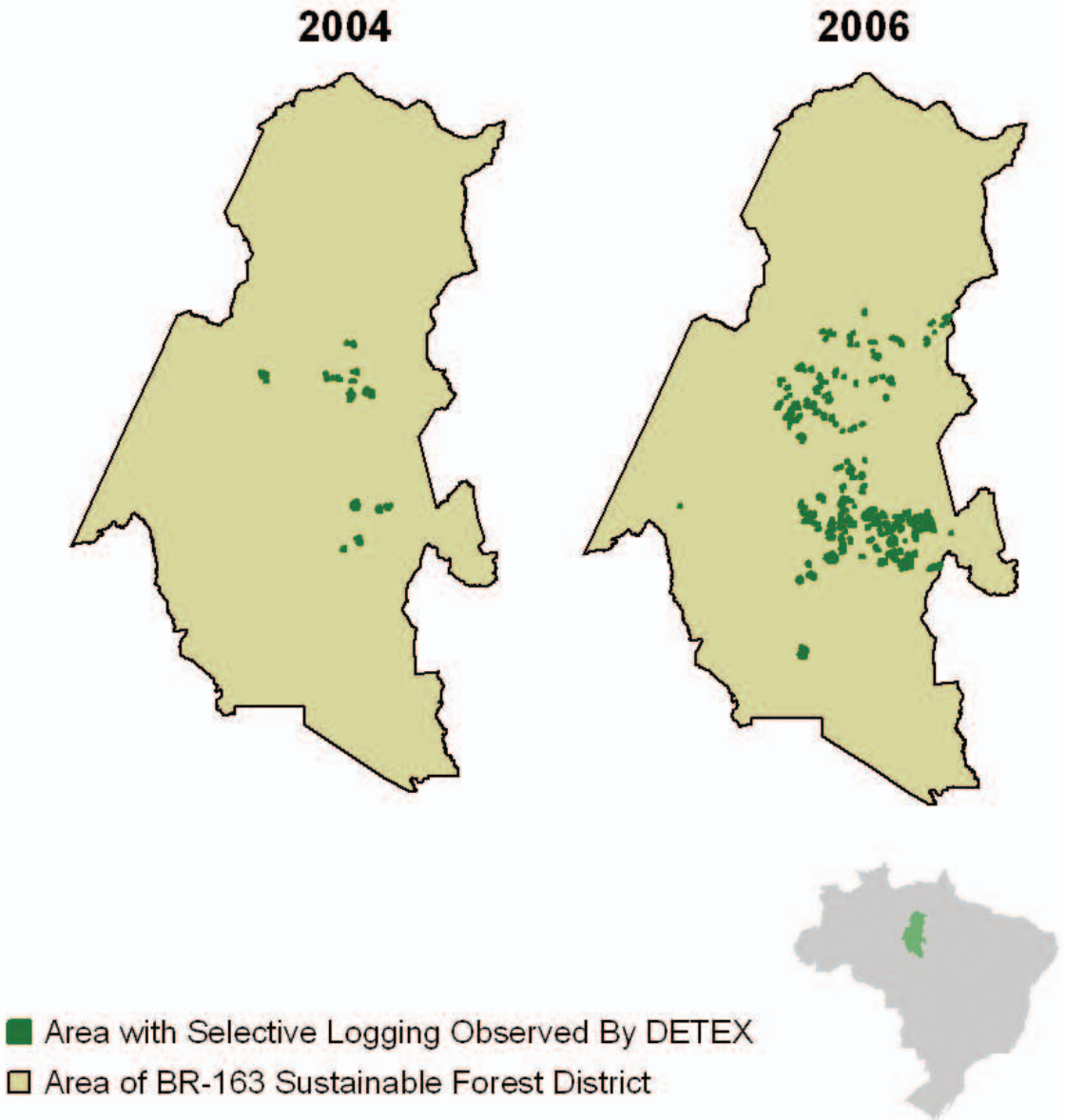
- BR-163 Sustainable Forest District: years 2004, 2005, 2006 and 2007;
- Purus-Madeira Region (BR-319): year 2006;
- Jamari National Forest: years 1985 to 2008;
- Saracá-Taquera National Forest: years- 1988 to 2007;
- Public Forests in the Brazilian Amazon area: years 2008 and 2009.

Figures found by mapping the selective logging (DETEX) in the BR-163 Sustainable Forest District

(km^2)

Period	2004	2005	2006	2007
Selective logging area	121.52	654.05	1,154.08	1,263.67

Source: INPE (2008d).



Evolution of selective logging in BR-163, in 2004 and 2006
Source: INPE (2008d).

Monitoring the Atlantic Forest biome

The NGO "SOS Mata Atlântica", in partnership with INPE, carried out the monitoring of deforestation in the Atlantic Forest biome for the 2005-2008 period through images from the satellite CBERS and from the LANDSAT satellites. Deforestation observed in this period totalled 102,939 ha, leading to an annual average of 34,313 ha deforested per year, which is quite close to the annual average identified between 2000 and 2005 (34,965 ha deforested/year). Out of this total, 59 incidents of deforestation occurred in areas over 100 ha large, totalizing 11,276 ha; the rest took place in areas less than 10 ha.

Deforestation in the Atlantic Forest (2005 – 2008)

(ha)

State	Deforested area
Bahia	24,148
Espírito Santo	573
Goiânia	733
Minas Gerais	32,728
Mato Grosso Sul	2,215
Paraná	9,978
Rio de Janeiro	1,039
Rio Grande do Sul	3,117
Santa Catarina	25,953
São Paulo	2,455
Total	**102,939**

Source: INPE (2009d).

Monitoring the Cerrado biome

Within the scope of the Program on Satellite Monitoring of Deforestation in Brazilian Biomes, by the Ministry of the Environment, the current situation of deforestation in Cerrado was mapped based on the comparison of images from the Landsat and CBERS satellites. According to such mapping data, between 2002 and 2008, the Cerrado vegetation cover suppressed was 85,074 km², which accounts approximately 14,179 km² deforested annually in that period. The deforested areas percentage were 43.7% in 2002, and it increased to 47.8% in 2008.

Deforestation in the Cerrado biome (2002 – 2008)

(km²)

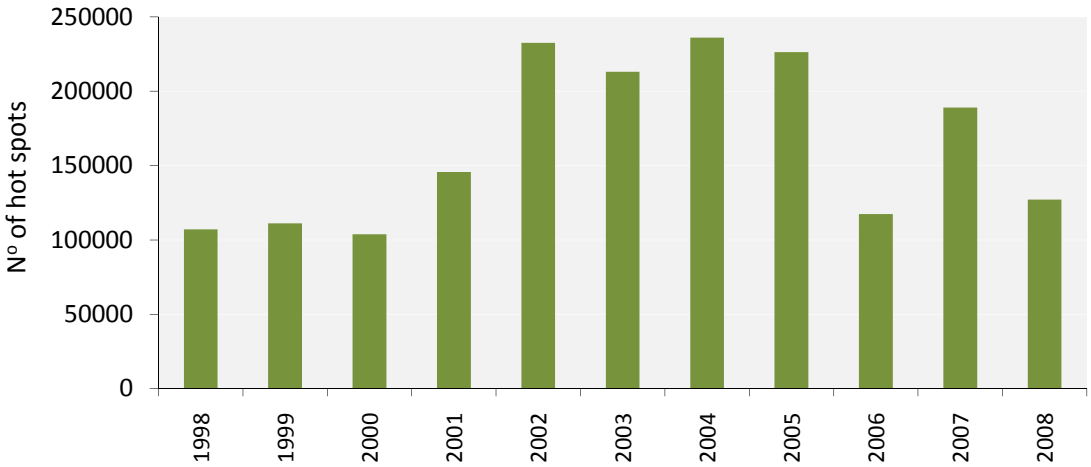
State	Deforested area
Maranhão	14,825
Bahia	9,266
Mato Grosso	17,598
Minas Gerais	8,927
Piauí	4,213
Tocantins	12,198
Mato Grosso do Sul	7,153
Goiás	9,898
Paraná	0,5
Rondônia	8
São Paulo	903
Distrito Federal	84
Total	**85,074**

Source: IBAMA (2009a).

Monitoring Wildfires

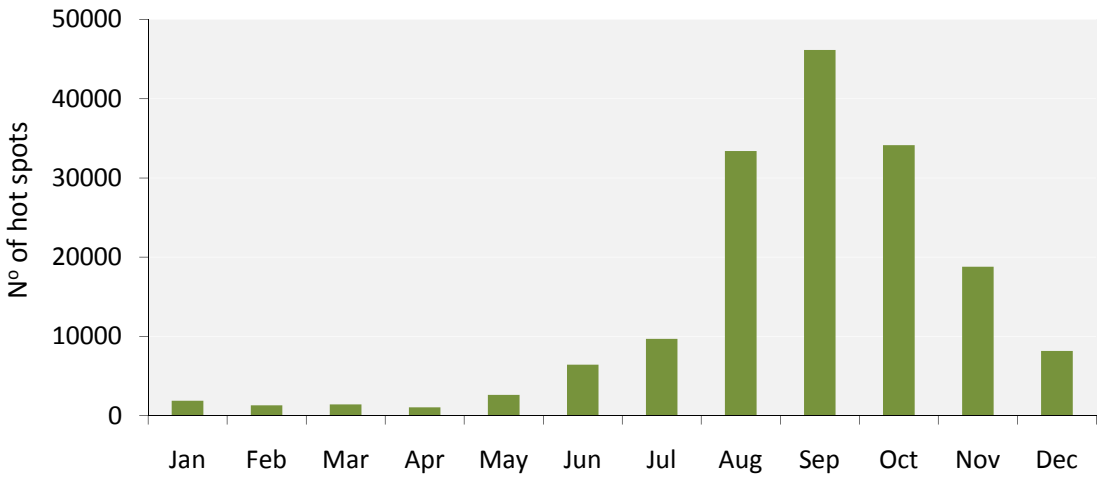
INPE has been producing data obtained from different satellites on hot spots available daily since 1998. The data from the night passages of the NOAA, and Terra and Aqua satellites (MODIS sensor) are loaded onto IBAMA's information system.Through a system that gathers geographic information, satellite images and several databases of detailed information about the entire national territory, the monitoring team identifies areas at risk of forest fires.

The hot spots detected in risk areas are recorded into an alert system that classifies them according to persistence, location, and hazard.



Annual total hot spots (1998-2008)
Source: IBAMA (2009b).

The statistics use data on hot spots detected by the NOAA-12 satellites at night (June 1998 - August 2007) and NOAA-15 (starting from August 2007).



Monthly average of hot spots (Jun .1998 - Dec. 2008)
Source: IBAMA (2009b).

Governmental Programs to Fight Deforestation and Illegal Use of Forests

The Brazilian Government has implemented several plans aiming at sustainable development, reducing deforestation and mitigating greenhouse gases emissions that directly affect the management of the country's forests.

Sustainable Amazon Plan (PAS)

The general purpose of PAS, which was launched in 2004, is to implement a new model of development in the Brazilian Amazon area, that is grounded on enhancing the potential of its natural and sociocultural heritage, and aimed at generating jobs and income; reducing social inequality; making innovative and dynamic economic activities feasible and inserted in regional, national and international markets; and the sustainable use of natural resources, while maintaining ecological balance (Brazil/ MI/MMA, 2004).

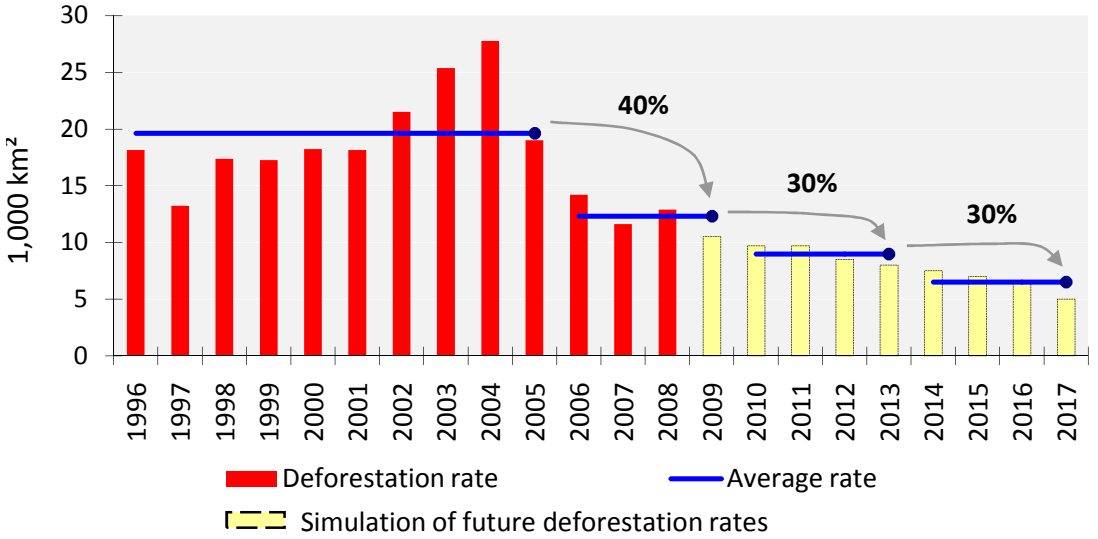
Plan to Prevent and Control Deforestation in the Brazilian Amazon area (PPCDAM)

Launched in 2004, PPCDAM's goal is to reduce deforestation in the Brazilian Amazon area, which is also known as "Legal Amazon". PPCDAM is organized in three axes: Territorial and Land tenure organization; Monitoring and Environmental Control; Fostering sustainable productive activities (Brazil. Civil House (Executive Office), 2004).

National Plan on Climate Change (PNMC)

Launched in 2008, PNMC's aim is to identify, plan and coordinate actions and measures to mitigate greenhouse gas emissions generated in Brazil, as well as other activities required for adaptation to the impact of climate change. Two of PNMC's main targets are related to the forestry sector:

1. Seeking sustained reduction of four-year deforestation rates in all Brazilian biomes until zero illegal deforestation is reached, or, in other words, reducing deforestation between 2006 and 2010 by 40%, compared to the ten-year average recorded from 1996 to 2005, and by an extra 30% for each of the following four-year periods, estimated against the previous periods. In the case of Amazon biome, such specific goal may avoid emissions to the extent of 4.8 billion tonnes of carbon dioxide in the 2006-2017 period, considering the order of magnitude of 100 tC/ha. Such amount will be reassessed after the inventory of carbon stocks is concluded as part of the National Forest Inventory.



Evolution of Amazon deforestation rates
Source: Brazil/CIM (2008).

2. Preventing the net loss of forest cover area by 2015, which means that, in addition to conserving forests at the levels established by the previous goal, the area of planted forests should double from 5.5 million ha to 11 million ha in 2020, 2 million ha of which should be planted with native species, and prioritizing planting forest in degraded pastures with the aim of promoting their economic and environmental rehabilitation. It will be possible to measure the positive impact of this specific goal as soon as the inventory of carbon stocks is concluded as part of the National Forest Inventory.

Action Plan to Prevent and Control Deforestation and Wildfires in Cerrado (PPCerrado)

Launched in 2009, PPCerrado aims at coordinating and carrying out initiatives to reduce deforestation in the region, defining reduction targets for deforestation rates and providing the foundation for estimating greenhouse gas emissions in the biome. Such calculation will be used to define emission reduction targets under the umbrella of the National Plan on Climate Change (MMA, 2009).

National Protected Areas

Protected areas are demarcated territories, managed according to legal provisions or other equally effective means, with the purpose of preserving or conserving nature and related cultural values.

According to the International Union for Conservation of Nature – IUCN, protected areas can be defined as "an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means" (IUCN, 1994).

In Brazil, there are two types of protected areas: they can be either public or private. Public protected areas are divided into Indigenous Lands and "Conservation Units". Conservation units, in turn, are divided into different categories according to their purpose. Such categories and specific purposes are defined by Law No. 9,985/2000, which instituted the National System of Conservation Units (SNUC).

Private protected areas have been established by Law No. 4,771/1965, which institutes the Forest Code. Private rural properties are required by this law to maintain a Legal Reserve area and conserve Permanent Preservation Areas. In addition, property owners may choose to create private reserves, defined as Private Natural Heritage Reserves (RPPN) in SNUC.

Federal Conservation Units

A Conservation Unit (CU) is defined as "a territory and its respective environmental resources with relevant natural characteristics, including jurisdictional waters, which the Government institutes with defined limits and conservation goals, under a special administration regimen, and to which suitable assurances of protection apply" (Law No. 9,985/2000).

Conservation Units are divided into two groups: Full-protection Units and Units of Sustainable Use. Each of these two groups has several subcategories with different specific purposes.

The basic goal of Full Protection Units is preserving nature. Only the indirect use of natural resources is admitted. The basic goal of Units of Sustainable Use is to conciliate the conservation of nature with the sustainable use of part of its natural resources.

Federal Conservation Units (2009)

CU	Category	No.	Area (ha)
Full-Protection	Ecological Station	31	6,869,411.18
	Natural Monument	2	44,179.73
	National Park	64	24,761,652.08
	Biological Reserve	29	3,868,939.47
	Wildlife Refuge	5	169,103.88
Subtotal		**131**	**35,713,286.34**
Sustainable Use	Environmental Protection Area	31	9,931,544.90
	Area of Relevant Ecological Interest	17	43,432.51
	National Forest	65	19,285,515.90
	Sustainable Development Reserves	1	64,441.29
	Extractivist Reserve	59	12,270,533.12
Subtotal		**173**	**41,595,467.72**
Full Total		**304**	**77,308,754.06**

Source: ICMBio (2009).

Federal Conservation Units by biome (2009)

Biome	Area (ha)	% of Brazil
Amazon	61,081,900	79.0
Caatinga	3,339,000	4.3
Cerrado	5,899,200	7.6
Pantanal	149,900	0.2
Atlantic Forest	3,179,500	4.1
Pampa	463,200	0.6
Sea / Coast	3,196,054	4.1
Total	**77,308,754**	**100**

Source: ICMBio (2009).

Indigenous Lands

Indigenous lands are lands traditionally occupied by Indigenous people, on a permanent basis and used for their productive activities. Indigenous lands are essential to preserving natural resources required for their well-being and for their physical and cultural reproduction, according to their uses, customs, and traditions. Even though Indigenous people are in permanent possession of the land, such lands are actually Union (Federal Government) assets, as ruled by the Brazilian Constitution.

Situation of Brazilian Indigenous lands (2009)

Situation	Quantity	%	Area (ha)
Under study	123	-	-
Delimited	33	1.66	1,751,576
Declared	30	7.67	8,101,306
Homologated	27	3.40	3,599,921
Regularized	398	87.27	92,219,200
Total	**611**	**100**	**105,672,003**

Source: FUNAI (2009).

Permanent Preservation Areas

Permanent Preservation Areas are protected areas defined by the Brazilian Forest Code (Law No. 4,771/1965), which can be covered by native vegetation or not. They and have an environmental role of conserving water resources, landscape, geological stability, biodiversity, genetic flow of fauna and flora, protecting the soil and ensuring the well-being of human populations. Permanent Preservation Areas are located alongside rivers or watercourses; around natural or artificial lakes, ponds or reservoirs; in headwaters; on the top of hills, mounts, mountains and sierras; on hillsides or parts of them; in shoals, fixing dunes or stabilizing mangroves; on the edge of plateaus or tablelands; and at altitudes over 1800 m high. It is not allowed to make use of forest resources in Permanent Preservation Areas. The removal of vegetation in these areas may only be permitted in cases of public utility or social interest.

Legal Reserve

A Legal Reserve is defined as an "area located within a rural property or appropriated area, excluding permanent preservation areas, required for the sustainable use of natural resources, conservation and rehabilitation of ecological processes, for biodiversity conservation and for sheltering and protecting native fauna and flora" (Brazilian Forest Code – Law No. 4,771/1965). Sustainable forest management for the production of goods and services is allowed on Legal Reserves areas. However, it is necessary to have a management plan approved by the competent institution.

The Brazilian Forest Code determines that the minimum below shall be maintained as Legal Reserves:

- 80% of rural properties located in forest areas within the Legal Amazon area;
- 35% of rural properties located in cerrado areas within the Legal Amazon area;
- 20% of rural properties located in forest areas or other types of native vegetation located in other regions of the country;
- 20% of rural properties located in grassland areas in other regions of the country.

Federal Protected Areas

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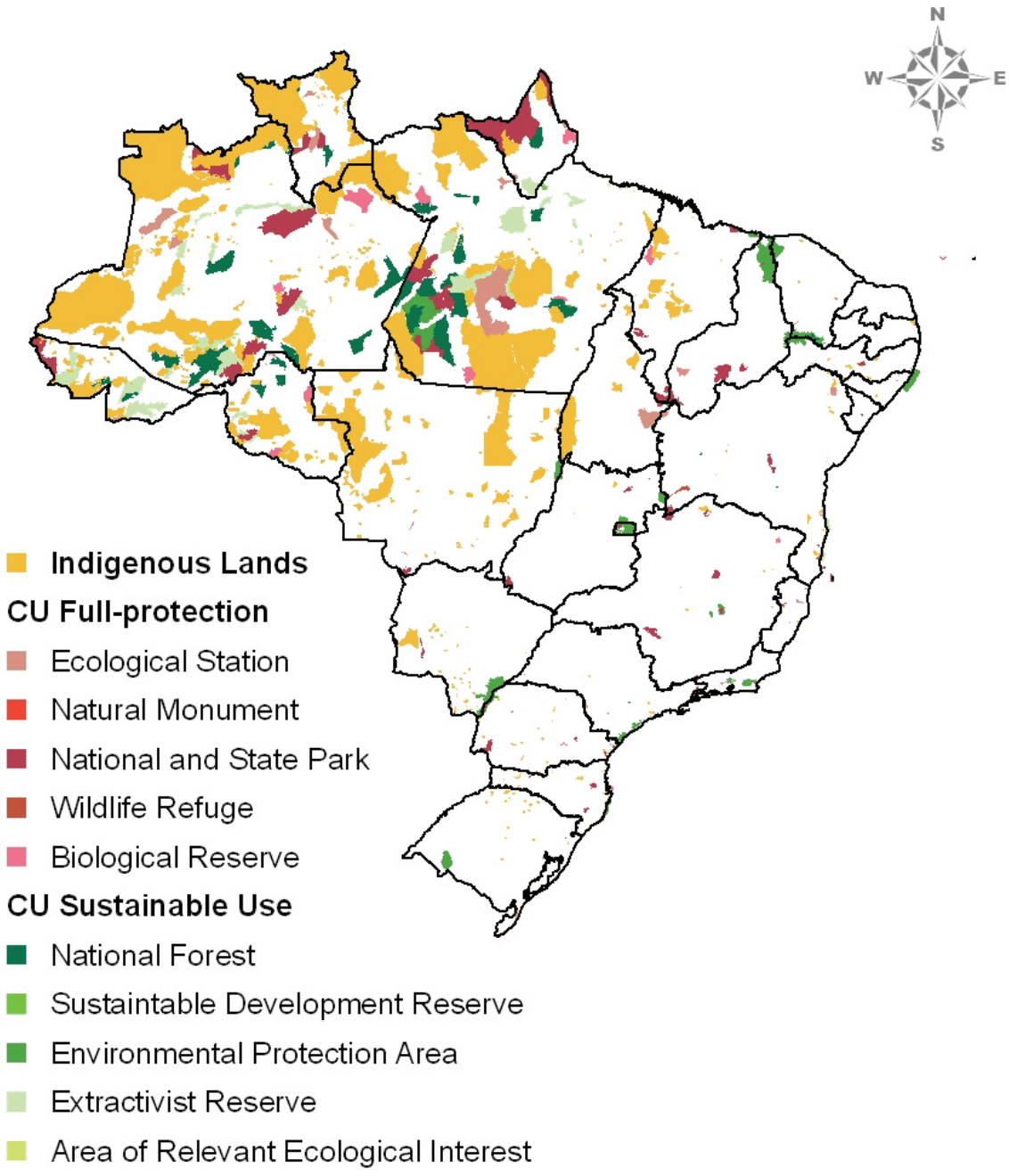

Source of data: MMA (2006); FUNAI (2008).

Biodiversity/Endangered and Protected Species

Brazil hosts one of the most diverse and exuberant floras of the planet. Its angiosperms are the richest and most diverse group of all plants. It is believed that there are between 30,000 and 35,000 species of angiosperms throughout the Brazilian territory. Gymnosperms have little representation, with 14 identified species (SHEPHERD, 2006).

Studies point to the existence of at least 7,880 natural forest tree species in Brazil. However, it is estimated that this number represents only 80% of the existing total (FAO, 2005). Few authors have recently estimated the existence of around 11,120 tree species in the Amazon alone (HUBBELL et al, 2008).

Regrettably the "Official list of species of Brazilian flora in danger of extinction" has 472 species (Brazil/MMA, 2008). The biomes with the highest number of endangered species are: Atlantic Forest (276), Cerrado (131) and Caatinga (46). In the Amazon area there are 24 species, 17 in the Pampa and two in Pantanal.

Some forest species in Brazil are protected by national law and it is prohibited to be cut:

- Brazil nut tree *(Bertholletia excelsa)* (Decree No. 5,975/2006);
- Rubber tree (*Hevea* spp.) (Decree No. 5,975/2006);
- Mahogany (*Swietenia macrophylla*) (Decree No. 6,472/2008).

Endangered wood species (2008)

Common name	Scientific name	Family	Biome
Aroeira, Aroeira do Sertão	*Myracrodruon urundeuva*	Anacardiaceae	Cerrado/Caatinga
Baraúna	*Schinopsis brasiliensis*	Anacardiaceae	Cerrado/Caatinga
Brazilian Pine	*Araucaria angustifolia*	Araucariaceae	Atlantic Forest
Cerejeira	*Amburana cearensis* var. *acreana*	Fabaceae	Amazon
Brazilwood	*Caesalpinia echinata*	Fabaceae	Atlantic Forest
Bahia Jacaranda / Brazilian rosewood	*Dalbergia nigra*	Fabaceae	Atlantic Forest
Braúna	*Melanoxylon brauna*	Fabaceae	Atlantic Forest
Pau-roxo / Purpleheart	*Peltogyne maranhensis*	Fabaceae	Amazônia
Canela-preta	*Ocotea catharinensis*	Lauraceae	Atlantic Forest
Brazilian sassafras	*Ocotea odorifera*	Lauraceae	Atlantic Forest
Imbuia	*Ocotea porosa*	Lauraceae	Atlantic Forest
Brazil-nut tree	*Bertholletia excelsa*	Lecythidaceae	Amazon
Mahogany	*Swietenia macrophylla*	Meliaceae	Amazon
Pau-amarelo / Yellowheart	*Euxylophora paraensis*	Rutaceae	Amazon

Source: Brazil/MMA (2008) with adaptations.

Forest Volume and Biomass

The volume of timber, which can be reckoned based on tree heights and diameters, is an important variable to estimate forest biomass commercial stock, and is a prerequisite for forest management.

Forest biomass is an indispensable parameter to understand the primary production of an ecosystem and assess the potential of a forest for energy production. Considering that 50% of dry timber is carbon (C), forest biomass is also an important element to understand processes involved in global climate change. Carbon stock is used to estimate CO_2 emissions into the atmosphere during the process of burning biomass.

The estimate for biomass in Brazilian forests is made by extrapolating the figure based on studies on the volume of each forest type per area unit to the total area occupied by each forest type in existing mappings.

Once the National Forest Inventory (IFN) is implemented, data on forest biomass will be more consistent and reliable in near future.

Total timber volume and biomass quantity per biome (2008)

Biome	Total volume of timber		Above ground biomass	
	Million m³	%	Million t	%
Amazon	107,861	84.7	92,672	84.6
Caatinga	2,408	1.9	3,108	2.8
Pantanal	869	0.7	597	0.5
Cerrado	8,117	6.4	4,918	4.5
Atlantic Forest	7,228	5.7	7,382	6.7
Pampa	893	0.7	909	0.8
Total	**127,376**	**100**	**109,586**	**100**

Source: SFB (2009a).

Types of Forest Use

Brazilian forest areas can be arranged according to the categories established by FAO in view of their function or priority purpose.

Brazilian forest areas distributed per category of designated function, as established by FAO (Jun 2009)

(1,000 ha)

Priority functions of forests	Area
Production of goods[1]	34,123.95
Protection of soil and water resources[2]	85,148.80
Conservation of biodiversity[3]	49,438.31
Socio-cultural services[4]	125,468.11
Multiple purpose[5]	21,869.29
Others[6]	207,655.40
Total	**523,703.86**

Source: Brasil/MMA (2009) with adaptations.

Notes:

[1]Production: National Forests, State Forests and Planted forests.

[2]Protection of soil and water resources: 10% of the total area of the country, the estimated permanent preservation area, was considered;

[3]Conservation of biodiversity: Ecological Stations; Biological Reserves; National Parks; Natural Monuments; Wildlife Refuges; Area of Relevant Ecological Interest; Private Natural Heritage Reserves.

[4]Socio-Cultural Services: Federal Extractivist Reserves; State Extractivist Reserves; Indigenous Lands; Federal Sustainable Development Reserves; State Sustainable Development Reserves.

[5]Multiple purposes: Federal Environmental Protection Areas; State Environmental Protection Areas.

[6]Others: Forest areas whose priority purpose is not known or not defined.

Public and Private Forests

Brazilian public forest areas are in the process of being identified and registered by the Brazilian Forest Service. Public forests enlisted by the National Public Forest Register (CNFP – Cadastro Nacional de Florestas Públicas) by November 2009 comprised an area of approximately 239 million hectares, which represents 28.1% of the national territory, and include approximately 26 million hectares of state forests.

Federal and State public forests included in the National Public Forest Register (ha) by November 2009

States and Federal District	Area (ha)	%
Acre	7,783,786	3.25
Alagoas	20,073	0.01
Amazonas	88,801,609	37.13
Amapá	10,605,449	4.43
Bahia	987,627	0.41
Ceará	88,015	0.04
Distrito Federal	75,447	0.03
Espírito Santo	102,693	0.04
Goiás	403,438	0.17
Maranhão	3,323,415	1.39
Minas Gerais	1,207,205	0.50
Mato Grosso do Sul	1,054,262	0.44
Mato Grosso	15,900,962	6.65
Pará	74,285,498	31.06

Paraíba	41,641	0.02
Pernambuco	192,050	0.08
Piauí	1,087,674	0.45
Paraná	474,250	0.20
Rio de Janeiro	219,094	0.09
Rio Grande do Norte	11,011	0.00
Rondônia	10,892,506	4.55
Roraima	16,828,470	7.04
Rio Grande do Sul	261,763	0.11
Santa Catarina	214,974	0.09
Sergipe	14,093	0.01
São Paulo	695,903	0.29
Tocantins	3,615,147	1.51
Total	**239,188,055**	**100**

Source: SFB (2009b).

Private forest areas in Brazil are estimated based on data collected directly from agriculture and livestock establishments through survey statements (Brazilian Census of Agriculture and Livestock - IBGE).

Private forests in agricultural and livestock establishments in Brazil

(1,000 ha)

	1970	1975	1980	1985	1995	2006
Forests	57,881	70,722	88,168	88,984	94,294	98,480

Source: IBGE (2009c).

Forests in private properties per type of forest and producers` land ownership status

(ha)

Type of forest	Ownership Status					Total
	Landowner	Settler without permanent land title	Tenant-farmer	Partner	Occupier	
Natural forests within PPAs or legal reserves[1]	47,552,508	913,727	684,336	81,188	931,342	**50,163,102**
Natural forests (other types)[2]	33,146,156	1,013,914	390,799	90,067	980,702	**35,621,638**
Plantation Forests	4,289,782	20,514	92,500	48,632	46,496	**4,497,924**
Agroforestry systems[3]	7,565,552	239,904	70,186	28,077	293,845	**8,197,564**
Total	**92,553,999**	**2,188,059**	**1,237,821**	**247,964**	**2,252,385**	**98,480,227**

Source: Brasil/MMA (2009) with adaptations.
Notes:
[1]Designated as permanent preservation areas or legal reserve.
[2]Exclusive permanent preservation areas and those in agroforestry systems.
[3]Área where forest species are grown and which are also used for food crops and livestock.

Sustainable Forest Management

Sustainable Forest Management is the administration of forests to obtain economic, social and environmental benefits, with due respect to the support mechanisms of the ecosystem under management, and considering the either cumulative or alternative use of multiple timber species, multiple non-timber products, as well as other forest goods and services.

Exploring primary forests and secondary formations under a sustainable forest management regime, either within the public or private domain, shall depend on prior approval of a Sustainable Forest Management Plan (PMFS - Plano de Manejo Florestal Sustentável) by the competent environmental institutions (Decree No. 5,975/2006).

Such Sustainable Forest Management Plan (PMFS) is the basic technical documentation which contains guidelines and procedures for forest management aimed at economic, social and environmental benefits, observing the definition of sustainable forest management.

Forest Concessions

Forest concession is a type of public forest management stipulated by Brazil`s Public Forest Management Law (Law No. 11,284, March 2006). Contributory Forest Concessions, that is, with payment for sustainable use of forest products and services is a form of indirect management that may be applicable to National Forests and other public forests which have not been designated for community use or designated as full-protection conservation units.

Brazil`s first Forest Concession area is located in the Jamari National Forest and is composed by three Forest Management Units – a small management unit (around 17,000 ha large), a medium one (of about 33,000 ha) and a large one (with approximately 46,000 ha).

The Forest Concession process started in 2007. In 2008, the stage of selection and contract of concession companies was concluded, and the stage of forest management implementation began.

The second forest concession process started in 2008 for an area of approximately 140,000 ha, comprising three Forest Management Units, located in the Saracá-Taquera National Forest, in Pará State. The call for tenders was published in July 2009.

Public Forests

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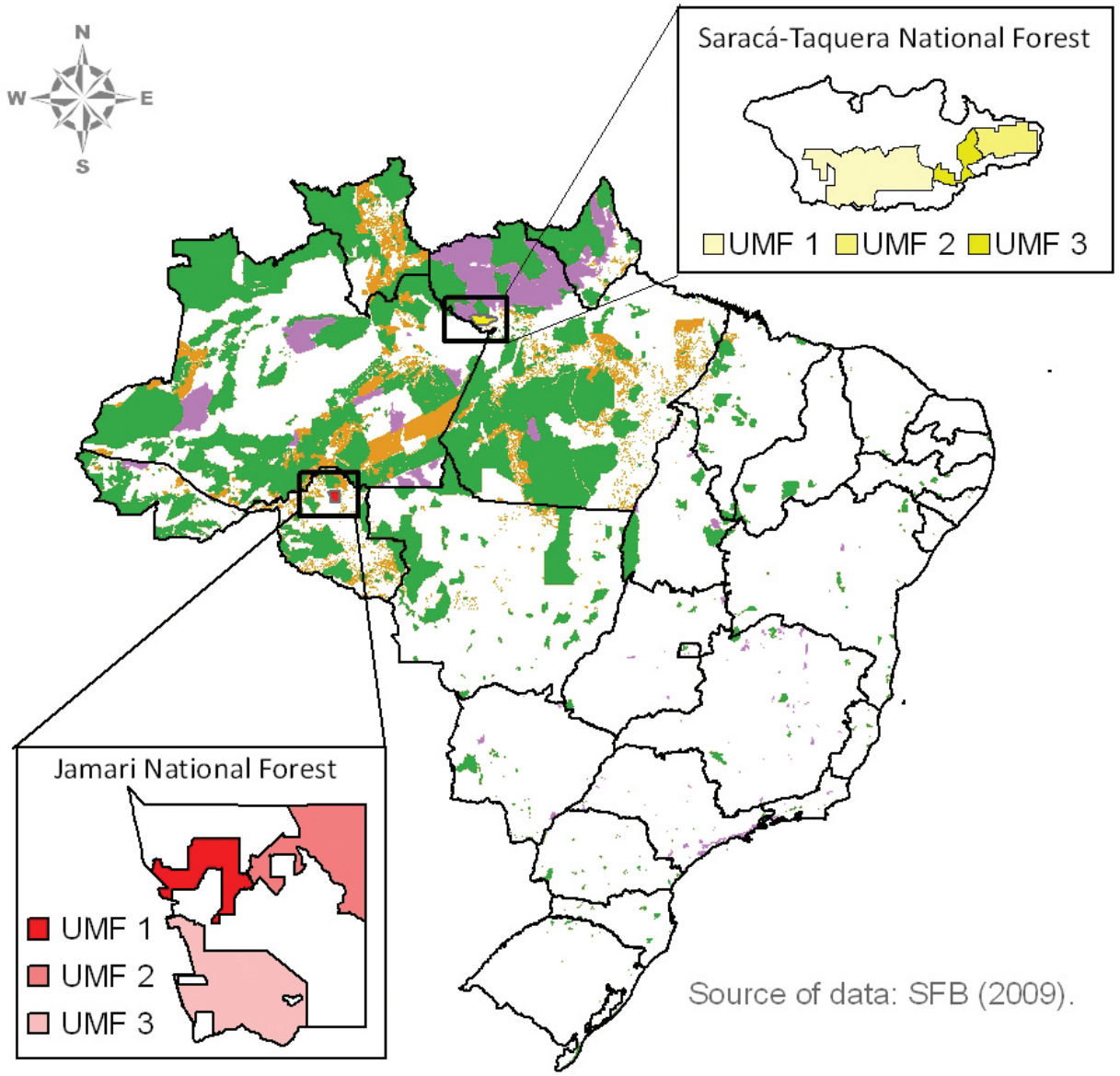


- Federal Public Forest under Concession
- Federal Public Forest in Process of Concession
- State Public Forest Destinated
- Federal Public Forest Destinated
- Federal Public Forest not Destinated

Community Forests

Community forests are forests assigned to be used by traditional peoples and communities, indigenous people, family farmers, and settlers registered with the national program of agrarian reform. The Brazilian constitution safeguards the right of indigenous and "quilombola" (descendants of slaves residing in hideouts known as "quilombos") populations to their ancestral territories, and the Public Forest Management Law reinforces the right of local communities to draw benefits from the use of forest resources without encumbrance.

The effort of the Brazilian State to acknowledge such rights is evident in the fact that currently 60% of Brazilian public forests are community forests. Over 2 million people depend on these different types of forest for their subsistence.

In addition to such economic importance, the forest has great relevance towards maintaining the cultural identity of such groups. It is fairly common to observe that, in a given region, forests occupied by traditional communities are relatively more conserved than other areas in view of their ancestral practices of use and defense of territory. Nevertheless, several communities face problems in conducting the sustainable use of forest resources, which in turn causes forest degradation.

Community Forest Management is so relevant for managing forests that, in 2009, a presidential decree established the Federal Community and Family Forest Management Program (Decree No. 6,974/2009). By the end of 2010, it is expected that sustainable forest management plans for community will have been implemented in at least 2 million hectares.

Federal community forests

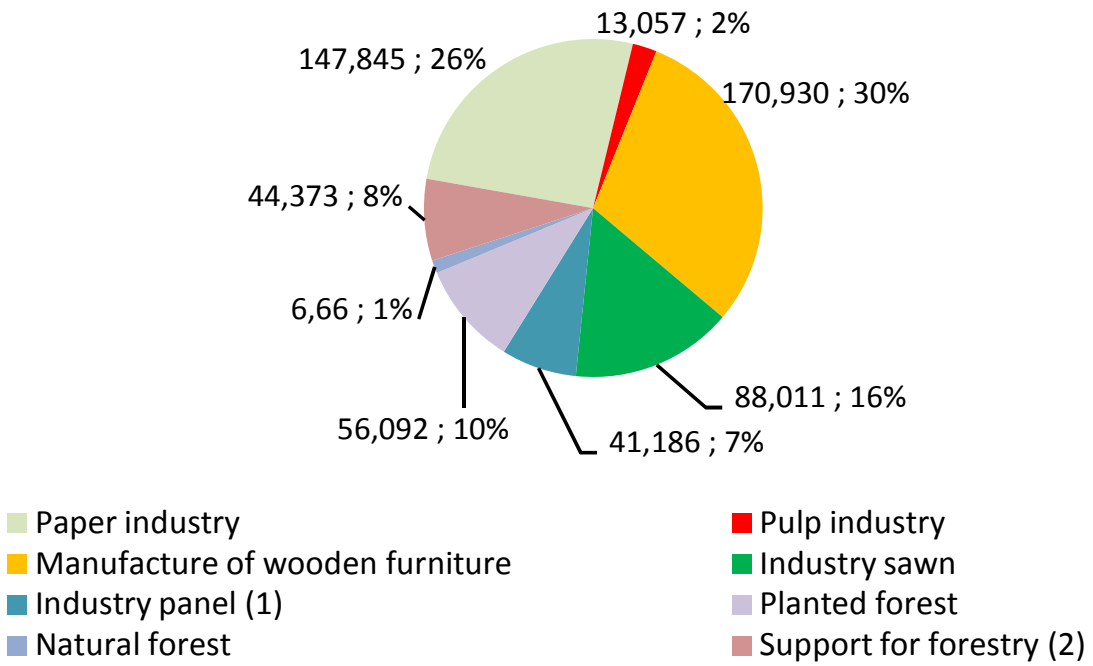
Reserves	Number of Units	Area (ha)
Extractivist Reserve (RESEX)	59	12,270,533
Sustainable Development Reserve (RDS)	1	64,441
Indigenous Lands	611	105,672,003
Forest Settlement Project	5	137,141
Settlement Project	106	2,608,213
Sustainable Development Project	97	2,900,068
Total	**879**	**123,652,399**

Source: SFB (2009b).

Socioeconomic Aspects of the Forest Sector

It is estimated that the forestry-based sector generates around US$ 37 billion and accounts for nearly 3.5% of the national GDP (SBS, 2007).

Studies indicate that formal direct jobs of the main forestry sector segments totaled 568,460 in September 2009. This represents an annual reduction of 8% against the growth of 0.75% in the whole country.



Formal direct jobs of the forestry sector (September/2009)

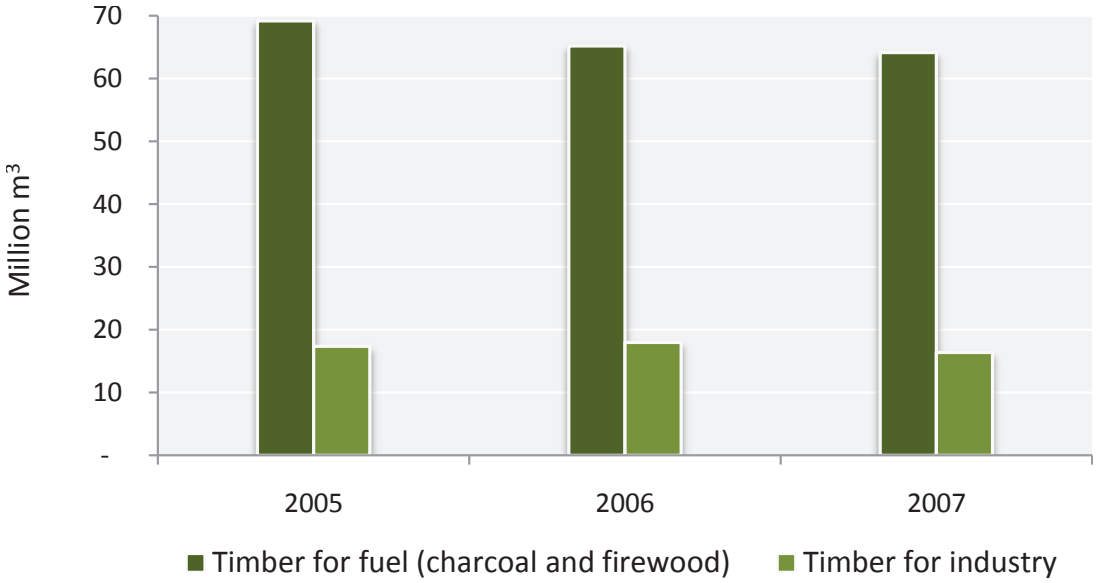
Source: CONSUFOR (2009)
Notes:
(1) Includes venner, plywood, particle board and MDF.
(2) Includes forestry: forest inventory assessment of wood, technical consulting, pest control, aerial seeding, aerial survey, reforestation, replanting of species, transportation of logs only in the location of the overthrow, unloading timber, fire-fighting and forest protection.

Timber Products

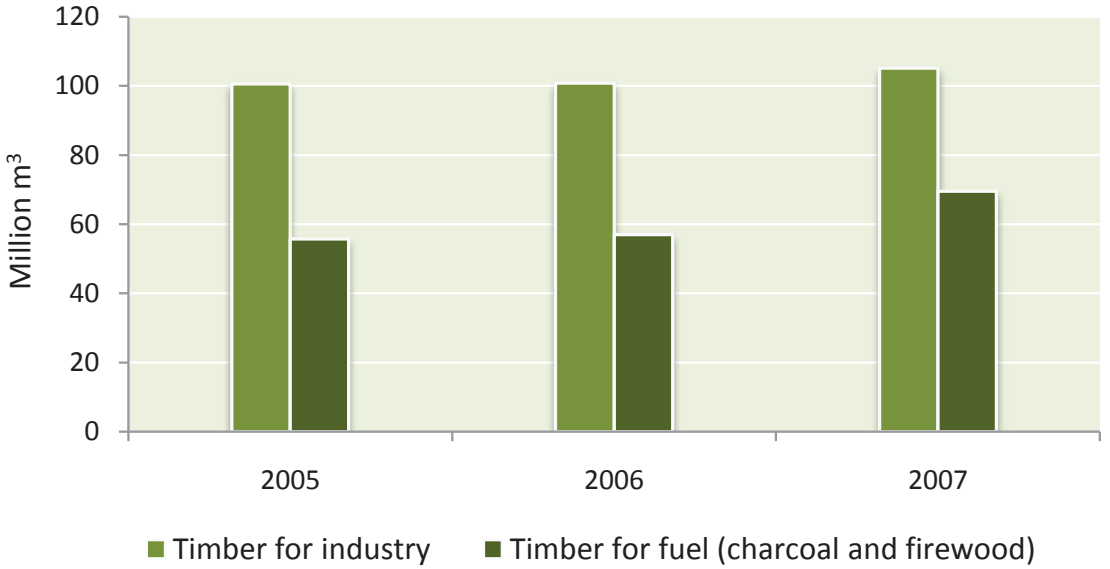
Annual production per timber industry segment

Extraction of timber as logs (million m³)	2005	2006	2007
Natural forest for fuel	69,201	65,206	64,153
Natural forests for industrial use	17,372	17,986	16,389
Natural forest	86,573	83,192	80,542
Pine	49,545	49,225	48,825
Eucalyptus	129,466	134,868	142,571
Production of sawnwood (million m³)			
Softwood (pinus)	8,935	9,078	9,577
Tropical timber	14,622	14,719	14,837
Production of panels (million m³)			
Softwood plywood (pinus)	2,460	2,375	2,161
Tropical timber plywood	1,125	669	648
Particle panels	2,263	2,500	2,784
MDF	1,400	1,700	1,879
Paper and pulp production (1000 t)			
Pulp	10,363	11,275	11,968
Newsprint	133	135	144
Writing paper	2,481	2,552	2,575
Tissue paper	778	787	812
Industrial/wrapping paper	4,180	4,231	4,424
Paperboard	597	619	645
Others	429	400	409

Source: IBGE (2009b), ABIMCI (2007), ABRAF (2009), BRACELPA (2009), ABIPA (2009).

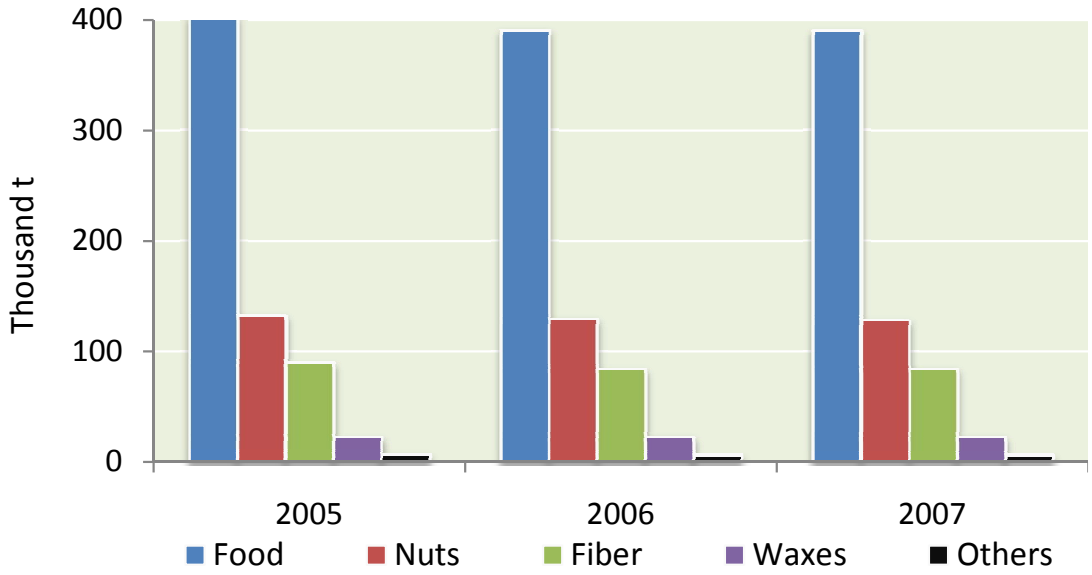


Volume of timber extracted from natural forests
Source: IBGE (2009b) with adaptations.



Volume of timber extracted from forest plantations
Source: IBGE (2009b) with adaptations.

Non-timber Forest Products



Quantity of non-timber products extracted from natural forests
Source: IBGE (2009b).

Quantity and value for main non-timber forest products from native species

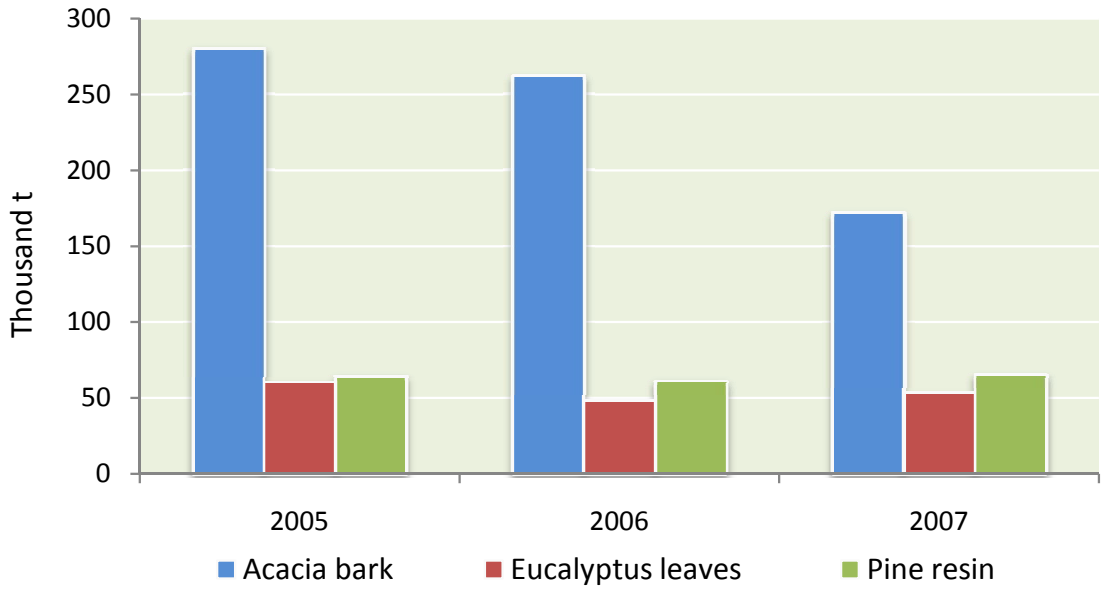
Product	2005		2006		2007		Main Biome
	Quantity (t)	Value (1,000 R$)	Quantity (t)	Value (1,000 R$)	Quantity (t)	Value (1,000 R$)	
Açaí berry	105	83	101	103	108	106,664	Amazon
Cashew nuts	6	6	6	5	5	5,853	Caatinga/Atl. Forest / Cerrado
Brazil nuts	31	47	29	44	30	45,492	Amazon t
Mate	239	77	233	87	226	87,667	Atlantic Forest
Paraná pine nuts	5	5	5	5	5	5,473	Atlantic Forest
Umbu berry	9	5	9	5	9	5,092	Caatinga
Latex (Hevea)	5	8	4	8	4	7,574	Amazon
Waxes	22,353	60,511	22,409	61,928	22,464	78,672	Caatinga
Buriti	483	879	467	430	500	1,150	Amazon
Piaçava	87	89	81	89	82	97,857	Amaz./Atl. Forest
Babaçu seeds	119,031	99	117,150	102	114,874	113,268	Cerrado
Copaíba oil	479	1,741	502	2,04	523	3,790	Amazon
Cumaru seeds	110	440	90	571	97	542	Amazon
Pequi seeds	5,089	4,284	5,350	4,863	5,363	6,035	Cerrado

Source: IBGE (2009b).

Quantity and value for main non-timber forest products extracted from planted forests

Silviculture Product	2005		2006		2007	
	Quantity (t)	Value (1,000 R$)	Quantity (t)	Value (1,000 R$)	Quantity (t)	Value (1,000 R$)
Acacia mearnsii bark	280	32	262	30	172	18
Eucalyptus leaves	60	4	48	3	53	2
Pine resin	64	135	61	94	66	79
Total	**405**	**171**	**372**	**127**	**291**	**99**

Source: IBGE (2009b).



Quantity and value for main non-timber forest products extracted from plantation forests
Source: IBGE (2009b).

Forest Product Exports

Main timber forest products export values

(1,000 US$)

Product	2005	2006	2007	2008
Wood pulp	2,033,622	2,478,516	3,012,062	3,901,135
Paper and paperboard	1,177,349	1,258,000	2,078,826	2,354,255
Sawnwood	882,712	846,409	922,500	675,059
Plywood	785,770	650,482	677,460	616,845
Wood chips and particles	101,009	106,097	116,014	142,180
Fibreboard	126,683	125,204	106,233	93,171
Veneer sheets	68,479	69,560	88,232	55,886
Particle board	49,250	49,381	68,934	32,416
Other sources of pulp	162	5,168	11,120	15,225
Roundwood	1,795	786	3,870	5,570
Charcoal	3,877	3,055	2,940	1,609
Recovered paper	114	365	1,004	749
Residue	1,403	4,266	726	67

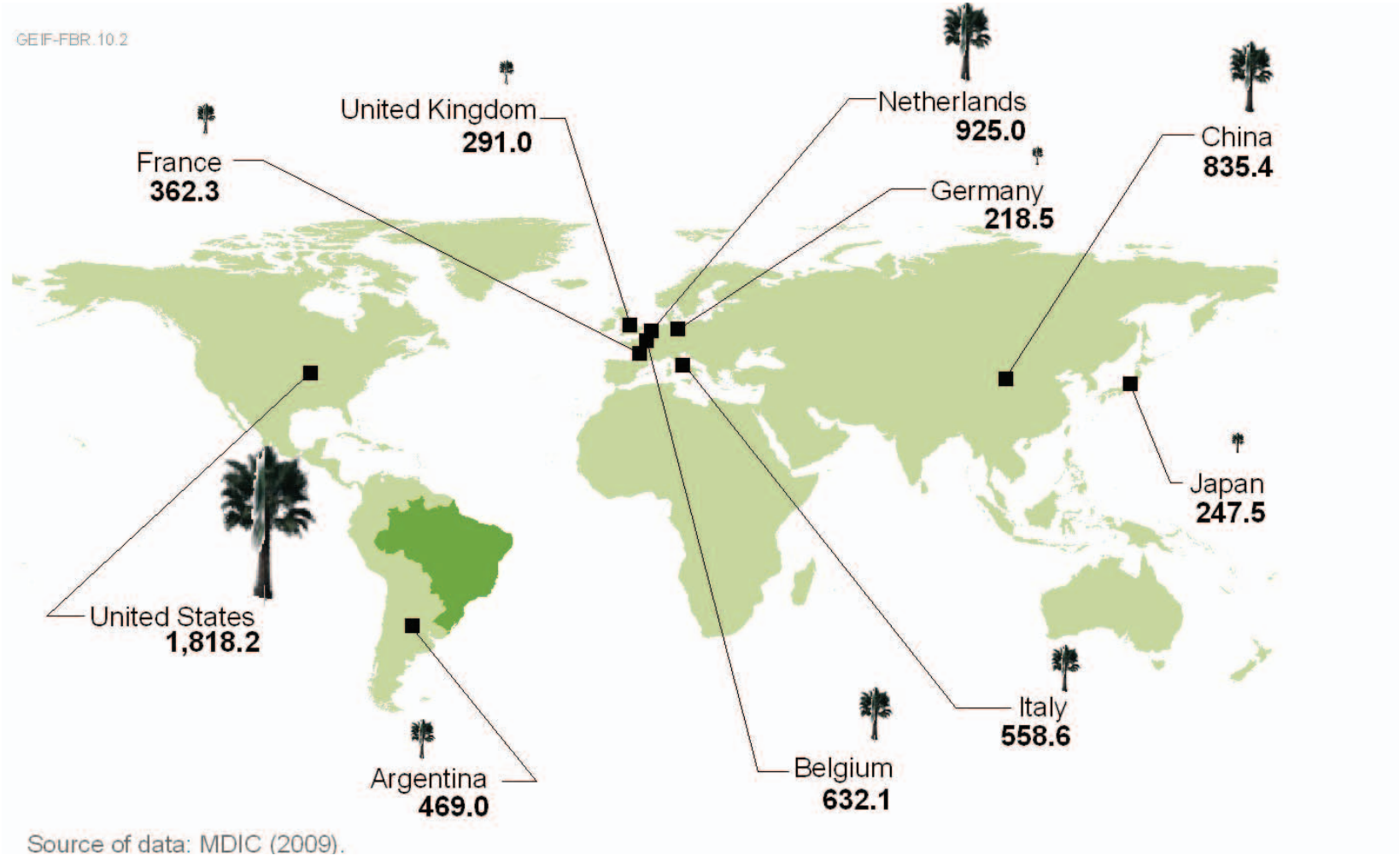
Source: Brazil/MDIC (2009).

Exports of main timber forest products

Product	Unit	2005	2006	2007	2008
Wood pulp	1,000 t	5,545,236	6,238,516	6,570,358	7,202,160
Paper and paperboard	1,000 t	1,904,646	1,809,117	2,576,805	2,580,020
Charcoal	1,000 t	14,934	12,722	10,723	5,580
Recovered paper	1,000 t	1,702	2,095	3,976	3,976
Other sources of pulp	1,000 t	109	5	10	11
Wood chips and particles	1,000 m^3	6,013	5,335	5,675	5,658
Sawnwood	1,000 m^3	3,653	3,167	3,167	2,102
Plywood	1,000 m^3	3,668	2,868	2,518	2,087
Fibreboard	1,000 m^3	911	776	608	453
Veneer sheets	1,000 m^3	234	207	308	120
Particle board	1,000 m^3	256	196	263	97
Roundwood	1,000 m^3	25	7	19	22
Residue	1,000 m^3	512	905	41	4

Source: Brazil/MDIC (2009).

Main destinations for Brazilian timber forest product exports, in 2008 (million dollars)



Exports of main non-timber forest products

Products	2006		2007		2008	
	Quantity (t)	Value (1,000 US$)	Quantity (t)	Value (1,000 US$)	Quantity (t)	Value (1,000 US$)
Cashew nuts	43,232	187,539	51,557	225,198	35,414	196,074
Brazil nuts	13,079	18,985	16,313	255,505	13,749	20,319
Vegetable waxes	16,029	43,312	15,468	68,092	15,195	85,236
Mate	31,626	32,300	31,064	36,166	31,607	45,862
Vegetable oil *	402	2,716	456	3,230	138.21	2,511
Resinoids	9	72	4	48	0.07	2

* Included oil of babaçu, jojoba, cedro, eucalyptus and rosewood.
Source: Brazil/MDIC (2009).

Forest Product Imports

Main forest product imports

(1,000 US$)

Product	2005	2006	2007	2008
Paper and paperboard	536,420	698,573	833,700	1,096,924
Wood pulp	187,753	199,934	221,544	264,089
Fibreboard	29,669	49,855	19,815	51,915
Charcoal	1,566	3,260	6,047	19,034
Sawnwood	10,734	11,414	13,925	17,670
Particle board	14,926	14,371	12,754	15,988
Veneer sheets	8,022	8,754	8,512	11,148
Other sources of pulp	20,973	11,378	6,269	6,628
Plywood	2,287	2,695	3,171	3,006
Recovered paper	1,627	1,492	3,475	2,121
Roundwood	1,424	2,327	515	572
Residue	99	150	246	450
Wood chips and particles	5	14	39	74

Source: Brazil/MDIC (2009).

Quantity of main timber forest product imports

Product	Unit	2005	2006	2007	2008
Charcoal	1,000 t	90,300	158,455	287,668	354,000
Paper and paperboard	1,000 t	718,737	863,072	978,052	120,310
Recovered paper	1,000 t	20,401	13,221	28,128	19,000
Wood pulp	1,000 t	328	340	312	341
Other sources of pulp	1,000 t	17,106	8,230	4,380	3,010
Residue	1,000 m^3	145	267	382	296
Sawnwood	1,000 m^3	154	134	146	103
Fibreboard	1,000 m^3	279	402	80	95
Particle board	1,000 m^3	83	68	46	52
Veneer sheets	1,000 m^3	42	13	12	12
Roundwood	1,000 m^3	11	16	8	7
Plywood	1,000 m^3	8	8	7	4
Wood chips and particles	1,000 m^3	0	2	3	2

Source: Brazil/MDIC (2009).

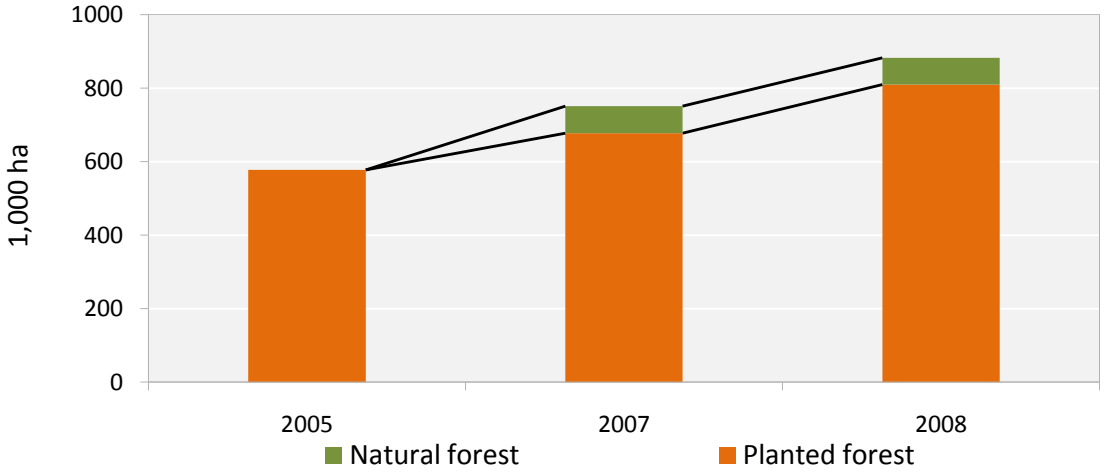
Forest Certification

To endorse forests and chain of custody in Brazil, there are several certifier companies that use two certification systems: the Brazilian Program of Forest Certification (CERFLOR), which is linked to the "Program for the Endorsement of Forest Certification Schemes (PEFC)"; and the "Forest Stewardship Council (FSC)".

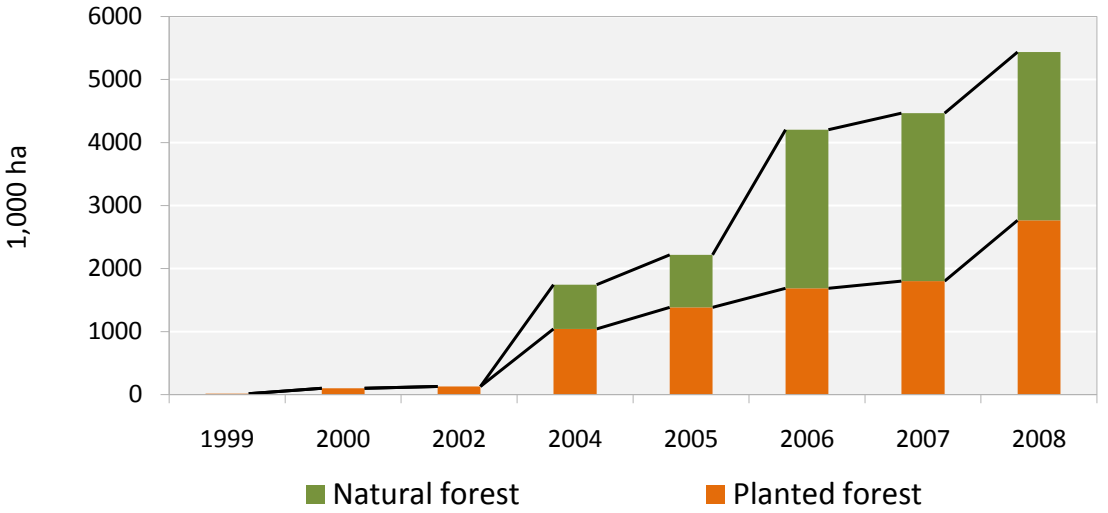
CERFLOR aims at certifying forest management and chain of custody once they meet the criteria and indicators established by standards formulated by the Brazilian Association of Technical Standards (ABNT) and integrated to the Brazilian System of Conformity Assessment and to the National Institute of Metrology, Standardization and Industrial Quality (INMETRO). In 2008, the area of CERFLOR certified forest in Brazil was of 882,902 hectares, of which 73,059 hectares were natural forests, in addition to 22 certified chains of custody.

FSC aims at promoting good practices in forest management according to principles and criteria that conciliate ecologic safeguards with social benefits and economic feasibility and which are the same for the whole world.

In 2008, there were 232 chains of custody certified by FSC, and 5,486,643 hectares FSC-certified forest areas of which 2,670,083 hectares were natural forest and 2,766,055 hectares of planted forests.



Evolution of CEFLOR-certified forest area in Brazil
Source: INMETRO (2009).



Evolution of FSC-certified forest area in Brazil
Source: FSC (2009).

Socio-economic Aspects of the "Legal Amazon Area"

The concept of "Legal Amazon" area was instituted by law for the purposes of economic planning. It encompasses Northern Brazilian states (Acre, Amazonas, Amapá, Pará, Rondônia, Roraima and Tocantins); the state of Mato Grosso (located in the Brazilian Midwest); and part of Maranhão state (Northeast Region), at the longitude of 44 degrees West; and a small portion of Goiás state (Midwest Region), above 13 degrees latitude south. The Legal Amazon area covers over 5 million square kilometres, which corresponds to approximately 61% of the Brazilian territory.

A study was conducted in 2004, regarding the timber industry in the Amazon. Some results are presented on the following table.

Logged timber consumption and gross profit of the logging industry in the Legal Amazon area (2004)

State	Nº of logging centres	Nº of companies	Consumption/ year logs (1000 m³)	Gross Profit (US$ million)
Acre	1	52	420	41.6
Amapá	1	73	130	9.3
Amazonas	3	48	490	55.9
Maranhão	1	45	430	31.7
Mato Grosso	26	872	8,010	673.9
Pará	33	1,592	11,150	1,113.6
Rondônia	16	422	3,700	368.9
Roraima	1	28	130	15.9
Total	**82**	**3,132**	**24,460**	**2,310.7**

Source: Lentini et al. (2005).

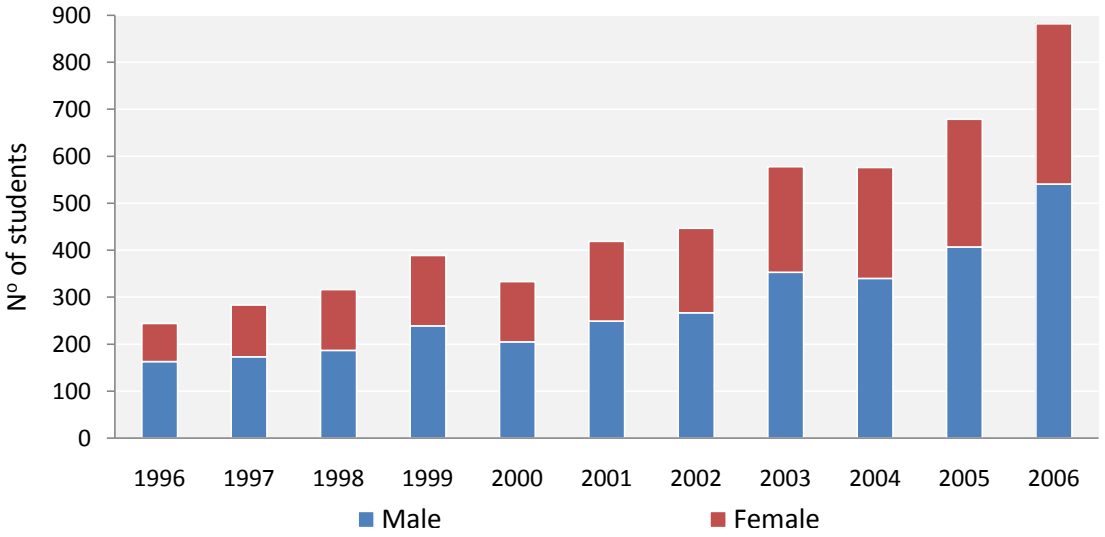
Forest Research and Education

In Brazil, there are 51 undergraduate courses in Forest Engineering, offered by 44 higher education institutions, and 21 postgraduate courses in Forest Engineering and Forest Sciences (INEP, 2009).

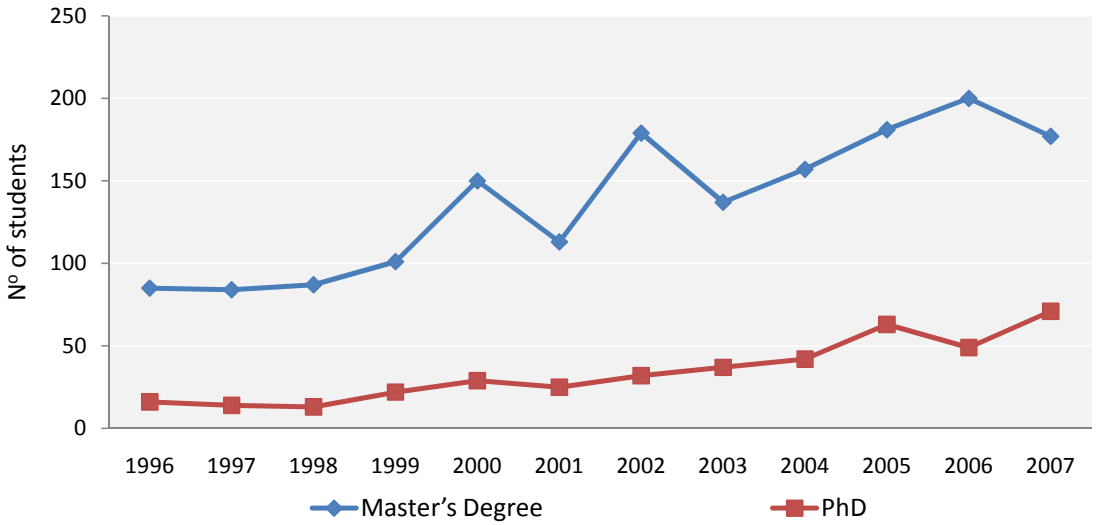
Graduates from undergraduate and postgraduate courses in Forest Engineering and Forest Sciences in Brazil

Courses	2005	2006	2007
Undergraduate courses[1]	679	882	937
Postgraduate courses (Master's degrees)[2]	181	200	177
Postgraduate courses (PhD)[2]	63	49	71

Source: [1] INEP (2008). [2] CAPES (2009).



Number of graduates from Forest Engineering courses per gender
Source: INEP (2009).



Number of students enrolled in postgraduate courses in Forest Engineering and Forest Sciences
Source: CAPES (2009).

Teaching staff members who worked in high education institutions in the area of forest resources or forest engineering, per gender and title, in 2005

Gender	PhD	Master's	Specialist degree	Undergraduate course	Expertise	Total
Female	157	93	16	17	0	**283**
Male	580	232	53	33	1	**899**
Not	46	8	3	0	0	**57**

Source: INEP (2009).

Professionals trained through secondary-school-level technical courses in forestry, per gender

Course	2003		2004		2005		2006	
	Male.	Fem.	Male.	Fem.	Male.	Fem.	Male.	Fem.
Forest Technician	139	46	173	50	174	53	174	53
Forest Management Technician	76	17	12	3	8	10	8	10
Total	**215**	**63**	**185**	**53**	**182**	**63**	**182**	**63**

Source: INEP (2009).

Number of professionals in the main centres for forest research outside universities

Research Centres	Education	2005			2008		
		Male	Fem.	Total	Male	Fem.	Total
Lab.of Forest Products (SFB)	PhD	7	1	**8**	10	3	**13**
	Master's degree	10	3	**13**	7	1	**8**
	Bachelor's degree	9	5	**14**	9	5	**14**
EMBRAPA Florestas, EMBRAPA Amaz. Ocidental e EMBRAPA Rondônia	PhD	40	13	**53**	43	20	**63**
	Master's degree	11	6	**17**	6	4	**10**
	Bachelor's degree	2	0	**2**	1	0	**1**
INPA (Silviculture and Forest Products)	PhD	14	7	**21**	15	7	**22**
	Master's degree	1	0	**1**	0	0	**0**
	Bachelor's degree	0	0	**0**	0	0	**0**
IPT (Timber technology)	PhD	4	0	**4**	4	0	**4**
	Master's degree	2	6	**8**	3	9	**12**
	Bachelor's degree	12	14	**26**	17	18	**35**
Emílio Goeldi Museum	PhD	3	11	**14**	3	11	**14**
	Master's degree	7	1	**8**	7	1	**8**
	Bachelor's degree	2	1	**3**	2	2	**4**
Total	**PhD**	**68**	**32**	**100**	**75**	**41**	**116**
	Master's degree	**31**	**16**	**47**	**23**	**15**	**38**
	Bachelor's degree	**25**	**20**	**45**	**29**	**25**	**54**
Sum Total		**124**	**68**	**192**	**127**	**81**	**208**

Source: SFB (2009a) with adaptations.

Brazilian Biomes and their Forests

Brazil hosts six continental biomes: Amazon, Cerrado, Atlantic Forest, Caatinga, Pampa and Pantanal, as shown in the table below.

Area covered by Brazilian biomes

Continental Biomes	Estimated area (km²)	% Brazil
Amazon	4,196,943	49.29
Cerrado	2,036,448	23.92
Atlantic Forest	1,110,182	13.04
Caatinga	844,453	9.92
Pampa	176,496	2.07
Pantanal	150,355	1.76
Total	**8,514,877**	**100**

Source: IBGE (2009a).

A Biome is a set of plant and animal living organisms that is characterized by types of vegetation that are contiguous and identifiable at a regional scale, paired with similar geoclimatic condictions and a shared history of changes, which results in a distinct biological diversity.

Biomes

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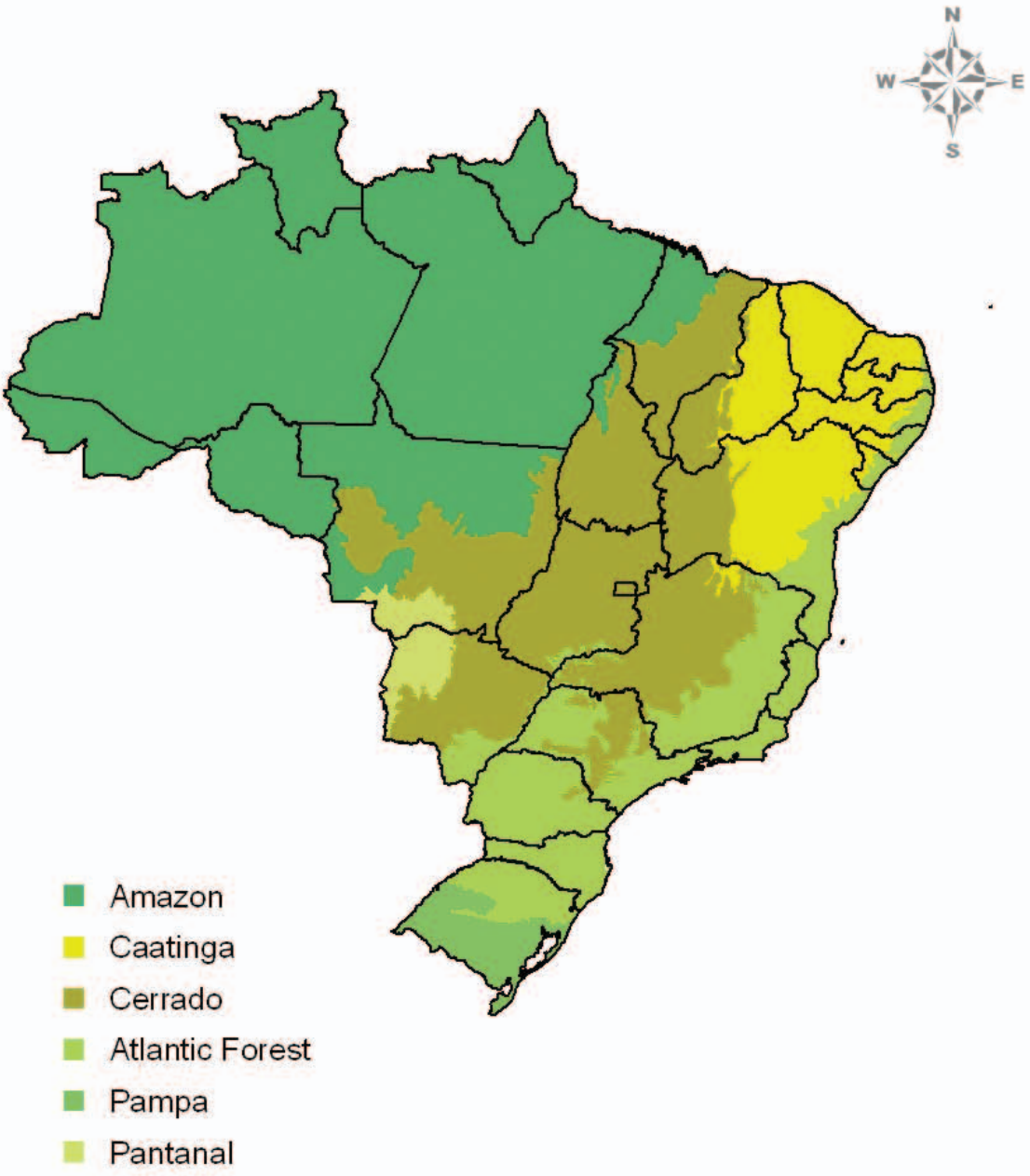

Source of data: IBGE and MMA (2004).

Amazon

The Amazon biome encompasses an area of 4.2 million km^2 (49.3% of the national territory). Such rainforest is home to the greatest share of global biodiversity. Its distinct ecosystems are also expressive of the diversity within the Amazon rainforest: dense mainland forests, seasonal forests, flooded forests (igapós), wetlands, floodplains (várzeas), savannahs, mountain refuges and communities of pioneer species. It hosts the largest hydrologic network of the world and concentrates 14% of all unfrozen surface freshwater in the planet.

Amazon Biome (2008)

	Total	% of Brazil
Estimated population	16,926,831	9.2
Area of the biome (ha)	419,694,300	49.3
Forest cover (ha)	356,429,362	41.9
Total volume of timber (million m³)	107,861	84.7
Stock of biomass aboveground (million t)	92,672	84.6
Stock of biomass belowground (million t)	13,434	65.7
Protected Area within Federal Conservation Units (ha)	61,081,900	14.6*

*** In relation to the biome area.**

Forests of the Amazon Biome

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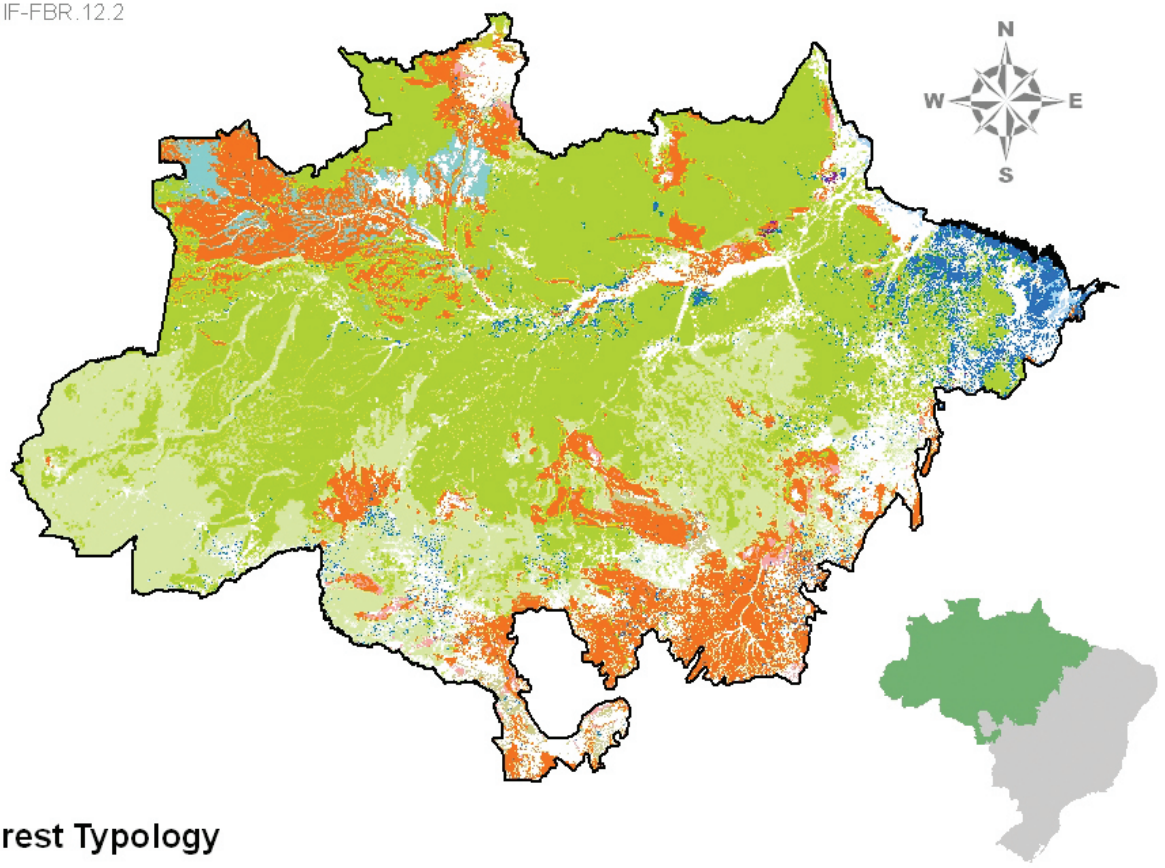


Forest Typology

- Dense Ombrophilous Forest
- Open Ombrophilous Forest
- Semi-deciduous and Deciduous Seasonal Forest
- Arboreal Forested Heath Forest (Campinarana)
- Arboreal Forested Savannah (Cerradão and Campo-Cerrado)
- Arboreal Forested Steppe Savannah (Arboreal Caatinga)
- Fluviomarine or Sea-influenced Vegetation (Mangroves and Shoals)
- Ecotone (Transitional Zone)
- Secondary Vegetation
- Reforestation

Source of data: MMA (2007).

Cerrado

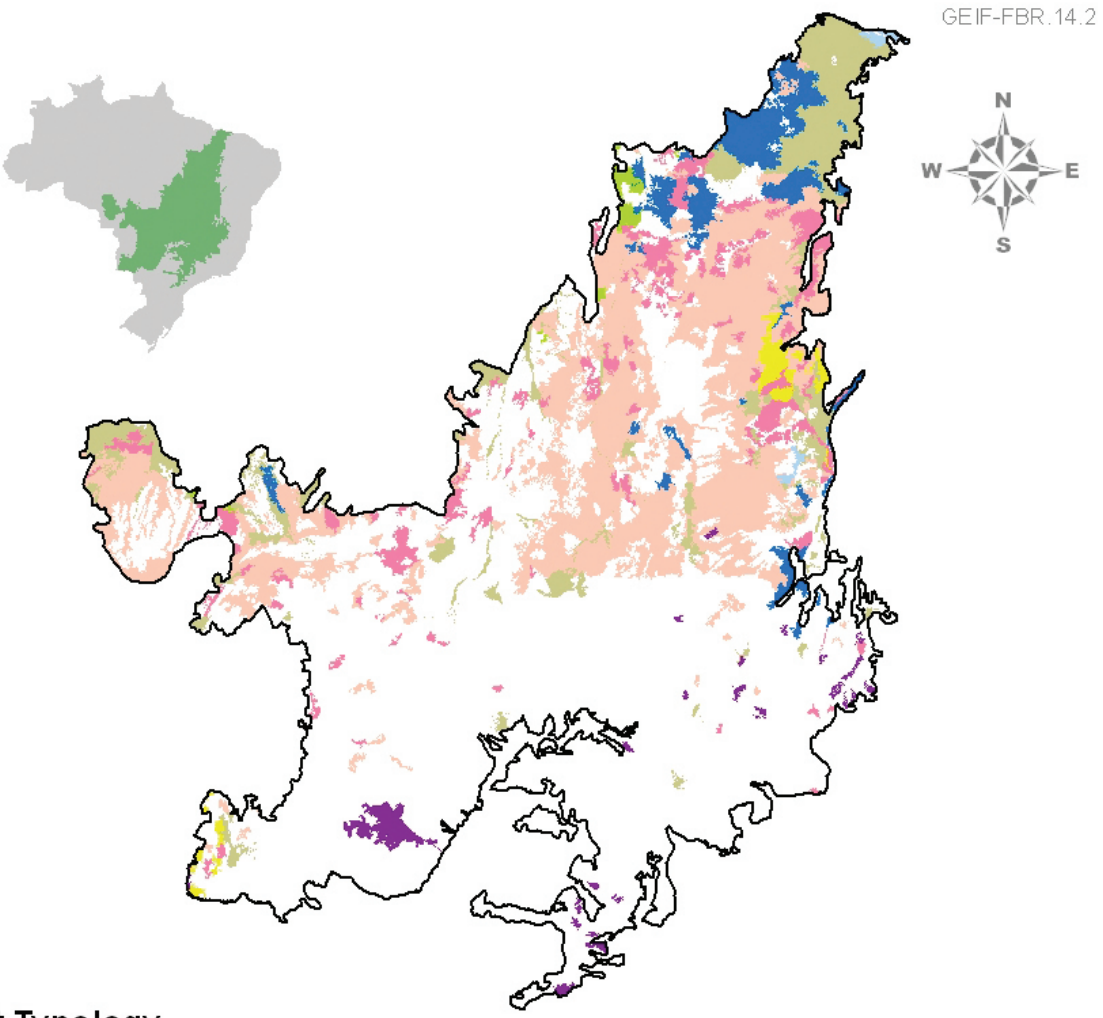
Cerrado is the second largest biome in the country. It is located in the most part of the central region of Brazil and extends over 2 million square kilometers (24% of the territory). Cerrado holds one of the highest biodiversity rates in the planet and a large concentration of endemic species. It is characterized by savannah-like vegetation, which can be sub-classified as cerradão (arboreal savannah), cerrado, open grasslands (campo limpo) and grasslands with shrubs (campo sujo), intertwined with gallery forests, seasonal forests, montane savannas and buriti wet grasslands (veredas de buritis). The Cerrado biome hosts a large biological diversity and provides essential environmental services to regulate the hydrologic cycle. In fact, the heads of the main river basins of Brazil (Araguaia, Tocantins, Xingu, Tapajós, Paraguay and São Francisco) are located in this biome. Cerrado is under serious threat due to disorganized agricultural expansion. From 2002 to 2008, 6.3% of the area of the biome was deforested.

Cerrado Biome (2008)

	Total	% of Brazil
Estimated population	29,805,941	16.2
Area of the biome (ha)	203,644,800	23.9
Forest cover (ha)	71,829,731	8.4
Total volume of timber (million m³)	8,117	6.4
Stock of biomass aboveground (million t)	4,918	4.5
Stock of biomass belowground (million t)	3,984	19.5
Protected Area within Federal Conservation Units (ha)	5,899,200	2.9*

*** In relation to the biome area.**

Forests of the Cerrado Biome



Forest Typology

- Forested Savannah (Cerradão)
- Arboreal Savannah (Campo-Cerrado)
- Deciduous and Semi-deciduous Seasonal Forest
- Dense and Open Ombrophilous Forest
- Fluviomarine or Sea-influenced Vegetation (Mangrove and Shoals)
- Steppe Savannah (Arboreal Caatinga)
- Secondary Vegetation
- Reforestation

Source of data: MMA (2007).

Atlantic Forest

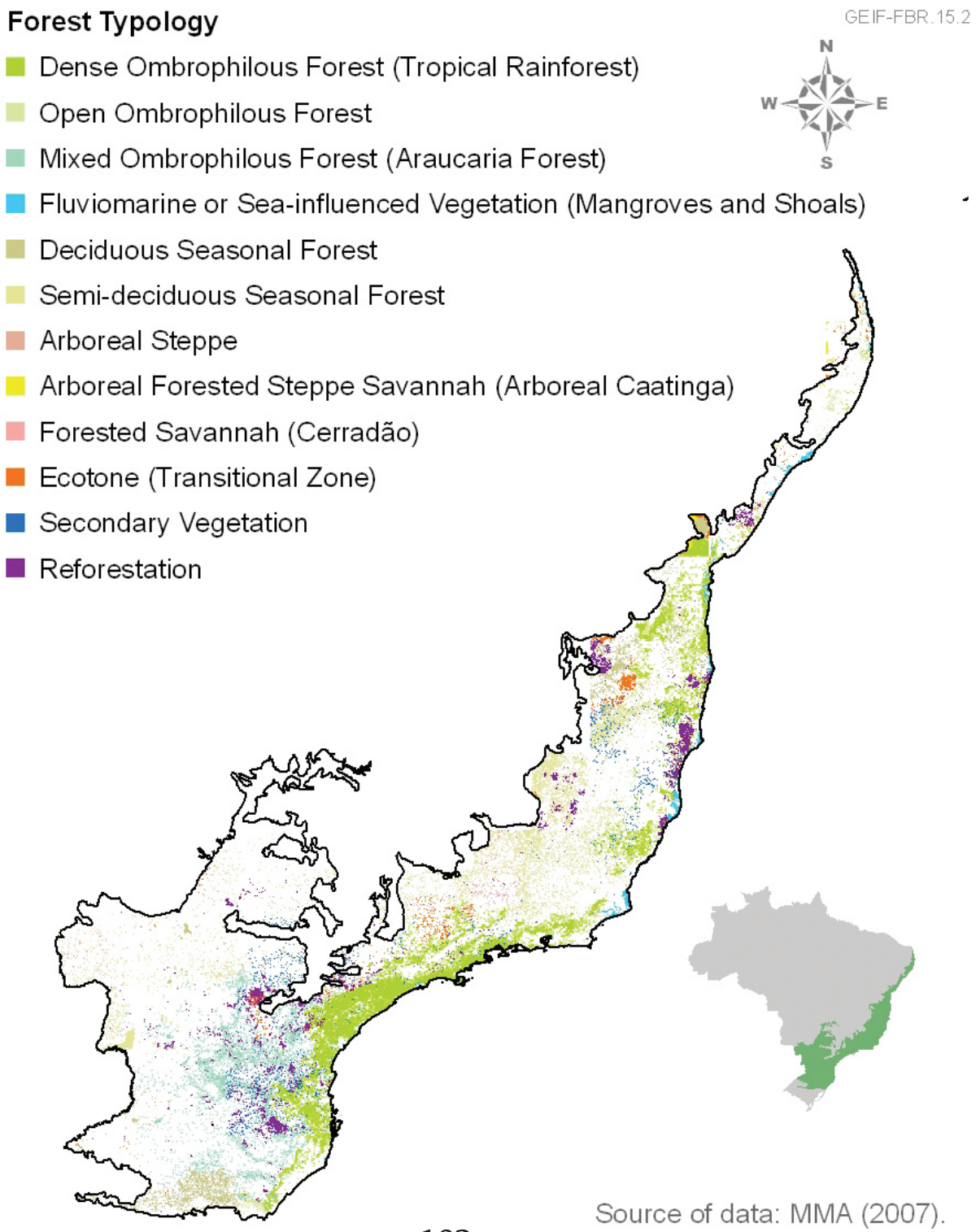
The Atlantic Forest biome and associated ecosystems encompasses an area of 1.1 million square kilometers, which corresponds to nearly 13% of the Brazilian territory, spans seventeen states, and extends across a coastal strip from Rio Grande do Norte to Rio Grande do Sul state, and inwards for around 500 kilometers in the South - Southeast (as opposed to 100 kilometers in the Septentrional portion of Brazil). Nevertheless, in view of centuries of environmental pressure, the area of the Atlantic Forest has been reduced to a highly fragmented area of only 300 thousand square kilometers. Yet the Atlantic Forest still hosts a significant portion of Brazilian biological diversity. Such biome is composed by a range of forest formations, including dense, mixed and open broadleaf forests; semi-deciduous and deciduous seasonal forests; mangroves; shoals (restingas) and associated high altitude grasslands; and swamps in inner Northeastern Brazil. Araucaria Forests (mixed broadleaf forests featuring Araucaria angustifolia, or Parana pine) occur in plateaus in Southern Brazil located west of Serra do Mar. However, a high number of species in this biome is endangered.

Atlantic Forest Biome (2008)

	Total	% of Brazil
Estimated population	106,896,616	58.1
Area of the biome (ha)	111,018,200	13.0
Forest cover (ha)	29,132,040	3.4
Total volume of timber (million m³)	7,228	5.7
Stock of biomass aboveground (million t)	7,382	6.7
Stock of biomass belowground (million t)	1,329	6.5
Protected Area within Federal Conservation Units (ha)	3,179,500	2.9*

* In relation to the biome area.

Forests of the Atlantic Forest Biome



Source of data: MMA (2007).

Caatinga

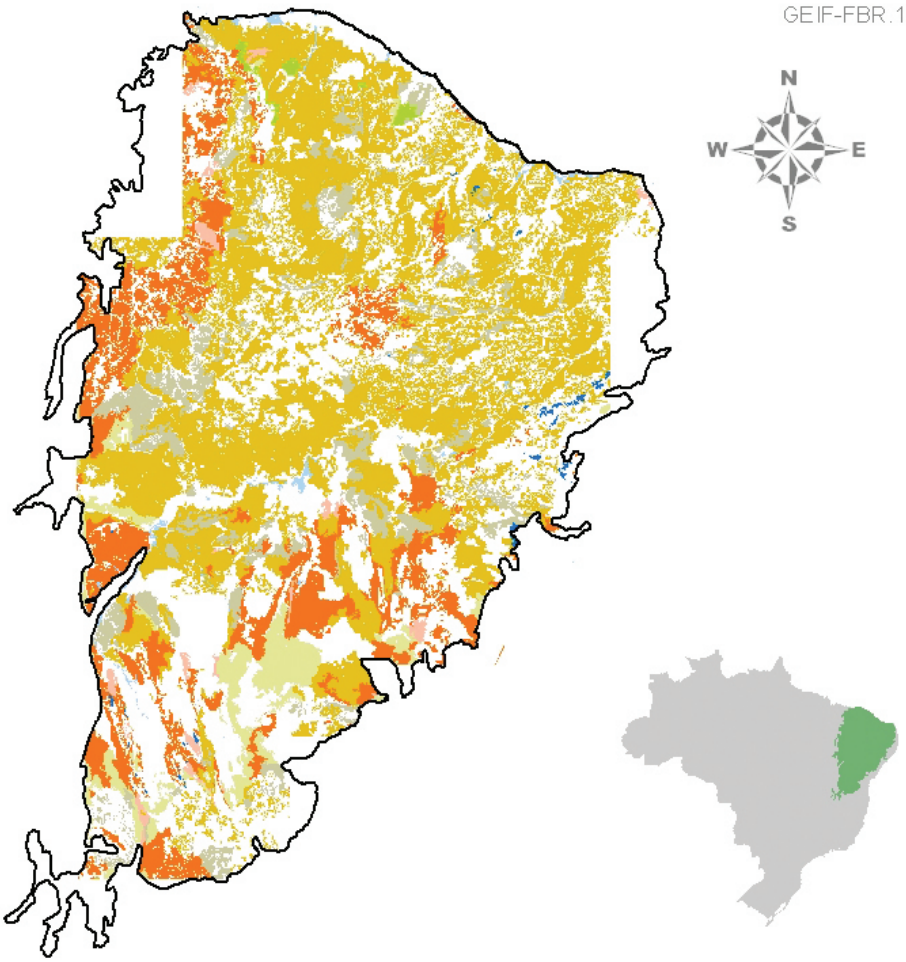
Caatinga is an exclusive Brazilian biome. Located in the Northeastern region of the country, it encompasses up an area equivalent to 10% of national territory and extends across great part of the Northeastern states and North Minas Gerais state. In the Caatinga, the dominant type of vegetation is the "steppe savannah", where predominant vegetation consists in small trees and shrubs which generally lose their leaves during the dry season (deciduous species) and in many cactus species. Despite the fact it is a semiarid region, with low average rainfall (between 300 and 800 millimeters per year), the Caatinga is extremely heterogeneous, with at least a hundred different types of unique landscapes, featuring ponds or temporary wetlands, mountain refuges and permanent rivers like the São Francisco. The Caatinga has undergone a high level of environmental degradation, especially with regard to desertification processes, and high indicators of human poverty.

Caatinga Biome (2008)

	Total	% of Brazil
Estimated population	23,734,361	12.9
Area of the biome (ha)	84,445,300	9.9
Forest cover (ha)	47,376,398	5.6
Total volume of timber (million m³)	2,408	1.9
Stock of biomass aboveground (million t)	3,108	2.8
Stock of biomass belowground (million t)	839	4.1
Protected Area within Federal Conservation Units (ha)	3,339,000	4.0*

*** In relation to the biome area.**

Forests of the Caatinga Biome



Forest Typology

- Forested Steppe Savannah (Dense Arboreal Caatinga)
- Arboreal Steppe Savannah (Dense Arboreal Caatinga)
- Dense and Open Ombrophilous Forest
- Deciduous and Semi-deciduous Seasonal Forest
- Fluviomarine or Sea-influenced Vegetation (Mangrove and Shoals)
- Forested and Arboreal Savannah (Cerradão and Campo-Cerrado)
- Ecotone (Transitional Zone)
- Secondary Vegetation

Source of data: MMA (2007).

Pampa

Pampa, also known as Southern grasslands, occurs in Rio Grande do Sul state and span across Uruguay and Argentina. The dominant vegetation is grass intertwined with mesophilic forests, subtropical forests (especially araucaria forests) and seasonal forests. The biome is characterized by a great richness of herbal species and several typologies, which compose integrated environments with araucaria forests in a few regions. Its ecosystems are currently under great pressure in view of the introduction of foraging species and of ranching activities.

Pampa Biome (2008)

	Total	% of Brasil
Estimated population	6,255,568	3.4
Area of the biome (ha)	17,649,600	2.1
Forest cover (ha)	3,589,197	0.4
Total volume of timber (million m³)	893	0.7
Stock of biomass aboveground (million t)	909	0.8
Stock of biomass belowground (million t)	164	0.8
Protected Area within Federal Conservation Units (ha)	463,200	2.6*

* In relation to the biome area.

Forests of the Pampa Biome

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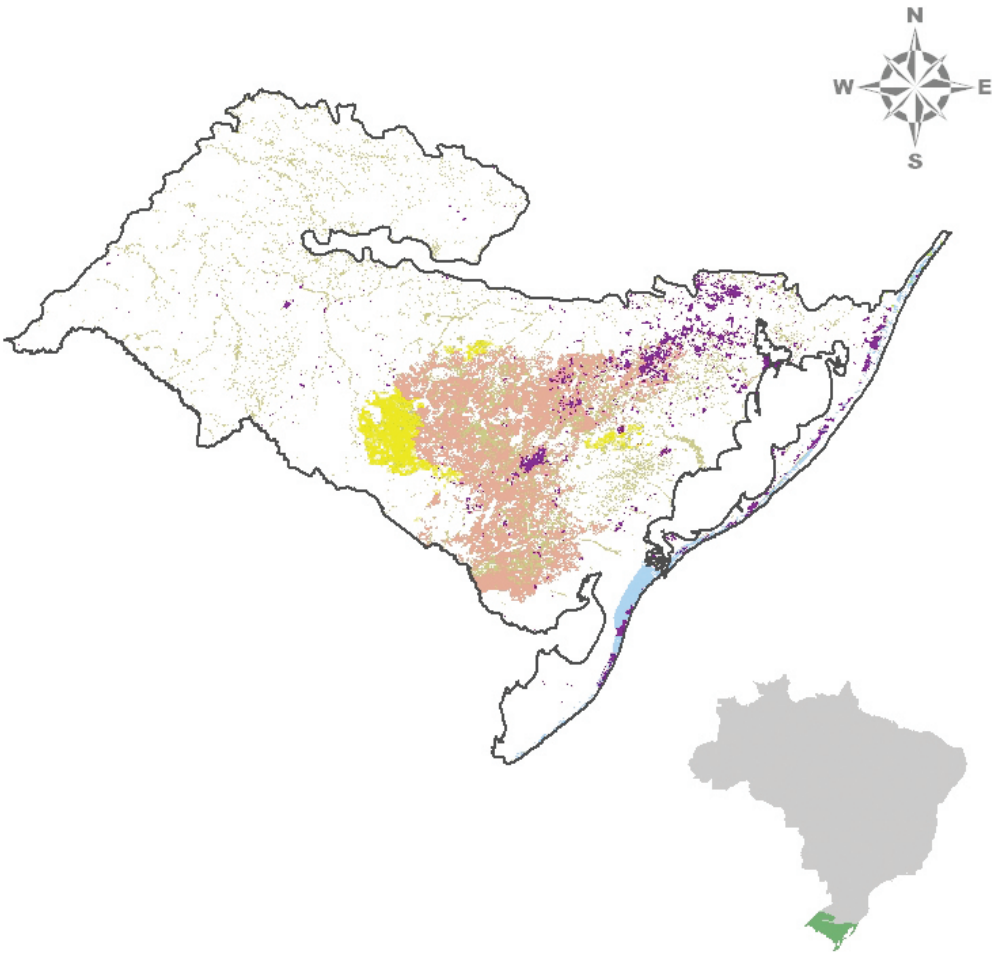


Forest Typology

- Arboreal Steppe
- Steppe Savannah (Campanha Gaúcha)
- Dense Ombrophilous Forest (Tropical Rainforest)
- Deciduous and Semi-deciduous Seasonal Forest
- Fluviomarine or Sea-influenced Vegetation (Mangrove and Restinga)
- Reforestation

Source of data: MMA (2007).

Pantanal

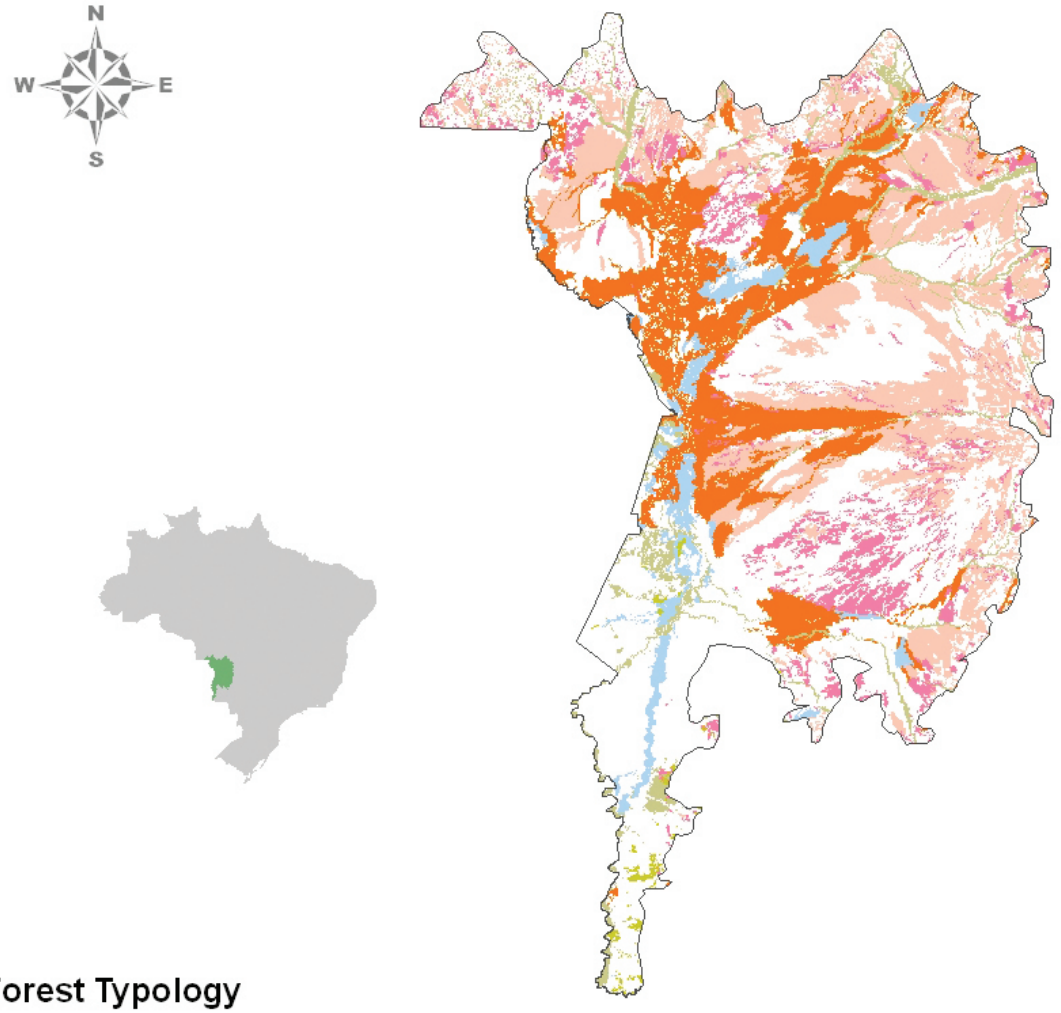
Covering over 150 thousand square kilometers in the states of Mato Grosso and Mato Grosso do Sul, Pantanal is the largest marshland of the world and contains an unparalleled richness of aquatic and terrestrial biological diversity. At an altitude of approximately 150 m above sea level and on a plain terrain, Pantanal changes drastically during the rainy season as large flooded areas arise (up to 80% of the plains are flooded). During the dry season, Pantanal resembles cerrado. The vegetation is a mosaic of low forest, cerradão, cerrado and floodplain. The ecosystems which the biome hosts are extremely fragile and are threatened by new trends in economic development and infrastructure building.

Pantanal Biome (2008)

	Total	% of Brasil
Estimated population	367,975	0.2
Area of the biome (ha)	15,035,500	1.8
Forest cover (ha)	8,731,839	1.0
Total volume of timber (million m³)	869	0.7
Stock of biomass aboveground (million t)	597	0.5
Stock of biomass belowground (million t)	690	3.4
Protected Area within Federal Conservation Units (ha)	149,900	1.0*

* In relation to the biome area.

Forests of the Pantanal Biome



Forest Typology

- Deciduous and Semi-deciduous Seasonal Forest
- Forested Savannah (Cerradão)
- Arboreal Savannah (Campo-Cerrado)
- Forested and Arboreal Steppe Savannah (Arboreal Caatinga)
- River- or Lake-influenced Vegetation
- Ecotone (Transitional Zone)

Source of data: MMA (2007).

GEIF-FBR.17.2

International Comparison

Comparison of forest areas in the world (2005)

Country	Forest Area (ha)	Area/ inhabitant
Russian Federation	808,790,000	5.7
Brazil	**477,698,000**	**2.5**
Canada	310,134,000	9.5
United States	303,089,000	1.0
China	197,290,000	0.2
Australia	163,678,000	7.9
Republic of Congo	133,610,000	2.3
Indonesia	88,495,000	0.4
Peru	68,742,000	2.4
India	67,701,000	0.4
Others	1,333,000,000	2.6

Source: FAO (2005).

Comparison of planted forests in the world (2005)

(ha)

Country	Planted Forest Area
1 China	28,530,000
2 United States	17,061,000
3 Russian Federation	11,888,000
4 Brazil	**5,384,000**
5 Sudan	4,728,000
6 Indonesia	3,399,000
7 Chile	2,661,000
8 Thailand	1,997,000
9 France	1,968,000
10 Turkey	1,916,000
11 United Kingdom	1,902,000
12 New Zealand	1,832,000
13 Vietnam	1,792,000
14 Australia	1,766,000
15 Malaysia	1,573,000
16 Spain	1,471,000
17 South Africa	1,426,000
18 Republic of Korea	1,364,000
19 Argentina	1,229,000
20 Portugal	1,067,000

Source: FAO (2005).

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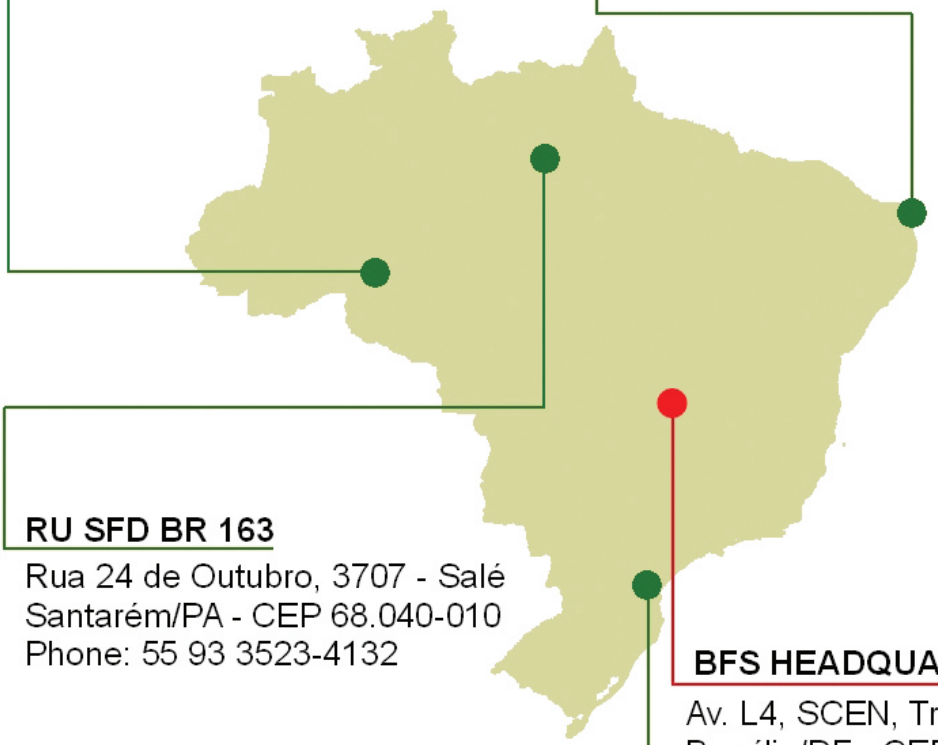

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