brazilian tree industry

THE PLANTED TREE INDUSTRY AND CLIMATE CHANGE

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Climate change has been one of today´s greatest challenges. The consequences are clear: temperatures have risen 1.02°C since the nineteenth century[1], sea levels have risen an average of 1.5 mm each year over the last century,[2] extreme events like droughts, floods, forest fires, and hurricanes are more frequent, and there have been losses in economic productivity.

According to the Intergovernmental Panel on Climate Change (IPCC), the burning of fossil fuels is one of the major factors responsible for the increased levels of greenhouse gases (GHG) in the atmosphere, which include carbon dioxide (CO_2) and methane (CH_4). Furthermore, deforestation and the decomposition of trash also contribute to changes in global and regional climate patterns.

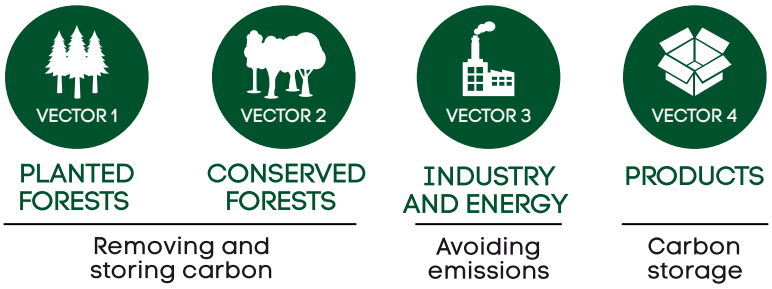
The world searches for solutions and alternatives to deal with these effects. Brazil stands out as one of the countries with the greatest potential for mitigating climate change.

The Brazilian planted tree sector has much to contribute to this agenda. It is estimated that nearly 8 million hectares of planted trees store 1.70 billion tons of CO_2eq. Additionally, the nearly 6 million hectares conserved by this sector in the form of Legal Reserves (RL), Permanent Preservation Areas (APP), and other conservation areas maintain carbon stocks on the order of 2.48 billion tons of CO_2eq.

The sector's contribution to minimizing climate change also involves the manufacturing process. Many industrial plants are self-sufficient in energy and have been historically reducing the emission of GHG as a result of investments in technology and replacing fossil fuels with renewable energy sources such as forest biomass.

Finally, in addition to removing carbon from the atmosphere and storing it, the sector also contributes to mitigate climate change by avoiding emissions through the production and use of various forest products instead of energy or products originating from non-renewable sources.

LEARN ABOUT THE FOUR VECTORS OF THIS SECTOR THAT CAN MITIGATE CLIMATE CHANGE



Check in details, in this infographic, how each stage of the production process helps to mitigate climate change.

Sources : 1) Met Office - The UK Meteorological Service
2) The Intergovernmental Panel on Climate Change (IPCC)

MILESTONES

1992

UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT (ECO 92, THE "EARTH SUMMIT") – RIO DE JANEIRO, BRAZIL

Creation of the United Nations Framework Convention on Climate Change (UNFCCC).

1997

COP 3, KYOTO – JAPAN

Established the Kyoto Protocol, which entered into force in February 2015 and set targets to reduce GHG emissions in the developed countries listed in "Annex I" considered to be historically responsible for climate change. The developing countries referred to in the "non-Annex I" group were able to participate in the process through the Clean Development Mechanism (CDM).

2009

COP 15, COPENHAGEN – DENMARK

Important agreements were made to develop national policies. In Brazil, the National Policy on Climate Change (Law No. 12,187) was settled, officially establishing the country's voluntary commitment to the UNFCCC to reduce its GHG emissions from 36.1% to 38.9% by 2020.

2010

WORLD'S FIRST CARBON CREDITS ISSUED

A Brazilian forest company issued the world's first forest carbon credits together with the World Bank and within the scope of the Clean Development Mechanisms (CDM).

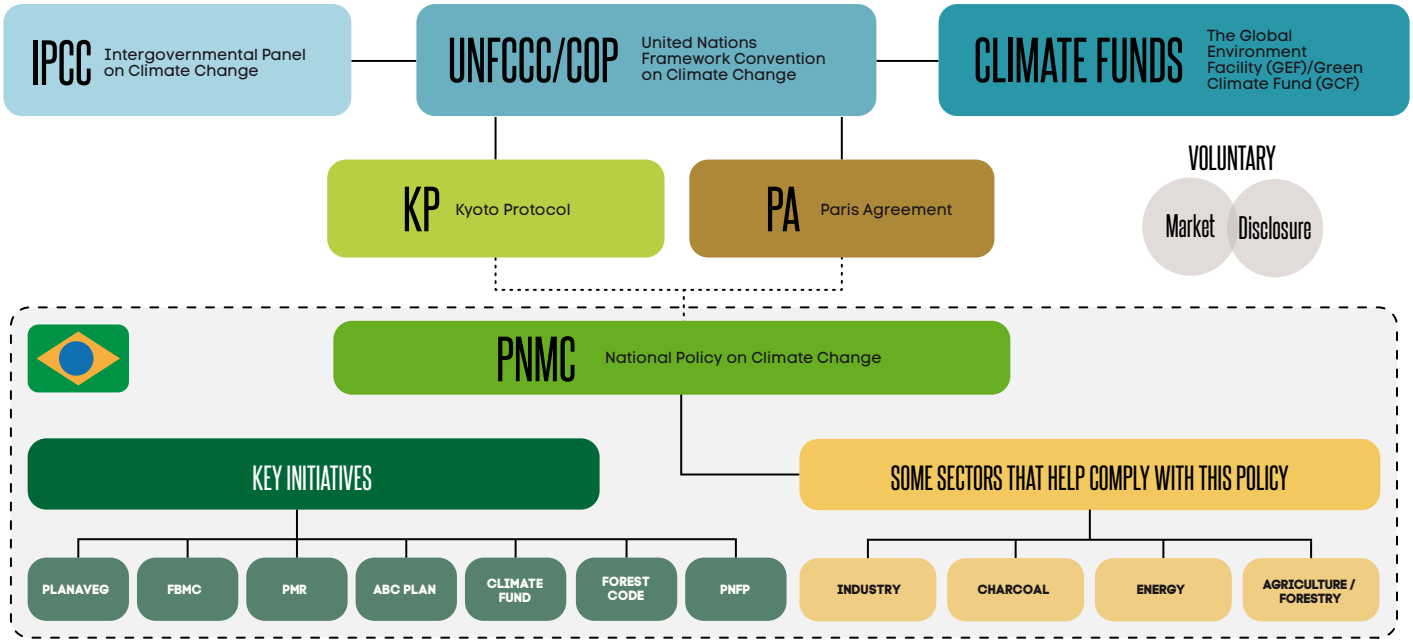
2015

COP 21, PARIS – FRANCE

The nationally determined contributions (NDC) were defined, stipulating what each country must do to reduce carbon emissions and limit the increase in the Earth's average temperature to 2°C, or 1.5°C if possible.

CLIMATE CHANGE GOVERNANCE

These domestic and international structures and institutions establish processes, agreements, goals, and regulations. These instruments can be official or voluntary.



IPCC

This scientific and political organization was established in 1988 and its specialists from more than 130 countries generate knowledge to support the international negotiations.

UNFCCC/COP

Works to stabilize GHG concentrations in the atmosphere, discussing initiatives to prevent and mitigate human intervention and its effects on the climate. The Convention of the Parties (COP) is its annual meeting to discuss regulations, agreements, and protocols.

CLIMATE FUNDS

The GEF aims to provide resources for projects in developing countries that benefit climate change, biodiversity, protection of the ozone layer, and water resources. The GCF exclusively serves the Convention and allocates equal amounts toward mitigation and adaptation in developing countries.

KYOTO PROTOCOL

The first instrument to define emission reduction targets for developed countries. It has instituted the CDM, a mechanism to regulate carbon credits trading to support developing countries and reduce GHG emissions.

PARIS AGREEMENT

It has established the NDCs; in which the Brazilian target is to reduce GHG emissions by 37% by 2025 and 43% by 2030 in comparison with 2005 levels. In its Article 6.4, the agreement lays out the transition from the CDM to other market mechanism procedures such as the Mechanisms for Sustainable Development (MSD).

VOLUNTARY MARKETS

Markets established to generate emission reduction units (credits) that can be used to offset emissions by any organization.

VOLUNTARY DISCLOSURE

Organizations that promote the transparency of information related to the management of climate change and other environmental aspects.

PNMC

Regulates issues related to climate change in Brazil and has several initiatives that assist in compliance.

KEY NATIONAL INITIATIVES

- **PLANAVEG:** The National Policy to Restore Natural Vegetation aims to broaden and strengthen policies, incentives, markets, and good practices, and aims for the recovery of at least 12 million hectares by 2030.

- **FBMC:** The Brazilian Forum on Climate Change was created so that society and the state can discuss solutions, raise awareness, and mobilize around this topic.

- **PMR:** The Partnership for Market Readiness is an initiative developed by the Brazilian Ministry of Finance and World Bank to define carbon pricing, through market mechanisms and/or taxation of emissions.

- **ABC PLAN:** The Low-Carbon Agriculture Plan targets the adoption of sustainable production technologies to meet commitments to reduce GHG emissions in the agricultural sector, including planted forests.

- **BRAZILIAN CLIMATE FUND:** Works to guarantee resources for projects or studies and finance joint ventures which aim mitigate climate change.

- **FOREST CODE:** This legislation establishes rules related to land use and protection of native vegetation to propel efficient management and also to consider payments for ecosystem services (such as carbon).

- **PNFP:** The National Policy of Planted Forests creates mechanisms to expand production of forest goods and services for social and economic development.

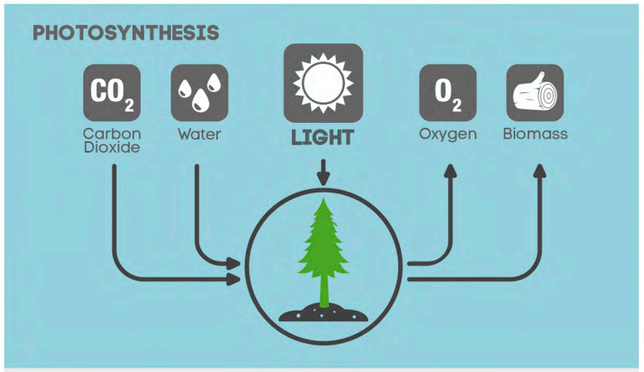
FOREST COMPONENT

Forests have distinct purposes, including production and conservation. In Brazil, for each 1 hectare of forests for productive purposes approximately 0.7 hectare is conserved. Regardless of their purpose, both promote diverse ecosystem services such as mitigating and helping to adapt climate change, regulating water flow, soil conservation, nutrient cycling, biodiversity maintenance and others.

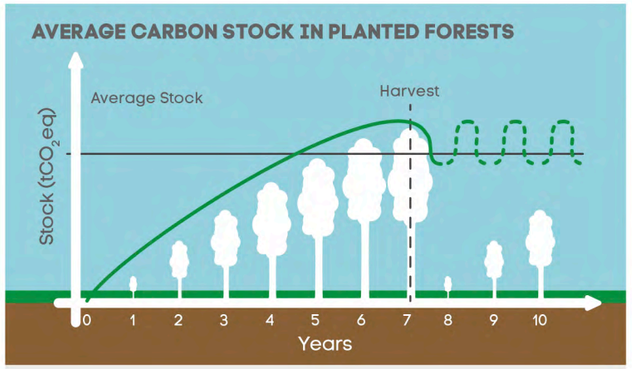
Trees truly recycle CO_2; through their natural process of **photosynthesis**, they absorb carbon dioxide and store the carbon in their biomass. Storage of carbon in different parts of trees and soils occurs in what are called **carbon pools**, as shown in the following mosaic. As productive forests are planted and harvested in several cycles over time, an **average carbon stock** is maintained in these areas throughout their useful life.

Thus, planted and conserved forests both help the sector to have a very neutral or even negative carbon balance, in which more CO_2 is removed by the forests than what is released by industries.

As a result, the forestry sector plays a key role in fulfilling Brazil's NDCs as long as adjustments to public policies and market instruments are implemented.



One of the ecosystem services promoted by trees is removal of carbon from the atmosphere, a process known as "carbon sequestration". This reduces the concentration of GHG, one of the main causes of climate change. Carbon removal occurs during the process of photosynthesis, in which plants produce the energy they need to develop. During photosynthesis, trees absorb molecules of carbon dioxide (CO_2) and water (H_2O), which in the presence of light results in the production of glucose ($C_6H_{12}O_6$) and water (H_2O) and releases oxygen (O_2) into the atmosphere. The glucose undergoes various chemical reactions within the plant, resulting in the production of biomass. Approximately 47% of a tree biomass is composed of carbon.



The above chart represents the average amount of carbon that is stored; for example, in a typical eucalyptus plantation during a seven-year rotation. Both the planting and harvesting happen on a rolling basis as follows: the area planted in year 0 will be harvested in year 7. At the time that this area is harvested, the areas in years 1, 2, 3, 4, 5, 6 and 7 remain standing. The following year (8th year), the area planted in year 1 will be harvested. At the time that this area is harvested, the areas planted in years 2, 3, 4, 5, 6, 7 and 8 remain standing. This last area was the first harvested area, which is now a 1-year-old plantation, and so forth. In this way, six of the seven areas (85%) are always standing, storing carbon in their biomass, while one of the seven areas (15%) is being harvested and subsequently reforested.

CARBON POOLS

AREAS WHERE CARBON IS STORED (STOCKS), IN THE TREES AS WELL AS IN THE GROUND.

1. **ABOVE GROUND**
   Stocks in trunks, branches, leaves, fruits, oils, resins, and flowers.
2. **BELOW GROUND**
   Stocks in roots
3. **LITTER**
   Stocks in leaves and small stems that cover the surface of the soil.
4. **DEAD WOOD**
   Stocks in pieces of trunk, larger branches, and stumps that remain in the forest.
5. **SOIL**
   Stocks in organic matter and soil.

VECTORS OF THE FOREST COMPONENT:

VECTOR 1

PLANTED FORESTS
Remove carbon from the atmosphere and store it in the form of biomass for productive purposes.

VECTOR 2

CONSERVED FORESTS
Remove carbon from the atmosphere, creating a stock in the form of biomass for conservation purposes over time.

FACTORY COMPONENT

Forest-based industry can provide for several segments: pulp, paper, wood panels, laminate flooring, steel produced with charcoal, energy and others. In addition to wood, other parts of the tree can be used commercially, such as the flowers, fruits, leaves, and resins. The section below describes how wood and biomass help prevent and reduce GHG emissions in several supply chains.

WOOD AS RENEWABLE ENERGY:
The role of biomass in the energy matrix is to generate renewable and sustainable energy. The planted tree industry generates most of the energy required for the production processes using biomass, around 70%. Additionally, more modern factories generate surplus energy and pass it to the national electric grid system. Wood can also be used to generate electricity in thermal power plants instead of fossil fuels. In the future, there is the possibility that more biorefineries will be established, generating other products besides energy (biofuels, for example).

LOGISTICS:
The different types of transport options used by the forest sector promote emission reductions by allowing a more efficient logistics strategy. Continuous investments in technology and innovation have developed increasingly lighter vehicles that can carry larger volumes and run on biofuels.

WOOD AS A RAW MATERIAL:
As a raw material, wood stores carbon and avoids GHG emissions by standing in for non-renewable energy sources (fossil fuels). 1 m³ of wood stores approximately 1 ton of CO_2eq[3]. In civil construction, the use of wood stocks 0.5 tons of CO_2 per square meter of construction, compared to the use of conventional materials. For example, because furniture has a long working life, it can keep carbon out of the atmosphere for up to a century or more[4]. And when it can no longer fulfill its function, it does not cause any threat to the environment since it degrades and is incorporated naturally into the ecosystem.

CHARCOAL-FIRED STEELWORKS:
In iron and steel production, charcoal from renewable sources (planted forests) avoids emissions resulting from the use of coal (a non-renewable source).

1 ton of wood → **470** kg of carbon stocks → Equals the emission of **10.200**[5] km traveled

PRODUCTS AND THEIR RELATIONSHIP WITH CONSUMERS

All products from planted forests are renewable. Thus they play an essential role in mitigating climate change. Manufacturing forest products is the exact opposite of manufacturing products derived from fossil sources, considering GHG emissions. While forests capture carbon from the atmosphere, store it in the form of wood, and release it in a renewable manner (in other words, recycling the carbon), production of products from fossil origins releases large stocks of carbon into the atmosphere; this carbon was previously confined in underground layers, and causes climate change when it is released.

CARBON STORED[5]

WOODEN TABLE
47 %

MILK CARTON
45 %

LAMINATE FLOORING
47 %

CHARCOAL
85 %

BOOK
45 %

VECTORS OF THE FACTORY COMPONENT AND PRODUCTS:

VECTOR 3 — **INDUSTRY AND ENERGY**
Avoid emissions by using products from renewable sources instead of fossil or non-renewable sources. Examples: biomass in thermal power plants, charcoal to produce steel, biorefineries, etc.

VECTOR 4 — **PRODUCTS**
These are composed of stored carbon and can replace similar products of fossil origin. As a result, by choosing products from responsible forest origins, consumers will play a vital role in mitigating climate change.

CONCEPTS

ADAPTATION
Changes made to prevent or mitigate damage that may be caused by climate change. Ex: clones resistant to periods of drought.

BIOMASS
Organic matter of vegetable origin.

BIOREFINERY
Industrial unit similar to an oil refinery that uses biomass as its source of energy. In biorefineries, the raw material is transformed into products (pulp, paper, charcoal, etc.), and after byproducts are recovered (pyroligneous extract and biomethane from forest waste, for example) they generate energy, biofuels, and chemicals derived from biomass. The goal is to use all of the biomass, seeking new applications for byproducts.

HARVEST
Cutting trees of native or exotic species, which are planted and/or managed for commercial or internal use.

DEFORESTATION
Converting natural forests to other land uses, which can result in a net loss in stocks of biomass and carbon.

FOREST CARBON CREDITS
Units of credits generated by forest projects. Can be sold in markets to meet emission reduction commitments (legal or voluntary).

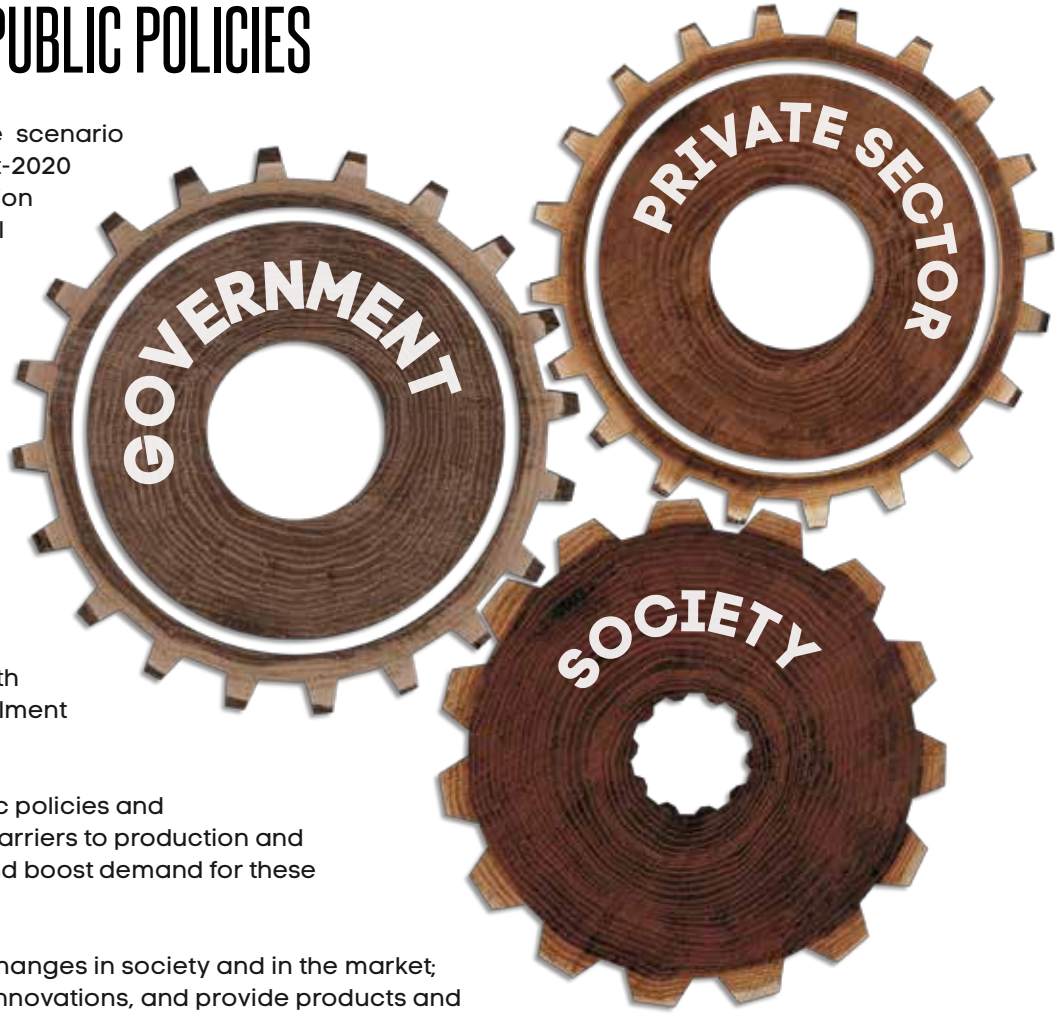
MITIGATION
Actions to reduce the excessive concentration of GHG in the atmosphere which cause climate change, through emissions reduction or carbon sequestration.

C, CO_2 AND CO_2eq
Carbon (C) is a chemical element that composes carbon dioxide (CO_2). 1 ton C = 3,66 ton CO_2. To compare emissions of GHG based on global warming potential, the concept of carbon dioxide equivalent (CO_2eq) has been developed.

Sources: 3) Intergovernmental Panel on Climate Change (IPCC)
4) Forest Plantations: generation of benefits with low environmental impact (EMBRAPA, 2015) http://acr.org.br/download/biblioteca/01.pdf
5) Calculations adapted from IPCC, considering: 1 table made of 20 kg of pine, the paper components of milk carton, 1 m² of eucalyptus laminate flooring, a 5 kg bag of eucalyptus charcoal, and a gasoline-powered economy car.

RECOGNTION AND PUBLIC POLICIES

Considering climate change scenario and the advent of the post-2020 period, means of implementation must be created so that Brazil can comply with its NDCs. Three groups of key actors can and should influence compliance or noncompliance with the NDCs: society, the government, and the private sector, each one within its own sphere of activity and responsibilities.



SOCIETY: value and prioritize products from renewable or low-carbon sources such as forests; monitor and engage with stakeholders to ensure the fulfillment of this agenda.

GOVERNMENT: implement public policies and mechanisms that can reduce barriers to production and trade of renewable products and boost demand for these goods.

PRIVATE SECTOR: be alert to changes in society and in the market; optimize processes, generate innovations, and provide products and services from renewable and sustainable sources that help mitigate and adapt to climate change.

WHAT MEASURES MUST BE IMPLEMENTED FOR BRAZIL TO COMPLY WITH ITS NDCs:

Increase the share of bioenergy to 18%.

Ensure compliance with the Forest Code.

Restore and reforest 12 million hectares of forests.

Achieve zero illegal deforestation in the Brazilian Amazon.

Attain 45% renewable energy sources in the energy grid.

Promote the use of clean technologies in the industrial sector.

DEMAND IS THE DRIVING FORCE IN ADDING VALUE TO RENEWABLE PRODUCTS

The country's ability to significantly increase its planted forest base, generate renewable products, and restore conservation areas is directly proportional to society's demand for wood-based products. The creation of a wide array of instruments, especially carbon pricing, by means of market mechanisms and other economic and financial instruments is fundamental to increase demand for low-carbon products.

Brazil, which is known worldwide not only for its strong productive capacity in agriculture and forestry but also for its vast and significant biodiversity, has an important role and can lead this agenda if the means of implementation are created and society's patterns of demand are modified. A fundamental measure at the public-private level is the creation of a specific plan for the sector which takes into account the wide, transversal nature of the planted tree industry and its many connections with various supply chains and economic instruments.