Forest products and efficient resource use as climate mitigation and adaptation strategies

COPPE / UFRJ

Prof. Suzana Kahn
Vice Director COPPE/UFRJ
UFRJ Green Fund Coordinator
Brazilian Panel on Climate Change
Increase Carbon Sink

Decarbonization pathway consistent with the Paris agreement

- Limiting warming below 2°C with 65% probability
- Limiting warming below 1.5°C with 50% probability

Anthropogenic CO₂ emissions (gross)
- Fossil fuel and industry
- Land use and land-use change

Anthropogenic CO₂ removals
- Land use and land-use change
- Engineering CO₂ sink (BECCS)

Biosphere carbon sink
- Land carbon sink
- Ocean carbon sink

Whiskers on total natural sinks: the 90% range of modeled uncertainties.
Economic Tools for Mitigating the Effects of Climate Change

- Carbon Pricing
- Subsidies
- Standards and certifications
- Taxations
- Emissions Trading
- Regulations

Carbon pricing is considered a “logical foundation for any police regime for low carbon development” (World Economic Forum).
A number of key industries that face intense trade competition, like steel and chemicals, are exempt from Canada’s tax. Instead, they participate in a separate program in which dirtiest companies within each sector either have to pay the government for excess emissions or buy carbon credits awarded to the cleanest companies.

There are some signs that carbon pricing could expand further in the states. Virginia and New Jersey are making moves to join the Regional Greenhouse Gas Initiative, and several Northeastern states are planning a similar program for cars and trucks that would put a price on transportation fuels and invest in mass transit, electric buses or other low-carbon solutions.
The Bamboo Carbon Cycle

- CO₂ sequestration by photosynthesis
- Carbon in harvested products
- Carbon in standing biomass

Above-Ground

- O₂ release
- CO₂ release due to decomposition of dead organic matter

Below-Ground

- Long-term CO₂ sequestration in soil
- Carbon in below-ground biomass (rhizome and root systems) which survives selective harvest
- CO₂ release due to soil respiration
# Increase Carbon Sink

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>CO2 Treatment Ha/year</th>
<th>CO2 Kilos Captured By Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Giant Bamboos</td>
<td>78.5</td>
<td>282.6</td>
</tr>
<tr>
<td>Fast Growth Trees</td>
<td>13.4</td>
<td>16.7</td>
</tr>
<tr>
<td>Slow Growth Trees</td>
<td>2.6</td>
<td>6.5</td>
</tr>
</tbody>
</table>

**NOTE:** A car throws 5 tons of carbon dioxide per year
Increase Carbon Sink

Restoration opportunity areas

Increase Carbon Sink

*Restored* 12 million hectares of forests, as well as achieve an estimated 45% share of renewable energy in the energy matrix composition by 2030.

*Moreover*, bamboo can be planted in areas where farming is not feasible, e.g., by rehabilitating degraded land including eroded slopes and re-establishing functioning and productive ecosystems by improving soil quality and restoring the water table.
Increase Carbon Sink

BAMBOO - CARBON BONUS PRODUCTION

• Carbon fixed per Ha/year: 21.41 Ton

• Carbon dioxide captured from the atmosphere per Ha/year: 78.5 Ton

• Value of the ton of carbon dioxide captured: USD 7

• Income per Ha/year: USD 549,50

BAMBOO – THE MARKET IN THE WORLD

68.8 billions dollars/ year

Asia pacific countries (60% of the market) = 41.2 billions dollar
China = 31.2 billions dollars
Bamboo benefits Sustainable Development Goals

Bamboo adds value to climate change mitigation and adaptation.

- **SDG7**: Ensure access to affordable, sustainable, and reliable modern energy services for all;

- **SDG13**: Promote actions at all levels to address climate change;

- **SDG15**: Protect and restore terrestrial ecosystems and halt all biodiversity loss, especially which calls for restoration of degraded ecosystems by 2030, which aims to increase forest cover and which calls for integration of natural resources into planning and development processes.
Brazil is the country with the **greatest bamboo diversity and the highest percentage of endemic woody bamboos in Latin America.**

- National Policy to Support Sustainable Management and Bamboo Cultivation (BRASIL, 2011):
  - Promotes sustainable management of native forests and commercial cultivation;
  - Offers incentives for family farming;
  - Aims to boost research on Brazil's native bamboo and provide its technological development.

- Bamboo can be a solution for the industries of the Brazilian economy, with enormous potential of use in the sectors of paper and cellulose, construction, furniture, lamination, coal, among others.
Area: 160.000 – 180.000 km² – forming a biome the size of all of the primary and secondary forests in Central America combined.
This area, largely composed of two bamboo species and comprises a significant portion of the Amazon Basin.
BAMBOO - Acre

• Acre has the largest bamboo forest in the world.

• The state’s principal forest types are tropical dense forests and bamboo forests with high floristic heterogeneity, which are considered to hold great economic value (Government of Acre 2013).

• Bamboo has been used in environmental conservation and as an instrument capable of reducing social inequalities, increasing in income (SEBRAE/ AC, 2018).

• Bamboo is a promising crop with many possibilities (EMBRAPA/ AC, 2018).

BAMBOO - Brazil

• National Policy to Encourage Sustained Management and Bamboo Cultivation - Law n° 12.484 (2011);

• High potential for commercial cultivation;

• High potential to develop industrialized products for domestic and international markets.

• Cleaner energy matrix and favorable location to export both through the ports of the Atlantic eastern coast and through the west coast using the ports of Peru through the interoceanic highway.
Research using bamboo extends from the use of bamboo stalk and slats to waste from primary processing. The main areas are:

- (i) structural use of bamboo stalks;
- (ii) use of bamboo slats as reinforcement of concrete and bioconcrete;
- (iii) bamboo-concrete adhesion (bioconcrete);
- (iv) bamboo’s durability against climate action and microbiological attack;
- (v) fire resistance of bamboo;
- (vi) high temperature behavior of bamboo;
- (vii) use of bamboo waste for bioconcrete production;
- (viii) development of raw earth and bamboo flooring mortars;
- (ix) thermohydric behavior, thermal durability, and fire resistance of bamboo bioconcretes.
Sustainable technology for Bamboo management in the Amazonian Region

• Development of new building materials
• Quantification of carbon storage benefit – LCA
• Socio-economic benefit of new building materials
• Pilot regenerative project
• Scaling up the business model
• Capacity Building in: Education, Innovation and Technology