

Brazil's NDC and forest restoration targets: future land-use and agriculture implications

Figure 1) No Forest Code

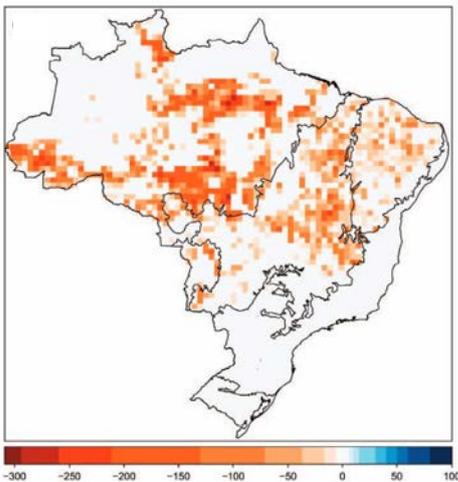
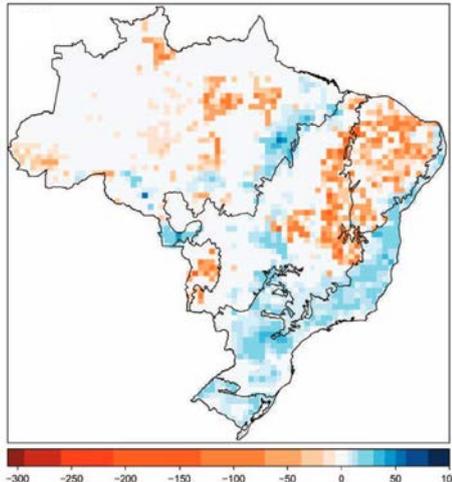


Figure 2) Forest Code 2010-2050



Figures: Spatial distribution of cumulative loss (orange) or gain (blue) of native vegetation for the scenarios 1) NoFC, and 2) FC between 2010 and 2050. Color bar values are expressed in thousands of hectares per cell. Scenario abbreviations: NoFC = no implementation of the Forest Code; FC = Forest Code fully implemented, i.e. with illegal deforestation control, forest restoration and compensation by the CRA

Source: INPE - Instituto Nacional de Pesquisas Espaciais

- › A series of adaptations and improvements in the GLOBIOM-Brazil model was developed in order to run realistic scenarios of the economic and environmental impact of land use policies in Brazil
- › Improvements include modeling of public and private policies such as Brazil's 2012 Forest Code and the Soy Moratorium (SoyM) in the Amazon, as well as the impacts of climate change on Brazil's agriculture
- › Rigorous enforcement of the Forest Code (FC) is key for Brazil to fulfill its emissions reductions and forest restoration international commitments
- › Climate change impacts the production of Brazil's major agricultural commodities, decreasing its production and shifting its geographic span

Background

In the 21st Conference of the Parties (COP21) of the United Nations Framework Convention on Climate Change (UNFCCC), Brazil pledged to cut its greenhouse gas (GHG) emissions by 37% below 2005 levels by 2025 and to reach a 43% reduction by 2030. In 2015, emissions from agriculture and land-use change and forestry (LUCF) sectors accounted for almost 70% of the country's GHG emissions.

Private properties cover approximately 572 million hectares (Mha) or 67% of Brazilian territory and contain more than 50% of Brazil's native vegetation. The most important environmental law that regulates land use and environmental management on private properties in Brazil is the Forest Code (FC), which dates from 1965 and underwent a major revision in 2012. The FC sets a minimum percentage of native vegetation to be preserved or restored on each property. The FC also includes the obligation that illegally deforested areas are to be restored at the landowners' expense, an amnesty for small farms (from 20 ha in southern Brazil to 440 ha in the Amazon) and the environmental reserve quota system (CRA), which is a tradable legal title of forest surpluses that can be purchased to offset environmental debts in the same biome.

Model development

In order to run realistic scenarios of the economic and environmental impact of land use policies in Brazil as requested by the Brazilian government, NGOs and other stakeholders, INPE undertook the development of a series of adaptations and improvements in the GLOBIOM-Brazil model. These improvements include modeling of public and private policies such as Brazil's 2012 FC and the Soy Moratorium (SoyM) in the Amazon, as well as the impacts of climate change on Brazil's agriculture. The use of

environmental reserve quotas (CRA) for the offset of environmental debts and the small farms amnesty (SFA) were also included in the model. Scenarios consider different starting dates, different geographic coverage and different levels of compliance with the before mentioned main provisions of the FC.

Emissions from the land-use change and forestry (LUCF) sector are calculated from the endogenous land-use changes projected by the model and the different biomass maps. The carbon content from forests and native vegetation is taken from Brazil's Third Emissions Inventory. Transportation costs are computed from a detailed and up-to-date representation of Brazil's transport infrastructure, considering different product types (solid, liquid or grain) and market destinations (nearest state capital or nearest seaport).

Main interim results

GLOBIOM-Brazil simulations show (see Figures) that, if rigorously enforced, the FC could prevent a net loss of 53.4 million hectares (Mha) of forest and native vegetation by 2050, 43.1 Mha (81%) of which are in the Amazon alone. The control of illegal deforestation promotes the largest environmental benefits, but the obligatory restoration of illegally deforested areas creates 12.9 Mha of new forested area.

Further reading: Soterroni, A.C., Mosnier, A., Carvalho, A.X., Câmara, G., Obersteiner, M., Andrade, P.R., Souza, R.C., Brock, R., Pirker, J., Kraxner, F. and Havlik, P., 2018. Future environmental and agricultural impacts of Brazil's Forest Code. *Environmental Research Letters*, 13(7)

More information and contacts:

Aline Soterroni – INPE /IIASA
(soterr@iiasa.ac.at)
www.restoreplus.org

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based on a decision of the German Bundestag