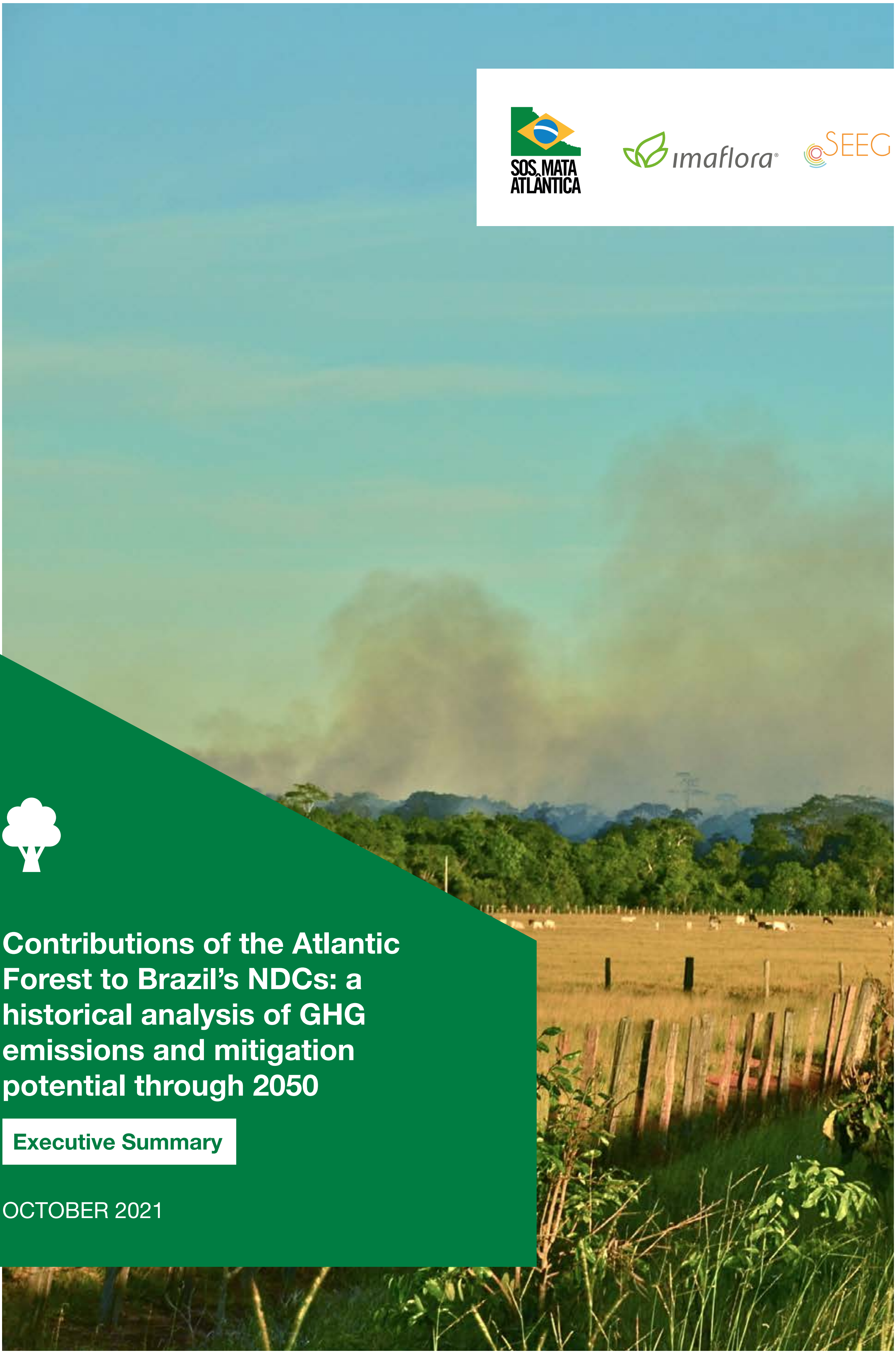

Contributions of the Atlantic Forest to Brazil's NDCs: a historical analysis of GHG emissions and mitigation potential through 2050

Executive Summary

OCTOBER 2021

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Production:

A Fundação SOS Mata Atlântica é uma ONG ambiental brasileira. Atua na promoção de políticas públicas para a conservação da Mata Atlântica por meio do monitoramento do bioma, produção de estudos, projetos demonstrativos, diálogo com setores públicos e privados, aprimoramento da legislação ambiental, comunicação e engajamento da sociedade em prol da Mata Atlântica e do clima, da restauração da floresta, das áreas protegidas e da água limpa.

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The contributions of the Atlantic Forest to Brazil's NDCs: a historical analysis of GHG emissions and mitigation potential through 2050 | Executive Summary

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Historical Analysis

• The objective of the study was to evaluate the potential for mitigating greenhouse gas (GHG) emissions from land-use activities in the Atlantic Forest biome. We used data and methods from the Greenhouse Gas Emission and Removal Estimating System (SEEG) to analyze the historical series of all the emitting sectors within the biome between 2000 and 2018 and to the mitigation potential for the land-use change and agriculturesectors from 2005 to 2050.

• Our main conclusion was that the land-use sector (agriculture + land-use change) in the Atlantic Forest may be able to reach a state of net-zero emissions starting in 2042, achieving zero deforestation by 2030, restoring 15 million hectares (ha) of forests and attaining the projected agricultural and cattleproduction goals via low-carbon practices until 2050. This scenario combines high food production with the end of deforestation, as well as robust forest restoration with the potential to generate jobs and income.

• The historical deforestation of 115 million hectares of Atlantic Forest caused the emission of 55 gigatons of CO_2e ($GtCO_2e$) over the span of 521 years. This is 20% higher than the emissions caused by deforestation in the Amazon, and 5.5 times higher than China's total emissions in 2010, year in which the country was the world's biggest emitter, with 9.87 $GtCO_2e$.

• The combined emissions of all the sectors within the Atlantic Forest biome (agriculture, land-use change, waste materials, energy and industry) reached 8.55 GtCO2e between 2000 and 2018. The biome is the second largest GHG emitter in the country and is responsible for 21% of Brazil's total emissions during this period.

• The Atlantic Forest reached 0.45 $GtCO_2e$ emissions in 2018, which would rank it as the 18th highest-emitting country in the world, above the UK, which emitted 0.44 $GtCO_2e$ during the same year.

• Hosting 70% of the Brazilian population and 80% of the country's GDP, the per capita and per unit emissions of the Atlantic Forest's GDP were three to five times lower than Brazil's average for the period 2000-2018. This reveals the biome has a smaller footprint and greater emissions efficiency when compared to the country's population and economy as a whole.

• The Atlantic Forest also ranked second most important biome due to its capacity to clean the atmosphere of greenhouse gases. Between 2000 and 2018, it was responsible for 14% of all greenhouse gas removals, fixing 1.25 $GtCO_2e$. The annual removal figures doubled between 2000 and 2018, mainly due to increased GHG removals through the regeneration of secondary vegetation. Removals usually revolve around 10% and 15% of gross annual emissions.

• The behavior of emissions arising from sectors within the Atlantic Forest is different from that of other Brazilian regions, especially the Amazon. Between 2000 and 2018, emissions in the Atlantic Forest were led by the following sectors: energy (37%), agriculture(32%) and land-use change and forestry (17%). When combined, land-use sectors (agriculture, land-use change and forestry) were found to be the main source of emissions between 2000 and 2018 (49%), but in a smaller proportion when compared to the sector in Brazil and the Amazon.

• Some subsectors stood out between 2000 and 2018 in regards to emissions, namely fuel burning (36%), followed by enteric fermentation (20%) and soil use change - especially deforestation - with 16%.

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Mitigation Potential

• Stopping deforestation and replacing fossil fuels with renewable energy could potentially reduce the biome's total emissions by 52% during the period.

• Within the agriculture sector, the Atlantic Forest is the Brazilian biome with the second largest GHG emissions (27%), considering the historical period from 2000 to 2018. It emitted 145 $MtCO_2e$ in 2018.

• Over a period of 19 years, the GHG emissions from the farming sector increased by 11.4 $MtCO_2e$ in the Atlantic Forest biome. Despite the increase of 9%, the Atlantic Forest presented one of the smallest emission growth rates when compared to other biomes, with greater production efficiency per emission, especially in livestock farming.

• Three cities in the Atlantic Forest (São Paulo, Rio de Janeiro and Serra/ES) were among the top 10 biggest GHG emitters in Brazil in 2018. While 10% of the cities concentrate 65% of the emissions in Brazil, 10% of the Atlantic Forest concentrates 56%.

• When analyzing how emissions are distributed among the subsectors and cities within the biome, we realize that the quest to achieve carbon neutrality in the Atlantic Forest must prioritize policies that aim at:

  • Reducing transportation-related use of fossil fuels in large cities;

  • Waste treatment (sewage and garbage) in urban areas, along with methane recovery and energy generation through methane combustion;

  • Fighting against deforestation, especially in the states of Minas Gerais, Bahia, Paraná, Santa Catarina and Mato Grosso do Sul, where 91% of the biome's deforestation is concentrated;

  • Forest restoration and the creation of protected areas;

  • Adoption of low-carbon agriculture, with the recovery of degraded pastures and soils, more efficient livestock farming and biological nitrogen fixation.

Legenda: Brazilian biomes.

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• If we take 2005 as our baseline and stop deforestation by 2030, the recovery/restoration of 15 million hectares of forests and the creation of 3 million hectares of protected areas by 2050 would result in a cumulative reduction of emissions in the order of 3.76 GtonCO_2e, of which 35% would be the result of reduced deforestation rates, 63% of forest regeneration and 2% of the creation of protected areas. This number is twice Russia's total emissions in 2018 (1.992), when the country ranked as the fourth largest emitter in the world.

• The recovery of 21 million hectares of pasture, the rollout of a Crop-Livestock-Forest Integration System [ILPF] across 8.4 million hectares, plus 24.9 million hectares of no-till farming, would result in a positive balance of 2.521 GtCO_2e in 2050, of which 40% would be the result of recovered pastures, 29% ILPF and 31% no-till farming. This figure is 1.5 times higher than Japan's emissions in 2018.

• The Atlantic Forest's land-use sector can potentially reduce the biome's total emissions by up to 6.28 GtCO_2e between 2005 and 2050, a number that is more than the total amount emitted by India (3.346) and Russia (1.992) in 2018, the planet's third and fourth biggest emitters, respectively, that year. Distributed as an annual average value (0.139 GtCO_2e), this would be enough to compensate one third of the emissions by France (0.361) or Vietnam (0.364) in 2018, for a period of 45 years.

• This accommodates a scenario of zero deforestation in 2030, which would be achieved by the replacement of pastures with expanded areas of no-till farming, ILPF and forest restoration. It would not result in reduced cattle production when compared to the established levels, but it could also lead to an increase in total food production, as well as to greater job creation and income generation.

• The attainment of GHG reduction and removal goals is dependent on governance measures and the adoption of best practices by decision makers from the public and private sectors. These actions would combine existing command and control policies and incentives that have never been thoroughly implemented or that need improvement, like the Forestry Code, the National System of Nature Conservation Units [SNUC], Planaveg, Safra Plan (credit). No technological barriers exist for their implantation and we have already made some advances in the last few years.

• Funding should be complemented by investments destined to ensure the environmental adequacy of rural properties, forest and agroforest businesses & production chains, and the low-carbon intensification of livestock farming and agriculture. It should attract resources from the federal and state governments, private sector, carbon market and multilateralism.

• The goals of our study can be incorporated into the next review of Brazil's NDCs, contributing to the achievement of the Paris Agreement and a state of net-zero emissions in the country by 2050.

Land-use changes resulting from emissions targets:

		AREAS—SOIL USE Millions of ha			
		2005	2025	2030	2050
SOIL USE DISTRIBUTION IN THE ATLANTIC FOREST	Pastures	36.8	27.8	26.6	21.6
	Degraded	21.8	9.7	6.6	0.00
	Optimal Condition	15.0	18.01	19.9	21.6
	Crop-Livestock-Forest Integration	0.52	5.2	5.9	8.4
	Crops (million hectares)	17.0	19.8	20.8	24.9
	Conventional Tillage System	8.8	7.9	6.2	0.0
	No-till System	8.2	11.9	14.6	24.9
	Forest Restoration	0.0	3.3	5.0	15.0
	Total	**54.3**	**54.3**	**58,3**	**69.9**

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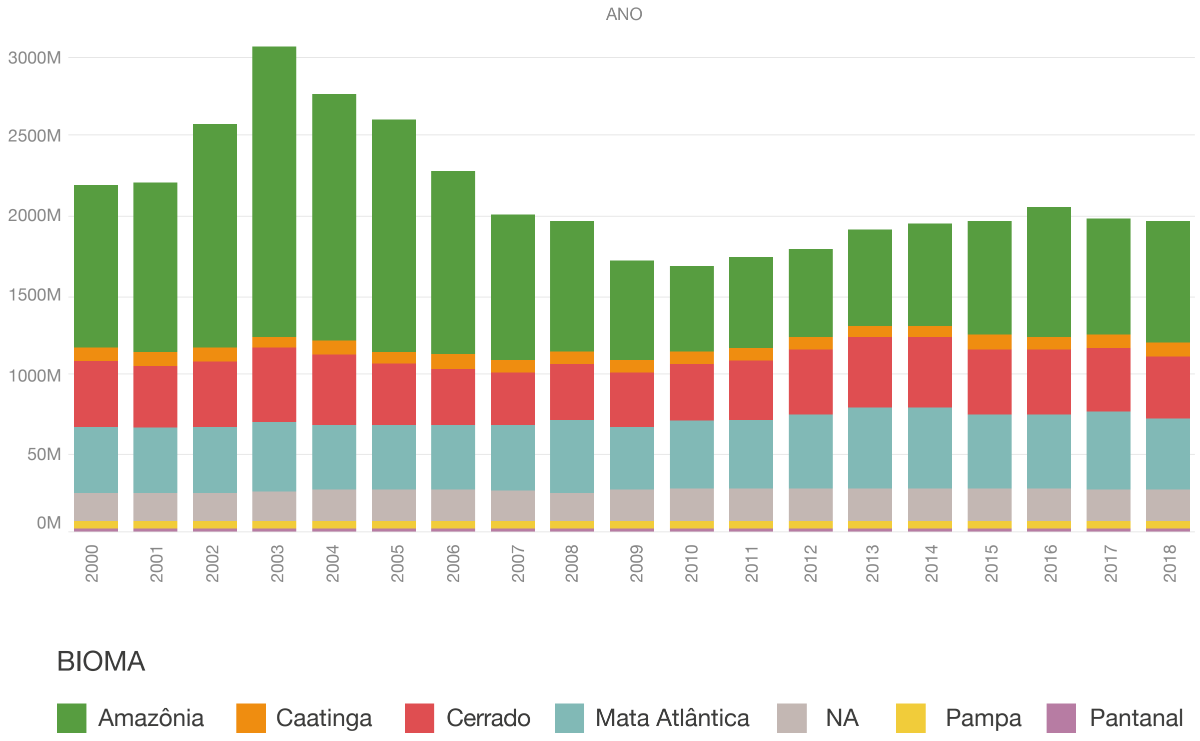
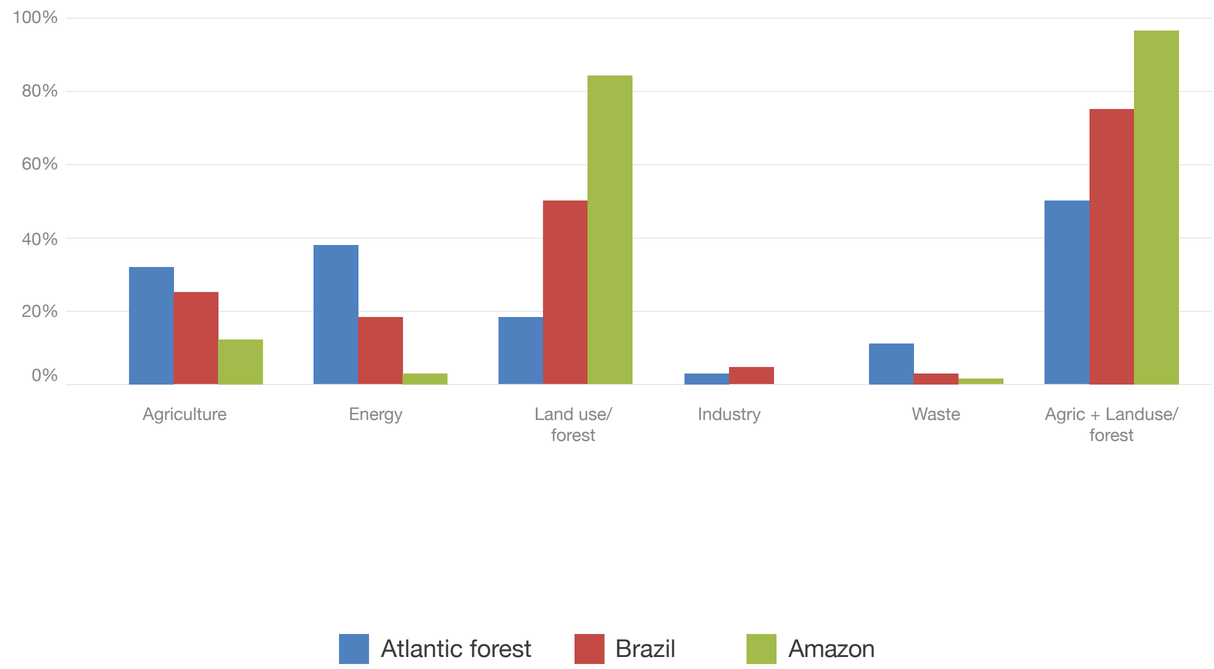
Evolution of gross greenhouse gas emissions across Brazil's biomes between 2000 and 2018 (MtCO2e):



Gross emissions by sector in the Atlantic Forest, Brazil and the Amazon, between 2000 and 2018:



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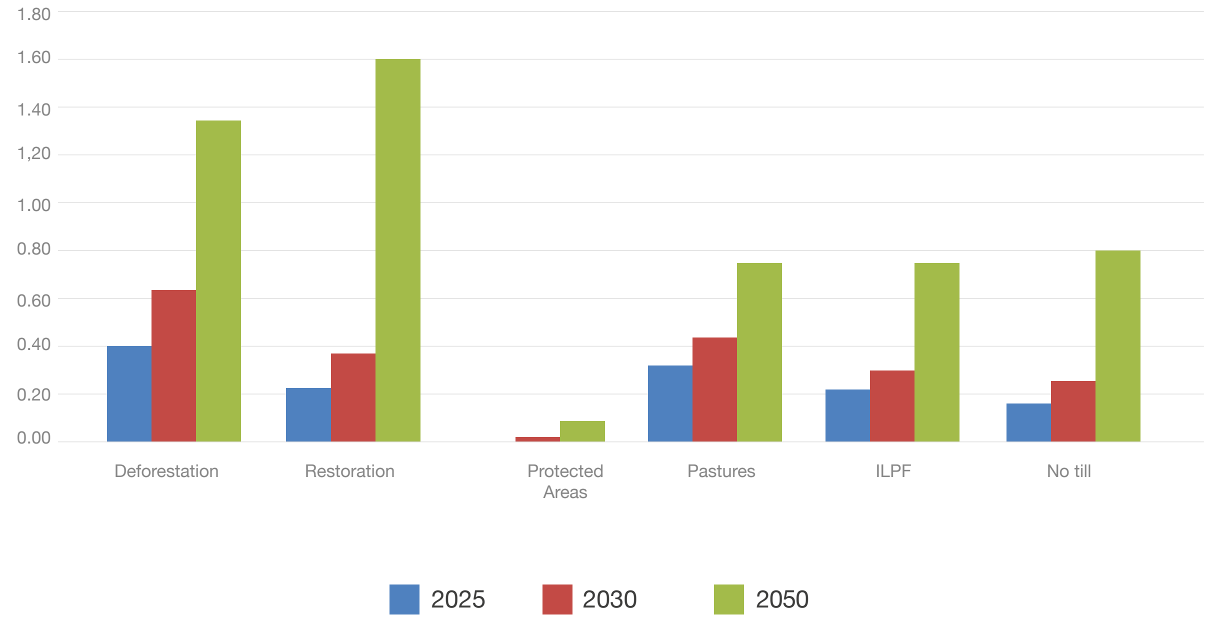
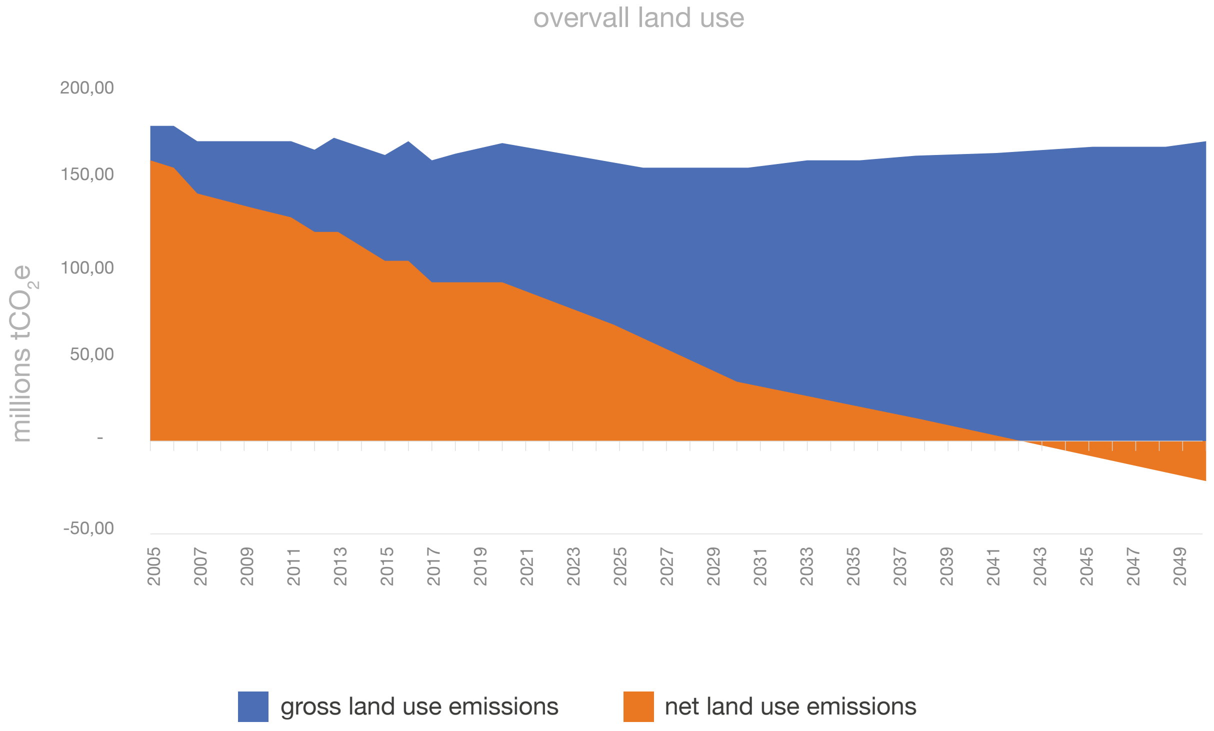
Estimated emissions reductions and greenhouse gas removals for the agricultural and land-use sectors in the Atlantic Forest, in 2025, 2030 and 2050, across different activities within the land-use change and agricultural sector:



Balance of the greenhouse gas emissions and removals from land-use activities (farming + land-use change) in the Atlantic Forest until 2050:



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