A DEEP DIVE

ANTICIPATING POLICY OUTCOMES IN BRAZIL'S AGRICULTURE, FORESTRY AND OTHER LAND USE SECTORS: BEYOND CARBON METRICS

Author: Nora Hampl

CLIMATE POLICY LAB

Key Insights

- Weak transparency and traceability of sourced productive inputs (biomass, cattle) undermine policy integrity and cohesion, including carbon accounting.
- The cost of preventing deforestation is cheaper than reforesting and restoring landscapes afterwards – avoiding destructive extraction in the nine Amazonian states should be a key priority to avoid massive future losses posing multiple risks including to agriculture outputs.
- It is imperative that incentives and subsidies fund resilience to climate change rather than agricultural and farming practices that contribute to it (monoculture without soil regenerative practices that continue to push against forest boundaries).
- Agroforestry and agroecology – premised on the conservation of biodiversity-rich forest, land, and soil – need to be integrated in the framework of local [bio]economies and improve livelihood security of local communities.
- A regulated carbon tax imposed across sectors including agriculture can effectively mediate between economic industry interests and climate and environmental security, while endorsing the 'polluter pays' principle.

Methodology

The Implementation Gap Analysis (IGA) developed by the Climate Policy Lab (CPL)[1] was applied in the first phase of IGA research to assess and rank sources of climate-related policy *implementation gaps*[2] in Brazil. This policy brief presents findings from the second phase of research; it maps the previously identified gaps ranked as most significant (*Competing goals, Stakeholder engagement/coordination*, and *Political will)*[3] to recently adopted *initiatives*[4] in the Agriculture, Forestry and Other Land Use (AFOLU) sectors. A mixed-methods approach was used, starting with a review of recently adopted policies and AFOLU emissions inventories including SEEG, MCTI, MapBiomas, INPE, and CPL policy database,[5] and followed by semi-structured in-depth expert interviews. The goal of the interviews was to validate,

disprove, or substantiate findings from the first research phase, but also to capture additional expert insights regarding the most critical policy implementation gaps impacting climate outcomes and net sinks in AFOLU sectors, particularly in the nine Amazonian states.

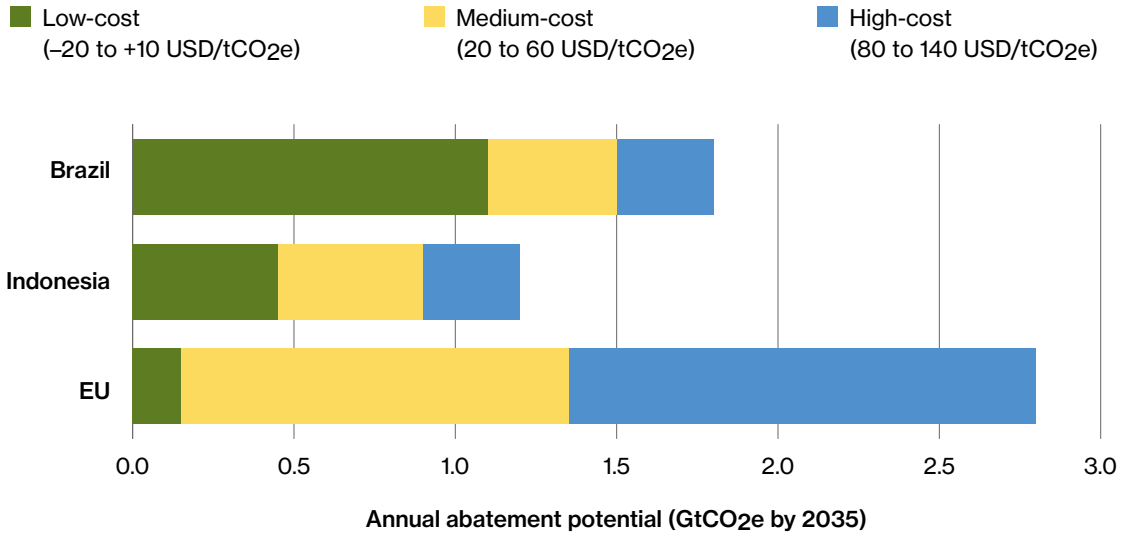
Country Context

The largest, fastest, and cheapest emissions cuts in Brazil are in the AFOLU sectors owing to the fact that 40–50% of the country's emissions are attributable to land use change (deforestation in particular). Altogether, however, the AFOLU sectors need to contribute a net sink, not merely zero emissions, which implies (a) the elimination of illegal deforestation, (b) reduction (or near-zero net) legal deforestation (not only in the Amazon, but also in Cerrado), and (c) a large-scale forest and land restoration with a view of making currently degraded lands productive and resilient to climate change. Sustainable land use management practices that underpin AFOLU policy packages are needed to deliver inputs for the rest of the economy and contribute to the supply chains of the emerging bioeconomy (PNDBio).

Because land use change dominates Brazil's emissions, forest and agricultural policies that impact land use management in the Amazon and Cerrado biomes are considered critically important for near-term mitigation. The Amazon biome and rainforest cover territories of nine Amazonian states, which contain protected areas where farming and ranching are prohibited. Regulation notwithstanding, cattle ranching has been the biggest driver of deforestation including in protected national forests (e.g., in the 1.3-million hectare Jamanxim National Park or in Serra do Cachimbo). Unresolved land titles and disputed federal lands complicate enforcement of forest and land use policies and manifest in registry irregularities and land ownership overlaps. Crucially, land irregularities facilitated fraudulent land titling favoring large and powerful land owners, leaving small-scale farmers 'stranded' (without land/land title), and thus susceptible and/or fully dependent on revenues from illicit activities for their survival.

Policy frameworks that have proved effective in slowing down the pace of deforestation, while simultaneously delivering economic benefits and the largest and fastest emission cuts, have been centered around land tenure and

Figure 1. A comparative marginal abatement cost curve in the AFOLU sectors



Data sources: seeg.eco.br, climateactiontracker.org, EU ETS prices, UNFCCC NDC documents

responsible land use management including (i) Indigenous lands protection (e.g., via land titling), which in the past exhibited significantly lower rates of deforestation; (ii) forest restoration and natural regeneration resulting in increased carbon sinks; and (iii) incentives for agro-forestry practices targeting both medium and small land holders that stipulate forest and native vegetation protection. Equally important, however, have been (iv) incentives serving as poverty-alleviation strategies for landless peasants and indigenous communities to offset lost revenues from illicit activities. Forest-carbon mechanisms and carbon pricing – when closely monitored, and if reductions in deforestation can be verified – can also help redirect activities away from deforestation. Nevertheless, regulated and voluntary carbon markets and emissions trading schemes, while meant to protect forests and channel private finance toward reducing emissions, have not always delivered the anticipated outcomes. Currently, the largest carbon-credit investigation in Brazil, "Operation Greenwashing," is underway.[6]

Table 1. Marginal cost of Brazil's 2035 NDC (land use mitigation harmonized into 2030–2035 USD/tCO_2e range)

Abatement category	Annual potential ($GtCO_2e$)	Marginal cost (USD/tCO_2e)	Policy action	Anticipated policy outcomes
Avoided deforestation (illegal)	0.5–0.7	–20 to +5	Stricter enforcement, land regularization and governance involving state actors	Intact ecosystem services (hydrological systems); avoided intentional fires; reduced land conflict; reduced participation in illicit economies
Pasture recovery/ land intensification	0.3–0.4	0 to 15	Financial and technical support for adoption of precision agriculture, rotational grazing and integrated crop/livestock/ forestry systems, replanting/ reseeding, restoring soil health	Improved food security and profitability as land productivity increases (double-cropping, multiple harvests); improved crop varieties resilient against climate change; reduced pressure to convert forests, grasslands, or other natural ecosystems into farmland
Forest restoration/ natural regrowth (regeneration)	0.2–0.4	5 to 25	Financial and technical support to prevent and control forest fires (satellite monitoring); plant native trees in degraded areas; regenerate forests along rivers and water bodies	Improved carbon sequestration; moderated local temperatures and increased resilience to droughts; improved soil quality; improved watershed health and water quality; trees integrated with crops and/or livestock can restore ecosystem functions and productivity (if done sustainably)
Low-carbon agriculture (reduced CH_4, N_2O emissions)	0.2–0.3	20 to 50	Financial and technical support for improved livestock and manure management, nutrient precision, biological nitrogen fixation, no-till agriculture, and improved irrigation and crop management	Lower GHG emissions intensity per ton of agricultural output; increased productivity and improved soil quality; enhanced resilience to drought and climate variability
Energy & industry decarbonization	0.2–0.3	80 to 140	Transport and industry electrification	Reduced pollution and improved air quality contributing to better health outcomes

Marginal cost data sources: seeg.eco.br, climateactiontracker.org

Interview Findings

Along with policies that enforce zero-deforestation, the implementation of the Forest Code and land regularization (titling) have been noted as urgent short-term measures *(Interviewees 1–4)* to address illicit land uses (logging, slash-and-burn, cattle grazing, mining and farming in protected areas). Both incentives and penalties have been deemed essential for policy effectiveness, but incentives in particular have been noted as critical to policy success (e.g., PPCerrado, PLANAVEG, PNCPD) *(Interviewee 4)*. While certain incentives would have direct impacts on the delivery of the stated policy goals (e.g., incentives for farmers to shift from unsustainable to sustainable land use practices and maintain agricultural productivity without expansion, which implies recovery of degraded pastures or low-carbon agriculture eventually resulting in lower methane and nitrous oxide emissions), strict penalties would in parallel disincentivize illegal land use practices (slash-and-burn, cattle grazing) and redirect farmers toward sustainable, climate-resilient land use management practices. These incentives would need to include targeted financial and technical support, support for market integration of sustainably produced goods, and dedicated policy monitoring over the longer term (until the practices outlive project/policy duration and become localized) *(Interviewees 1, 3, and 4)*. Most interviewees expressed the view that better monitoring and oversight would benefit land use outcomes of all policies in the AFOLU sectors *(Interviewees 1–3).*

GAP 1: COMPETING GOALS

Competing goals across sectors

(crops for food versus energy, for exports versus domestic use, quantity versus quality)

Agricultural policy goals emphasizing commodity outputs such as cattle and monocrop production need to have clearly defined and monitored land management practices *(Interviewees 2 3, and 4).* Expansion of cattle ranching and monoculture have historically clashed with efforts to halt deforestation, fires and land/forest degradation. At the local level, such practices reduced water and food security for small farmers, landless farmers and indigenous communities *(Interviewee 1).* At the national and regional level, weak forest protections pose risks for Brazil's agriculture outputs and by implication, global food security, since intact Amazon rainforest guarantees rainfall on which the agriculture sector depends *(Interviewee 4)*. Imposing a regulated carbon tax across sectors would help moderate the competition over policy goals and likely improve policy outcomes, since polluters (rather than society at large) would pay for the damage their activities cause.

Weak traceability, *transparency* and *oversight* allow sourcing of material inputs to mostly pass unchecked for deforestation links (cattle and sugarcane) (*Interviewees 2–3*). In the energy sector, policies relying on forest residue and agriculture crops (e.g., RenovaBio) need to guarantee that biomass used to produce ethanol did not come from illegally deforested areas – before certified credits (CBIOs) are issued and transferred to fuel distributors. Similarly, cattle certified as raised in areas that have not been illegally deforested need to be traced along the entire life cycle (from birth to feed to production) *(Interviewees 2 and 3),* and certification should include meat quality rather than quantity (weight of the animal) *(Interviewee 3).*

Competing goals at national, state and local level

Policy ambition at the national level needs to be legislated at the state level (*Interviewee 2*) and subsequently become reflected in state agendas, eventually trickling down to local levels *(Interviewees 1, 2, and 3).* States can draw on national, regional, and local technical and research capacity (universities, research centers) to disseminate the latest advances in sustainable and climate-resilient land management, water and food security practices, as well as help promote low-carbon infrastructure development (sanitation, waste-to-energy systems, water testing and filtration, etc.). Conversely, such institutions should ensure their capabilities translate into impactful practice and reach remote Amazonian communities who live

without access to livelihood security. In this sense, participation by licit economic actors and their support for local livelihoods could, if done right, outcompete interests of the growing illicit economy *(Interviewee 4)*.

Competing goals at temporal scales

Political decisions follow political cycles and tend to be incompatible with long[er] term policy goals *(Interviewee 1 and 2).* Long-term resilience, water and food security, and the associated productive value of soil and standing forests are more often than not traded for short-term gains. For example, PPCerrado policy requires only 20–30% of the original native vegetation be set aside as a Legal Reserve, while the majority can be cleared; this is in contrast to PPCDAm where the reverse is the case (80% of the biome has to be preserved, and 20% can be deforested) *(Interviewee 2 and 4).*

GAP 2: STAKEHOLDER ENGAGEMENT/COORDINATION

It is imperative for AFOLU policies to be inclusive and ensure broad community participation. "Without participatory process, the policy goes nowhere – 8 out of 10 policies fail" *(Interviewee 1).* Multilevel stakeholder engagement, as well as coordination, have been noted as the most important sources of policy implementation gaps in the AFOLU sectors *(Interviewees 1, 2, and 3).* For example, the lack of state-level stakeholder engagement in the implementation of the Forest Code and land regularization enabled titling irregularities and environmental crimes, all while delaying enforcement. Since no specific timelines were in place for states to advance and legislate the Forest Code implementation (including mandatory land allocations for environmental protections), states failed to prioritize the agenda *(Interviewee 2 and 3).*

Discrepancy between national policy ambition and state interests can be further exacerbated by different priorities at the local level *(Interviewee 1),* where some communities are genuinely trying to build sustainable livelihoods around small-scale agroforestry and diversified local food production rather than grow monocrops for export markets, but receive very little policy or project support *(Interviewee 1 and 4)*. National and state support for livelihood projects of these communities is critical to the future protection of the intact Amazon biome *(Interviewee 1)*.

Cross-sector stakeholder engagement and coordination will also impact the effectiveness of the recently established regulated carbon market and its mandatory emissions-trading system. Crucially, agriculture, the country's second-largest emissions sector, has been granted an exception, raising questions about the stringency of agriculture policies and posing risks for land use emissions outcomes of policies such as PPCerrado, PLANAVEG, PNDBio, and PNCPD. As is, the greatest extent of legally permitted deforestation is currently taking place in Cerrado, where the weak conservation target of 20% (or 35% for Cerrado savanna areas within the Legal Amazon), almost guarantees a continued, large-scale clearing and future soil quality degradation.

GAP 3: POLITICAL WILL

Because long-term policy focus is key to successful policy outcomes, policy design and policy decision-making should be considered a continuous process that exceeds political terms *(Interviewee 1)*. Relatedly, regulation does not work without effective governance *(Interviewee 2 and 3).* Given the fact that companies will always seek to cut their transaction costs including the cost of clean-up (negative externalities), voluntary rather than regulated markets may downgrade policy integrity and fail to deliver the anticipated outcomes (or may even contribute to higher emissions).

While some AFOLU policies focus on achieving national emissions targets, they should simultaneously account for their contributions to the water-food-energy-forest security nexus – a basic indicator of environmental security against which long[er] term policy outcomes in the AFOLU sectors can be measured. This requires political will to engage in a long-term, system-level land use planning involving different sectors, ministries, and agencies. Political will is also needed to pursue transparency and traceability requirements in the entire life cycle (i.e., tracing

cattle from birth to feed to production; tracking the clearing of native vegetation for biofuel production), making it possible to establish a carbon footprint and links to deforestation *(Interviewee 3).* Upholding these standards will contribute to policy cohesion of the emerging bioeconomy (PNDBio) and its future outcomes *(Interviewees 1 and 3).*

Importantly, national priorities and deforestation policies (PPCDAm) need to address the pervasive and growing influence of the illicit economy (i.e., extra-local criminal organizations controlling extraction and trade in illegal commodities including logging) *(Interviewee 4)*, while subcontracting local communities as cheap labor. Combatting illicit economies and illegal activities requires a consistent, multi-level, and multidimensional approach, grounded in the long-term presence of trusted actors at the local level.

Recommendations

Policy design in Brazil's AFOLU sectors needs to approach land use planning as a systemic management priority that crosses multiple ministries and agencies, while requiring legislative coordination (the same laws need to be binding across sectors such as forestry, agriculture, energy & mining, wildlife and fisheries, urban development, bioeconomy, etc.).

> Crucially, protection of nature (forest and native vegetation across biomes) must become an integral part of all agriculture practices.

Land use planning in the AFOLU sectors should consider the interactions between policy goals and trade-offs (e.g., monocrop outputs versus biodiversity protection), related to the competing policy goals and respective land management practices (in agricultural production, forestry, small, medium and large scale farming). Agriculture policies in particular need to be cross-checked for compliance with the Forest Code. The value of such trade-offs and losses, even if difficult to quantify (e.g., medicinal value of novel biological compounds present in biodiverse rainforest), should be included in all land use planning, especially in Brazil's biodiverse biomes.

A consensus-driven, policy-coherent technocratic approach centered on carefully designed incentives and consistent over the long[er] term with respect to environmental management should be adopted and transcend political cycles. Incentives to establish conservation-minded farming communities of practice should be introduced and include both medium and small-scale farmers, landless peasants, and Indigenous communities. However, climate policies need to be expanded and go beyond carbon metrics (i.e., include broader benefits to the national economy or, at local levels, contributions to livelihood security). The focus on narrow emission metrics instead of broader social and economic indicators makes it difficult to evaluate 'beyond-carbon-metrics' policy outcomes.

An integrated database (combining data on land ownership, land use and management, environmental protections, funding, subsidies, penalties, taxation, participation in carbon markets and emissions trading, etc.) should be produced, widely shared and used in decision making across sectors. Based on most recent and relevant data, incentives in different sectors can be tweaked as necessary (e.g., incentives for landowners to practice agroforestry and conserve forests that would outcompete revenues from cattle production).

The regulated carbon market, which would include the agriculture sector, can be used to integrate circular bioeconomy supply chains (from local-state-regional-national) underpinned by a national public procurement strategy for sustainable development. Demand side levers, along with supply-side measures, can be introduced to shape local/state/national markets.

Endnotes

1. The IGA framework includes four broad categories of policy implementations, *(1) Governance and Institutional Capacity, (2) Political Economy and Interests, (3) Financial Constraints,* and *(4) Technical and Legal Constraints,* which are broken into additional subcategories. In the case of Brazil, the subcategories *Competing Goals, Stakeholder Engagement/Coordination, and Political Will* were identified as having the greatest impact on climate-related policy outcomes including net sinks.

2. CPL's definition of *implementation gap* is the discrepancy between intended and actual outcomes after policy adoption.

3. Nora Hampl, L. Yonaha, T. Stec, and N. Unterstell, *Bridging Reality with Brazil's Climate Aspirations,* Policy Brief (Climate Policy Lab, The Fletcher School at Tufts University, November 2025), https://bpb-us-e1.wpmucdn.com/sites.tufts.edu/dist/d/8478/files/2025/11/CPL_IGA_PolicyBrief-Brazil.pdf

4. *Initiatives* in this policy brief refer to current policies in the **forestry sector:** *Plan for Prevention and Control of Deforestation in the Legal Amazon* (PPCDAm) and *Cerrado* (PPCerrado), *National Native Vegetation Recovery Plan* (PLANAVEG), and *The National Bioeconomy Development Plan* (PNDBio); and to the following policies in the **agriculture sector:** *The new ABC+ Plan, National Program for the Conversion of Degraded Pastures into Production Systems (PNCPD), National Payment Policy for Environmental Services (PNPSA),* and *National Program for the Strengthening of Family Agriculture (PRONAF).*

5. Climate Policy Lab, *National Climate Policy Inventories* (2026), https://www.climatepolicylab.org/national-climate-policy-inventories.

6. Currently under investigation, "Operation Greenwashing" allegedly involves a criminal network spanning 22 companies, land registries and public agencies that falsified land titles and seized about half million hectares of Amazon land, then sold fraudulent credits worth 33 million USD to multinationals.

FOR ACADEMIC CITATION:

Hampl, N. (2026, August). *Anticipating Policy Outcomes in Brazil's Agriculture, Forestry and Land Use Sectors: Beyond Carbon Metrics* (Policy Brief). Climate Policy Lab, The Fletcher School at Tufts University.

ABOUT THE AUTHOR:

Nora Hampl is a research affiliate and former Postdoctoral Scholar at the Climate Policy Lab at The Fletcher School, Tufts University.

ACKNOWLEDGEMENTS:

This policy brief was developed in collaboration with the Talanoa Institute. Additionally, Climate Policy Lab extends sincere thanks to all interviewees for generously sharing their time, insights, and expertise.

FUNDING FOR THIS RESEARCH:

Research for this policy brief was supported by Climate Policy Lab's core funders, including the Rockefeller Brothers Fund and the William and Flora Hewlett Foundation.

Any errors or misrepresentations are the sole responsibility of the authors.