Facilitating, Enabling, and Triggering Sectoral Transitions: Brazil

Case Study 10. Reducing Deforestation in Brazil

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Context

Brazil is an upper-middle-income country that aspires to high-income status and joining the Organisation for Economic Co-operation and Development. In 2021, approximately 87 percent of its 214 million population lived in urban areas (World Bank 2018b). It is also home to one of the world's most unique and precious ecosystems, the Amazon biome, a significant global carbon sink that influences regional precipitation patterns. The country's current export basket is heavily dominated by agricultural commodities such as soya beans (10 percent) and nonrenewable resources such as iron ore (10 percent) and petroleum oils (9 percent).[8] This presents challenges, both in terms of the rate of growth and implications for the sustainable management of the country's natural capital and inclusive development in rural landscapes.

As Brazil aims to achieve growth and development, it has the opportunity to do so in a climate-smart manner. Its gross emissions are dominated by agriculture and land use change, especially from deforestation, with a relatively low carbon intensity in the rest of the economy. One of the key issues that it needs to tackle, however, is curbing deforestation. A low-carbon development path supports the country's need to reduce its exposure to climate change risks. Measures to curb deforestation and maintain native vegetation would reduce the agriculture, energy, and other sectors' exposure to the impacts of drought, soil erosion, and heat waves, given the ecosystem services provided by the Amazon and Cerrado biomes.

Tackling deforestation in Brazil requires addressing the key drivers of deforestation, including extensive cattle ranching, land grabbing, and illegal logging. Converting land for crop production is a key driver in the Cerrado. Estimates show that about 70 percent of deforested land in the Amazon is used for cattle ranching, the result of weak law enforcement, poor land governance, and macroeconomic drivers, such as commodity prices and demand, and real exchange rates. Although environmental policies are the responsibility of state and federal governments, municipalities must also be involved in addressing the key drivers of deforestation through their local policies and can influence the extent of land grabbing or illegal logging.

Brazil has successfully curbed deforestation in the past. From 2004 to 2012, during the commodity boom, the country's environmental policies succeeded in curbing

deforestation rates by 84 percent (Fearnside 2017). Many researchers credit the Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm) and enforcement of the Forest Code for the reduction in deforestation.

Policy

Launched in 2004 and overseen by the Environment Ministry, the PPCDAm promoted drastic conservation reform in Brazil. The objective of this plan was to mitigate the trend of increasing deforestation in the Legal Amazon in a coherent, integrated, and effective manner. The PPCDAm had distinct phases, emphasizing aspects of its three axes: land planning, monitoring and control, and promotion of sustainable land use activities (West and Fearnside 2021). A key land use planning action taken in its third phase of (2012–15) was revising the Forest Code in 2012.

Robust monitoring and control are necessary to reverse the weak law enforcement and poor land governance underlying the drivers of deforestation. While the Project to Calculate Deforestation in the Amazon (PRODES) has enabled the use of satellite data to monitor deforestation in the Brazilian Amazon since 1988, the DETER satellite system, launched as part of the PPCDAm, changed the way monitoring was done. Developed by the National Institute for Space Research, DETER is a satellite-based system that captures and processes georeferenced imagery on forest cover in 15-day intervals and uses them to identify deforestation hot spots and areas in need of immediate attention. It then alerts the Brazilian Institute for the Environment and Renewable Natural Resources, which operates as the national environmental police and law enforcement authority, and state environmental agencies on deforestation, allowing for targeted on-the-ground forest law enforcement, inspection, and collection of environmental fines. PRODES provided annual deforestation rates to the public and decision-makers and informed measures such as the Municipality Priority List, which was considered an effective mechanism for tackling deforestation. Established in 2007, the Municipal Priority List singles out municipalities with intense deforestation activity for differential action, including rigorous environmental monitoring and law enforcement, stricter licensing and georeferencing requirements for rural establishments, changes in the approval of subsidized credit contracts, and a refusal by meatpacking plants to buy cattle from embargoed farms.

The 2012 Forest Code, which governs the use and protection of private lands in Brazil, has two types of legally binding protection instruments for conservation on private lands. Permanent preservation areas (PPAs) are areas of vegetation that are critical to the preservation of key ecosystem functions, and legal forest reserves (LFRs) are a percentage of land area that has to be maintained with native vegetation to conserve biodiversity, where clear-cutting is prohibited and sustainable forest management is allowed. The Forest Code also created a new national database, the Rural Environmental Registry (CAR in Portuguese), an online public registry where every landowner must

register their rural property, including georeferenced data on all PPAs and LFRs. Registering their property on the CAR also gives landowners access to their rights under the Forest Code, including rural credit from financial institutions (Chiavari and Leme Lopes 2015).

Results and Impacts

Econometric research conducted on the impact of DETER on deforestation reveals positive results. Between 2001–03 and 2015, forest loss decreased by 90 percent in indigenous lands, 64 percent in protected areas, 70 percent in rural settlements, and 78 percent in federal lands. Reduced deforestation also preserved ecosystem services. Studies find that an increase in the number of fines applied in a given year significantly reduced forest clearings the following year, while crop price indices also impact deforestation. When controlling for price effects, municipality-specific fixed characteristics, and time trends, the results show that Brazilian environmental policies had a sizeable direct impact on deforestation levels and helped curb forest clearings (Mullan et al. 2022).

Counterfactual data also reveal that significant areas of deforestation were avoided due to the presence of the combination of policies (Assunçãoa, Gandoura, and Rochad 2019). For example, the Municipality Priority List policy, while effective, was not enough to curb deforestation on its own. Rather, it depended on the presence of other policies. Its effectiveness was enhanced when combined with efforts to designate clear land titling (including protected areas); voluntary supply chain commitments; sectoral agreements involving federal and state governments, companies, banks, and civil society organizations, such as the Soy Moratorium; and the Plan for Accelerated Growth. But without these other policies, the Municipality Priority List did not significantly reduce deforestation. Spatial monitoring systems such as DETER and PRODES were crucial, as they strengthened the implementation of these different policies and contributed to reducing deforestation.

The effectiveness of the PPCDAm declined over time as its implementation budget was significantly reduced. Costing environmental policies is a challenge because of the diverse entities involved and the coding of the budget. A preliminary estimate reveals that the key agencies involved in implementing the PPCDAm and other environmental policies received, at the height of support (2012), an annual amount of approximately $0.64 billion; in 2021, they received $0.38 billion. Compounding the financial challenges are technological limitations associated with implementing DETER, which cannot detect deforestation when there is significant cloud cover. Recent analysis found that deforestation was higher during periods of heavy cloud cover than other times (Sales, Strobl, and Elliott 2022).

The political economy of deforestation undermines the effectiveness of using spatial data-based monitoring and control efforts, such as DETER. Farmers form a

strong and powerful special interest group in the Brazilian Amazon that strongly opposes government measures that constrain access to "free" land or increase the cost of agriculture. Analyses have shown the linkage between the presence of municipal-level farmer mayors and deforestation (Braganca and Dahis 2021). One study finds that, between 2019 and 2021, political interference, such as budget cuts, employment freezes, and obstructing decision-making, has weakened monitoring and enforcement and created a big discrepancy between the numbers of deforestation alerts and fines collected (figure 3.12; Werneck, Angelo, and Araújo 2022). At the same time, the number of embargoes and confiscated illegal equipment—two key measures for controlling deforestation—also decreased by 70 percent and 81 percent, respectively. Associated with the weakening of monitoring efforts, mayors who support deforestation are enabling illegal land grabbing and logging. Just 53 of Brazil's 5,570 municipalities were responsible for 66 percent of deforestation in the Amazon between 2012 and 2021.

Complementing monitoring and control with mapping untitled public lands and modernizing the land registration system will also help reduce land grabbing. Mapping untitled public lands would give the government spatial data to facilitate the designation of public lands as protected areas, including sustainable use lands and indigenous territories; form the basis for regularizing private land claims; and help determine which public lands could be designated for private use. Modernizing Brazil's land registration, analysis, and validation practices would be an important complementary action (Stassart et al. 2021). Support to accelerate validation of the CAR would help

FIGURE 3.12 **Deforestation in the Amazon and IBAMA Infraction Notices for Deforestation, 2003–21**
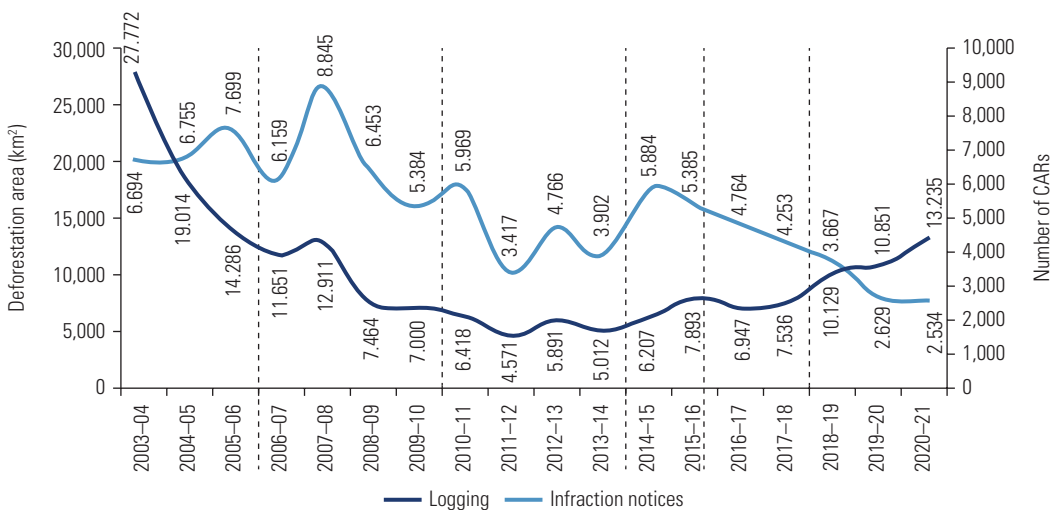
Source: Based on data from INPE 2021.

Note: IBAMA (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis, or Brazilian Institute of the Environment and Renewable Natural Resources) is the national environmental agency. CARs = Rural Environmental Registries (Portuguese); km² = square kilometer.

reinforce this effort, enabling the use of incentives and instruments in the new Forest Code, including the trading forest certificates.

Key Takeaways

While addressing the multiple factors that underlie deforestation in the Legal Amazon is complex and requires a multisectoral approach, there is significant value in having a robust spatial monitoring and control system. Effective implementation of an instrument such as DETER can ensure the effective implementation of the PPCDAm's land use planning, monitoring and control, and sustainable land use axes. Real-time satellite monitoring is an effective tool for implementing policies that can curb deforestation, especially when twinned with enforcing penalties for violating the law. It is therefore important to shield appropriations associated with generating satellite monitoring data, dispatch these data to inspection and law enforcement agencies, and enforce the law without political interference. As the cost of producing and processing high-resolution satellite imagery decreases, linking tools like DETER and PRODES with policy measures such as the PPCDAm and the Municipality Priority List would be more widely replicable.

It would be equally valuable to have a powerful tool to accelerate the process for validating the CAR and removing illegal registrations in the environmental registry system. A way forward would be to have an integrated CAR database and system that is accessible to both the federal and state governments and is based on unique and comprehensive data on, among other things, land tenure, land use changes, and public forests (Moutinho and Azevedo-Ramos 2023). This, along with DETER, will reinforce the implementation of existing policies and regulations, such as the requirement for environmental compliance systems such as CAR to qualify for public loans.