

The effectiveness of corporate zero-deforestation commitments at reducing agricultural deforestation in Brazil

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Overview of Project

The overall objective of the project was to determine **whether and under what conditions have zero-deforestation commitments (ZDCs) reduced the environmental impacts of agricultural production in the Brazilian cattle and soy sectors**. ZDCs are policies made by food companies, like [Nestlé](#), [Unilever](#), and [Cargill](#), to purchase goods only from deforestation-free producers, blocking all others from their supply chains. These policies are a novel, increasingly widespread solution to prevent agriculture-driven deforestation, the leading driver of forest loss worldwide, whilst maintaining food production. In Brazil alone, soy and cattle production supports the livelihoods of millions, yet drives over 80% of deforestation¹. However, evidence for ZDCs' efficacy remains unclear, particularly due to three key knowledge gaps surrounding ZDCs: i) the varied implementation/adoption of ZDCs over time and space, ii) the presence of loopholes allowing some individuals to avoid ZDC rules, and iii) the unclear impact of political context in implementing regions. Each of these issues is addressed by our project.

Key Achievements

- Zero-deforestation policy adoption mapped at both municipal and property scale for the first time in Brazilian cattle sector
- Identification that ZDCs reduced deforestation by $7,000 \pm 4,000$ km² ($15 \pm 8\%$) in Brazilian states of Pará, Rondônia, and Mato Grosso
- 74% of deforestation identified occurred in non-ZDC supply chains and 21% occurred on the properties of indirect suppliers of ZDC firms, two major loopholes for avoiding ZDCs
- Outside the Amazon biome, we identified a political narrative that is resistant to ZDC adoption and advanced a novel theoretical concept, the “sacrifice frontier” to explain this phenomenon

Approach used

As ZDCs are policies implemented by companies, transparency regarding who is treated by a given ZDC is often very low, creating major challenges for policy assessment. To overcome this challenge for the Amazonian cattle sector, it was necessary to adopt a novel interdisciplinary approach. To overcome the low transparency regarding who is treated by a ZDC, I developed a multi-stage fuzzy matching approach to cross reference public datasets of cattle movements, property boundaries, and cattle slaughterhouses. This enabled the creation of two novel datasets: the first identifying ZDC treatment over space and time as a function of the collective market share of firms that had adopted ZDCs (figure 1a), and the second identifying annually the properties selling to ZDC companies directly and indirectly (figure 1b), as well as the deforestation associated with each of these processes.

To determine the effectiveness of ZDCs, I examined how variation in ZDC treatment altered deforestation levels in fixed-effects panel regression models, alongside key covariates. This was then further built upon to estimate the effect of increased ZDC treatment in the Amazon, finding that had all firms adopted a ZDC, deforestation could have dropped by 50%. This work has been published in *Global Environmental Change*². To determine how loopholes in ZDC implementation

reduce the potential effectiveness of ZDCs, I used the property level dataset to examine deforestation amongst cattle producers supplying non-ZDC firms and amongst producers who selling to ZDC firms via intermediaries, two of the key loopholes to ZDCs. By analysing *total deforestation* observed and the *increased deforestation* relative to baseline groups, I was able to determine for the first time, both the business-as-usual deforestation and additional deforestation (i.e., leakage) associated with each loophole. Finally, to understand the role that political narratives play in the adoption and implementation of ZDCs, I used a combination of theoretical induction supported by semi-structured interview data to develop and test a novel theoretical model, the *sacrifice zone*, to explain where ZDCs are likely to be met with high political resistance.

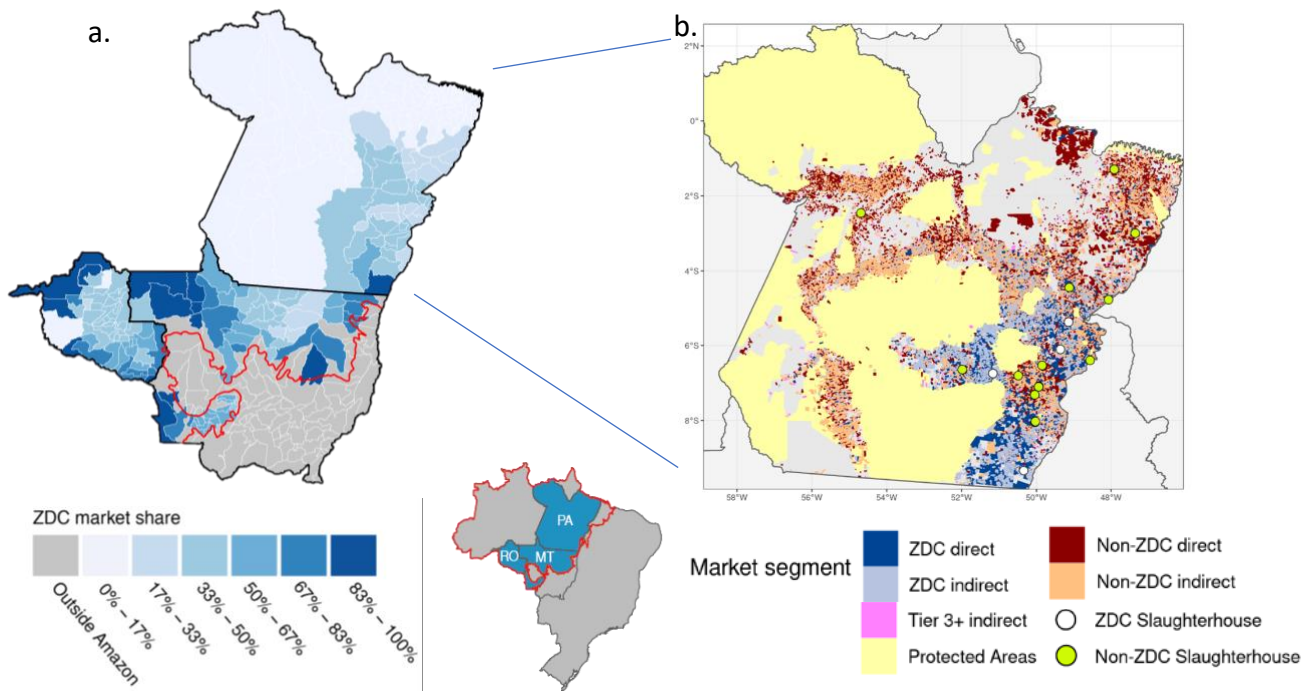


Figure 1: a. Municipal-level ZDC treatment as measured by the collective market share of ZDC firms in the Brazilian states of Pará (PA), Rondônia (RO), and Mato Grosso (MT), collectively responsible for 80% of Amazonian deforestation and 80% of the Amazonian cattle herd. b. ZDC and non-ZDC supplying cattle producers, divided by whether they sell directly or indirectly (i.e. via intermediaries) to a slaughterhouse.

Social and ecological issues addressed by project

The production of agricultural commodities is a major contributor to economic development and rural livelihoods in tropical regions, such as Brazil, where livestock is an increasingly central smallholder livelihood strategy. Yet these products drive nearly a third of global deforestation, 30% of global greenhouse gas emissions, widespread biodiversity losses, and have been linked to numerous cases of social conflict and land grabbing³⁻⁵. The scale of tropical deforestation, in combination with climate change, has been hypothesized to create the risk of abrupt, widespread tropical forest dieback, particularly in the Amazon. Such regime shifts could lead to huge reductions in agricultural production, threatening food security across the tropics⁶. This project examines a critical policy to current attempts to decouple deforestation from agricultural production thereby safeguarding both environmental and human wellbeing. By identifying the scale of loopholes present, clear strategies to improve ZDC policy effectiveness are clarified, and the potential environmental and social benefits and trade-offs are quantified.

For more information, the full project is available at tinyurl.com/yckweadk or visit zerodeforestationimpacts.com for the project website

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