

Reducing tropical deforestation through local collective action in the Brazilian Amazon

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Research Proposal (work-in-progress)

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Note: The outline of my research proposal present here is a work-in-progress aimed at requesting research support from external funding agencies. Any comments, critiques, and suggestions to improve the narrative, rationale, and methodology of my proposal are very much appreciated and welcome.

Abstract

Policies inducing positive outcomes in one place may fail drastically when local settings differ, particularly when collaboration among diverse and competing social groups is required to overcome collective problems. Anti-deforestation policies for the Brazilian Amazon are traditionally implemented at the level of the biome, disregarding context-specific realities and the role of local actors and institutions mediating land-use decisions. My dissertation project approaches the deforestation blacklist, an innovative instrument centering monitoring and sanctioning initiatives at the county level. Previous studies confirm the positive effect of this instrument, highlighting the role of bottom-up, collective arrangements among local stakeholders towards controlling deforestation rates to remove their counties from the blacklist. Despite that, only 11 out of 52 counties were removed from the blacklist to date. I will draw on case studies in a sample of counties to examine how the interplay among diverse social groups has driven either the success or failure of blacklisted counties to reduce deforestation rates and exit the blacklist.

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Statement of the problem

The Brazilian Amazon has experienced rapid and intense social and environmental changes since the 1960s. At the regional scale, government development projects and market incentives have prompted population growth, infrastructure development, agricultural expansion, and urbanization. Besides resulting in marked land use and land cover changes, these macro-scale processes have also promoted the rise of diverse social groups struggling for identity, land, and resources' access in the region (Lima and Pozzobon 2005). Local actors and institutional arrangements embedded in particular biophysical, socioeconomic, and political settings have mediated varied responses to regional and global forces upon the region, and the interplay of processes across different spatial and temporal scales has shaped the Amazon as a complex mosaic of juxtaposed social and environmental realities (Brondizio 2006; Becker 2005).

As the largest continuous tropical forested landscape, the Amazon biome provides economic goods and non-market ecosystem services which support livelihoods from local to global scales. Holding 60% of the biome in its territory, Brazil has significant responsibility for its conservation and development. However, degradation and loss of forestlands have been salient outcomes from the accelerated changes in the region. Brazil had the highest rate of tropical forest loss in the 1990-2015 period (Keenan et al. 2015), and alternative land uses replaced some 780,000 sq.km of forests in the Amazon to date (Almeida et al. 2016). This scenario has challenged stakeholders negotiating strategies whereby Brazil can achieve its voluntary commitments to zero deforestation by 2030 (Brasil 2016).

Environmental policies regulating land use and cover change in the Amazon have frequently been designed by the federal government and implemented at the level of the biome. This top-down ecological approach is insensitive to intraregional variability, disregarding the role and diversity of local actors mediating land-use decisions impacting forestlands (Gibson, McKean, and Ostrom 2000). Since rates and patterns of deforestation relate to particular social groups (e.g., large landholders, small farmers, traditional and indigenous communities, private firms) competing for land and resources (Godar et al. 2014), comprehending context-specific interactions among these actors becomes crucial to inform analysts and policy-makers. Depending on the size and diversity of social groups settled in a given area, the interplay of local actors within- and across different groups will likely result in different responses to regional anti-deforestation policies (Ostrom 2005).

My dissertation project will approach that puzzle by framing the deforestation blacklist, an instrument which centers monitoring and sanctioning initiatives on 52 counties considered deforestation hotspots in the Amazon. Because removal criteria were set at the county level, the blacklist requires collective action among local stakeholders towards controlling deforestation rates. I will draw on cross-sectional analysis

and case studies to examine how intraregional variability and the interplay among local social groups have driven either the success or failure of blacklisted counties to reduce deforestation and exit the blacklist.

Project rationale and literature review

The *List of Priority Counties* (hereafter, “deforestation blacklist”) is an environmental policy designed by the Brazilian Ministry of the Environment (MMA) and disclosed in the period between 2008-2013 listing 52 counties considered deforestation hotspots in the Amazon. This policy instrument is part of a broader environmental program launched in 2004 by the Brazilian government (Brasil 2004) and represents an innovative strategy to curb deforestation in the Amazon. First, it shifted the focus of surveillance activities from the entire biome to concentrate it in a few counties. Second, the deforestation blacklist set its compliance criteria at the county level, which has promoted vertical decentralization among government levels, and fostered horizontal co-responsibility at the local level, requiring collective rather than individual action among stakeholders (Mello and Artaxo 2017). Finally, it mandated farmers to register georeferenced data about their landholdings in a public cadaster, therefore resulting in a database linking agents to land cover changes.

By 2013, only 11 counties had been removed from the blacklist after accomplishing its removal criteria. These criteria are (i) the control of annual deforestation rates below 40 sq.km and (ii) the register of georeferenced information about at least 80% of the eligible area (i.e., private landholdings) in a public cadaster (CAR, Portuguese acronym). In spite of the novelties implemented by this environmental policy, the deforestation blacklist still illustrates the usual approach of federal anti-deforestation policies designed for the Amazon: a set of standard targets applied to a heterogeneous region.

Impacts arising from the deforestation blacklist

The monitoring efforts centered upon only a few counties allowed the government to raid stronger operations in blacklisted counties. This resulted in the sanction of actors and embargo of facilities and properties engaged in illegal activities, impacting a substantial number of individuals associated with illegal logging (Assunção and Rocha 2014; Arima et al. 2014). The strategy of “naming and shaming” also harmed the reputation of counties, hindering the trade of agricultural products in regional markets. Parallel initiatives such as the moratoria in the soybean and beef supply chains worsened the scenario since retailers stopped trading with farmers from blacklisted counties (Massoca, Delaroche, and Lui 2017; Sills et al. 2015). Additionally, the concession of agricultural credit to farmers became conditioned upon the registry of private landholdings in the public cadastral system (Banco Central do Brasil 2008), further complicating

local agrarian activities. In synthesis, the literature has evidenced that these cumulative problems impacted local economies, increased unemployment rates, and in some counties have resulted in violent outcries (Zwick and Calderon 2016; Viana et al. 2012; Abranches 2016; Marconato and Queiroz 2012).

Outcomes arising from the deforestation blacklist

At the regional scale, econometric models have confirmed the role played by this environmental policy in curbing deforestation among blacklisted counties (Assunção and Rocha 2014; Arima et al. 2014; Cisneros, Zhou, and Börner 2015; Sills et al. 2015). However, the channels by which this result was achieved remain unclear. Assunção and Rocha (2014) confirmed that the policy increased monitoring and law enforcement mechanisms, but did not affect economic variables such as the price of commodities, local agricultural production, and agricultural credit loans. Cisneros, Zhou, and Börner (2015), on the other hand, found that all these mechanisms had only a marginal role in explaining why blacklisted counties experienced higher reductions in deforestation rates than non-blacklisted counties. The authors suggest that potential channels explaining the success of this policy are context-specific, mainly related to the ability of local stakeholders to organize themselves towards complying with the blacklist removal criteria.

Indeed, because the removal criteria are set at the county level, actions taken individually by farmers and other stakeholders are not enough to overcome the collective problem faced by the county. The persistence of uncoordinated action among local actors replacing forests by alternative land-uses makes everyone worse off. The solution requires landholders to both reduce and coordinate forest clearings, besides agreeing in providing sensitive information about their properties – a polemic issue in places where land tenure is usually unclear and compliance with environmental laws is the exception. Moreover, decision-makers and governmental agencies must collaborate to support monitoring activities and provide the technology and information for the registry of landholdings – a task eventually requiring the expertise and support from third-party actors. Finally, all such activities demand financial resources. Therefore, the deforestation blacklist demands the emergence of bottom-up, collective institutional arrangements among various stakeholders at stake in each county as a requisite to exit the blacklist (Nepstad 2017).

Complementary to aggregate analyses conducted at the regional level, case studies have revealed the effects the deforestation blacklist had at the scale of one specific county, i.e., Paragominas, northeastern Amazon (Figure 1). Previously known by its violent historical linked to land conflicts and illegal logging and deforestation, Paragominas became the first county removed from the blacklist in 2010 (Brooks 2011; Zwick and Calderon 2016). Viana et al. (2012, 2016) examined the factors triggering the emergence of a “novel multi-partner governance arrangement” in Paragominas. Led by the mayor and supported by the

local rural elite (i.e., the rural producers' union), Paragominas designed the Green Municipality Project along with two NGOs to accomplish its tasks and exit the blacklist. This local pact assigned roles to each participant and defined the rules of the game towards the collective tasks required to remove Paragominas from the blacklist. The authors highlight key factors for the local pact to succeed. First, effective leadership of, and articulation between the mayor and the rural elite, which supported their legitimacy to convey among farmers the (unpopular) strategy to registry their landholdings in a public cadaster. Second, technical support and expertise from the environmental NGOs to monitor deforestation and register properties. Third, financial aid from a private investor. And finally, institutional support from the federal and state governments.

The authors also recall the transitioning momentum initiated in Paragominas early in the 1990s towards the diversification of local economy. This included the articulation among local leadership concerned about the collapse of local activities (i.e., logging and cattle ranching) caused by predatory practices which were gradually depleting timber stocks and degrading pasturelands. This picture gave rise to a local political coalition which has been struggling to recover the image, credibility, and political-economic role of Paragominas in the region since then (Marconato and Queiroz 2012). Contrary to the first migrants who colonized the region in the 1960s, farmers and other local actors involved in the Green Municipality Project have currently set deep roots in Paragominas, playing a pivotal role in this process. As Nepstad (2017) pointed out, this overall context triggered the emergence of another important factor underlying the process which unfolded in Paragominas: local pride.

Shortcomings in current analyses

Although previous studies have demonstrated the success of this policy in reducing forest loss, I argue that current analyses regarding the deforestation blacklist deserve further examination to explore two main points. First, the effect of intraregional variability across blacklisted counties on the outcomes of the deforestation blacklist. And second, the effect of diverse social groups and institutions at the local level on the emergence of collective actions towards removing counties from the blacklist.

- *Intraregional variability*

Affirming that “blacklisted districts have experienced distinctly larger reductions in deforestation than comparable non-listed districts” (Cisneros, Zhou, and Börner 2015, 2) reveals little about responses arising from different realities. As (Ostrom 2005) advised, rules producing incentives leading to productive outcomes in one setting may fail drastically when socioecological systems differ.

The Brazilian Amazon was considered a homogeneous, isolated, and demographically empty area until the 1960s, when government incentives and programs triggered significant structural changes in the region. Infrastructure projects (i.e., roadways and telecommunication) have allowed local circulation, regional connection, and global articulation across the Amazon. Financial incentives boosted agricultural and industrial endeavors as opposed to traditional extractive activities. And colonization projects and infrastructure expansion reconfigured patterns of territorial occupation. These changes attracted waves of migrants, gave rise to large urban centers, and resulted in varied patterns of socioeconomic, political, and territory organization (Becker 2005).

These historical conditions have given rise to 700+ counties differing sharply from one another regarding land tenure, diversity of social groups, political organization, economic basis, and market connectivity. Among the 19 counties listed in Pará, the State comprising most blacklisted counties, the area of counties ranges between 4,500 to 160,000 sq.km; the number of rural properties varies from about 500 to 7,000+, population size from 8,000 to 230,000, and the per capita GDP varies 4-fold. These figures exemplify the heterogeneity of biophysical, economic, and demographic attributes of counties impacted by this policy, suggesting the challenges faced by each of them to achieve the homogeneous targets required to exit the blacklist may be very different.

In Paragominas, the process of land concentration which characterizes former agricultural frontiers required a relatively small number of large farms (i.e., 500±) registered on CAR to meet the blacklist removal criteria. Created in the 1960s along the roadway connecting Belém to Brasília, respectively the state's and country's capitals, Paragominas is currently a consolidated area enjoying political force, economic stability, robust institutions and strong social organization. In this regard, the reality of Paragominas contrasts with that of agricultural frontiers characterizing blacklisted counties in remote areas which are still experiencing the boom and bust cycles associated with migration of colonists, predatory logging, cattle ranching expansion, unsustainable agricultural activities, and conflicts among social groups for land and resources.

- *Diversity of actors and institutions*

The second shortcoming relates to the lack of additional case studies examining the reaction of stakeholders in different counties, which hinders analysts to learn from the response this policy triggered in context-specific realities. This is important because as Gibson, McKean, and Ostrom (2000, 3) advise, the role of local agents and institutions “lay at the heart of explanations of forest use and condition.” Indeed, Becker (2005) reminds that local governments at the state and county levels along with local actors have

assumed an increasing role in the process of setting the directions and strategies driving land use and cover change within their territories. It is the struggle for land, identity, resources' access, labor, government support, and economic profit among different actors at stake in specific realities which defines the institutional arrangements among them and, therefore, their ability to cope with social dilemmas such as that imposed by the deforestation blacklist.

In this regard, a preliminary fieldwork conducted in additional blacklisted counties (Figure 1) in 2015 suggests this environmental policy has affected local stakeholders in varied ways. In Moju, a county which remains blacklisted, previous government sanctions preventing small farmers to contract federal loans have been in place for a long time. Therefore, the restrictions on the access to agricultural credits imposed on blacklisted counties were not new in Moju, which resulted in little incentive among local actors towards overcoming this issue. Moreover, the expansion of palm tree plantations (i.e., dendê, *Elaeis* sp.) fostered by large companies in the region has provided labor and income to small farmers, replacing their dependence on familiar agriculture and weakening the social organization of small producers. A further issue complicating things in Moju regards to the heterogeneity of local social groups. This includes traditional families inhabiting riverine floodplains along the Moju river since the 1700s; small colonists attracted by the construction of a roadway in the 1970s; small farmers who currently lease their lands to palm oil firms; and local loggers.

On the other hand, outcries in Tailândia caused by the rise of unemployment rates following the embargo of local facilities (e.g., sawmills and farms associated with charcoal production) prompted an immediate response by local leaders and government officials. Informal narratives report the role of influential loggers in organizing and fostering these outcries to pressure government action. However, since third-party technical and financial supports were not available as in Paragominas, strategies to remove Tailândia from the blacklist differed sharply from the Green Municipality Project devised in that county. Different from Moju and Paragominas, Tailândia emerged as an autonomous county only in the mid-1970s when the first colonists arrived in the region following the construction of a roadway. Local social groups are essentially portrayed by former loggers and charcoal producers currently leasing their lands to palm oil companies; the timber industry, and small farmers engaged in local cooperatives of familiar agriculture.

Research Goals

This research proposal will address the shortcomings discussed above by pursuing two complementary goals (Figure 2).

Research Goal 1: At the regional scale, this project will examine how attributes reflecting the diversity of blacklisted counties regarding their historical, socioeconomic, biophysical, and governance settings affect the likelihood of these counties to achieve the blacklist removal criteria.

Research Goal 2: At the scale of the county, this project will draw on case studies in a sample of blacklisted counties in which in-depth interviews with local stakeholders will be conducted to reveal how diverse actors and institutions embedded in context-specific realities mediate local responses to this environmental policy.

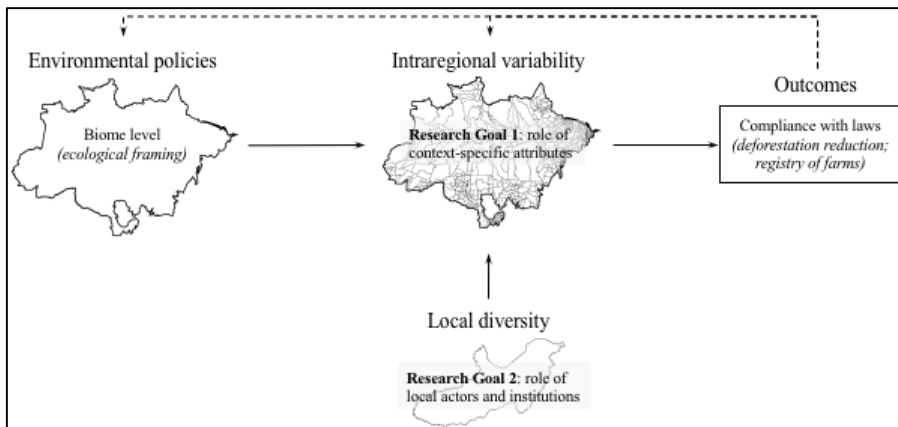


Figure 2. Conceptual framework illustrating the research goals which will be pursued by this research proposal at the regional and local scales.

Research Design and Methodology

- *Research Goal 1*: At the regional scale, this project will examine how attributes reflecting the diversity of blacklisted counties regarding their historical, socioeconomic, biophysical, and governance settings affect the likelihood of these counties to achieve the blacklist removal criteria.

This goal will be pursued through a cross-sectional analysis comparing the effect of a set of variables characterizing blacklisted counties upon their likelihood to comply with this federal policy. Table 1 groups a preliminary set of variables into three distinct categories representing biophysical, socioeconomic, and governance attributes of each county. These variables have been selected based on the analysis of previous research investigating the deforestation blacklist, the preliminary information collected during fieldwork in the state of Pará, and the experience of studying the region. These variables are expected to reflect the intraregional variability existing across blacklisted counties which may affect their response to the deforestation blacklist.

A small set of these variables will be selected, and nonlinear models will be employed to estimate their effect on the likelihood of a county to comply with the deforestation blacklist (dependent variable). The analyses will be performed considering the blacklisted counties in the state of Pará first (n=19). Pará comprises most of the counties sanctioned (n=19) and removed from the blacklist (n=6), and the state is the

focus of case studies which will be conducted as part of the Research Goal 2 detailed below. The opportunity to collect first-hand data *in loco* will result in the ability to test a large number of variables in the models. Therefore, the identification of a set of significant variables during this first round of analysis will guide further data collection in the remaining counties (n=33).

Table 1. Set of potential independent variables reflecting the attributes of blacklisted counties which are expected to affect their response to the environmental policy.

Attribute	Variable	Type	Rationale	Data source
Biophysical	% of remaining forest cover	Continuous	The less forest cover remaining, the higher the likelihood of a county to comply with the law.	PRODES
	Distance to the capital	Continuous	Relates to market connectivity and law enforcement by state authorities.	IBGE
Socioeconomic	Number of farms	Continuous	The smaller the number of farms, the higher the likelihood of a county to comply with the law.	SICAR
	Size of rural population	Continuous	The smaller the size of the rural population, the higher the likelihood of a county to comply with the law	IBGE
	Land concentration (Gini index)	Continuous		Atlas da Questão Agrária Brasileira
	Stage of county's consolidation	Categorical	Is the county placed in an agricultural frontier or in a consolidated area?	
Governance	Local political partisanship	Categorical	Identifies the relationship between the mayor and the governor	TSE
	Presence of NGOs	Categorical	The presence of NGOs providing technical and financial support to blacklisted counties has facilitated the removal from the blacklist.	Fieldwork
	Autonomy of local environmental agency	Categorical	The autonomy of local government officials to solve environmental issues (registering properties, licensing agricultural activities) becomes faster	SEMAS
	Number of social organizations	Continuous	A measure of the diversity of social groups in a county which may affect the emergence of collective actions	Local public agencies
	Budget of social organizations	Continuous	Gives a measure of the strength of local groups in influencing political pressure towards action	Local organizations

A preliminary consultation with the Indiana University Statistical Consulting Center (ISCC) indicated at least three approaches to pursue this research goal.

- i. *Binomial logistic regression*: This approach offers the opportunity to test the effect that different independent variables has upon a binary categorical dependent variable. In this case, compliance with the deforestation blacklist represents the dependent variable which can assume two values representing either the (i) full compliance or the (ii) non-compliance of a county with the deforestation blacklist.
 - ii. *Multinomial logistic regression*: A multinomial logistic regression offers the opportunity to test the effect that different independent variables have upon more than two categorical dependent variables. Compliance with the deforestation blacklist represents the dependent variable again. However, in this case, the depended variable can be broken down into additional categories representing the partial compliance of a county with the policy. The dependent variables thus can be expressed as (i) full compliance, (ii) compliance with reduction in deforestation rates only, (iii) compliance with the registry of rural landholdings only, and (iv) no compliance with the policy.
 - iii. *Multinomial logistic regression with fixed effects*: This approach differs from the previous because it considers changes in both the dependent and independent variables over time. Thus, it is possible to take into account changes in each county regarding the compliance with the law as related to changes in the independent variables over time. For instance, information collected in Tailândia suggests that after electoral years, changes in the political partisanship of the mayor and the governor may affect their political relationship and, consequently, the support received by counties from the state.
- *Research Goal 2: At the scale of the county, this project will draw on case studies in a sample of blacklisted counties in which in-depth interviews with local stakeholders will be conducted to reveal how diverse actors and institutions embedded in context-specific realities mediate local responses to this environmental policy.*

As Cisneros, Zhou, and Börner (2015) suggested, the impact of blacklisting may “differ substantially depending on the ability of local stakeholders to organize themselves towards the goal of being removed from a blacklist.” Identifying local actors and understanding the institutions mediating their interaction in different counties as a response to the deforestation blacklist is necessary to evaluate the results this policy had at the local scale. These institutional arrangements refer to the set of rules ordering the conduct and strategy of local actors following the inclusion of their county in the blacklist. They may be formal institutions, such as the rules defining the blacklist removal criteria; the normative of the Brazilian Central Bank restricting agricultural credit loans to properties not registered on CAR; the items agreed upon the Green Municipality Project in Paragominas, or any interinstitutional cooperation set between the agricultural and environmental agencies in Tailândia. These institutions may also be informal ones, such as the voluntary commitment shared among farmers to avoid new clearings; the trust in local leaders asking farmers to provide sensitive personal information to the government; or the sense of belonging and proud

shared among citizens in Paragominas regarding their county. Once institutions are appropriately crafted and respected, they “promote positive outcomes by helping actors resolve ‘social dilemmas’” (Imperial and Yandle, 2005, p. 494).

The Research Goal 2 will be pursued through a cross-sectional institutional analysis in a sample of three blacklisted counties in the state of Pará. Pará is an emblematic state in the region, one which has been impacted by different economic projects aimed at developing the Amazon since the 1960s. Consequently, several counties in the state have figured among the deforestation hotspots in the region (INPE 2008). By focusing the analysis in one state, this study can control for (i) intraregional variation across the Amazon, and (ii) incentives (i.e., specific institutional initiatives and environmental programs) available at the state- and municipal-level which might affect the incentives available for counties struggling to exit the blacklist. Moreover, the pioneering Green Municipalities Program launched by the governor of Pará in 2011 defines a common landmark for the counties pursuing the control of illegal deforestation and the regularization of rural properties. This adds further relevance for this study to be conducted in that state since results arising from this project can inform the implementation of this state-level program.

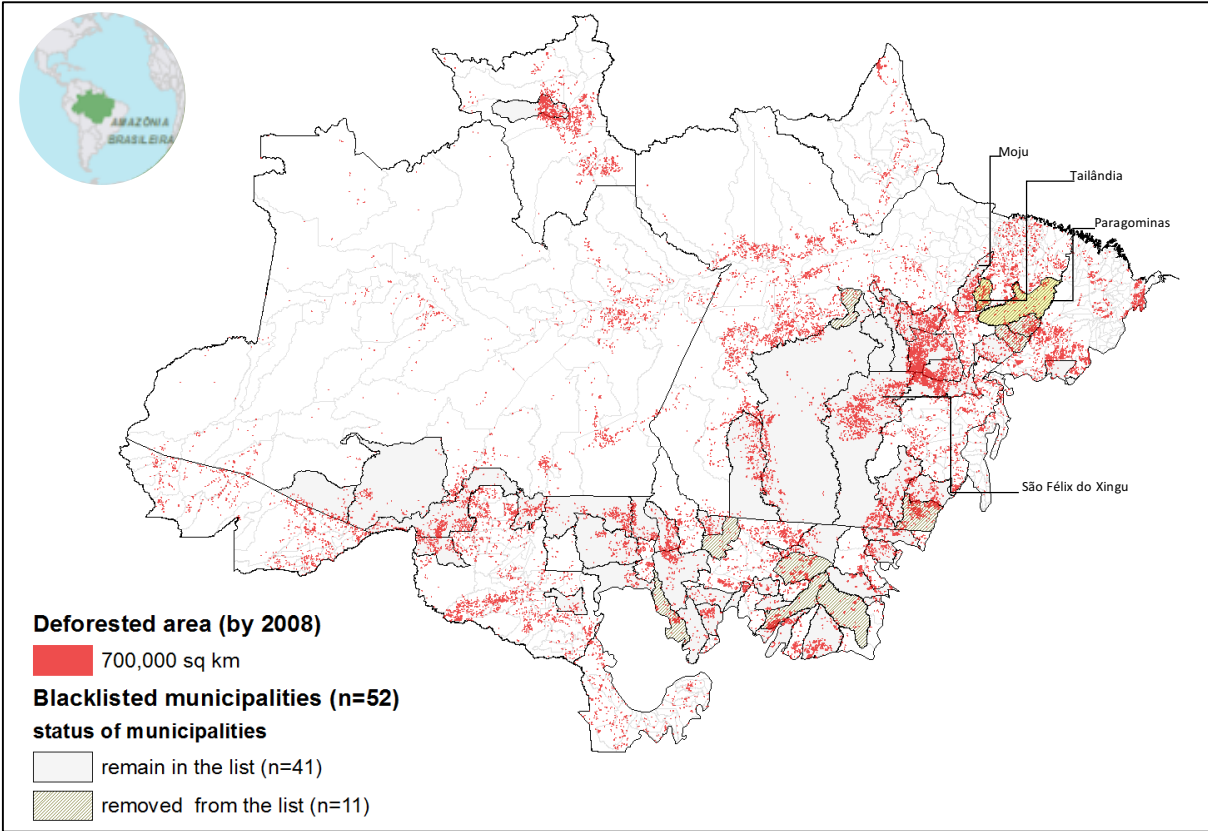
The sample definition will rely on further analysis and discussion with official representatives and local stakeholders of blacklisted counties. One option is to study Paragominas, Tailândia, and São Félix do Xingu (Figure 1). The first two counties were already visited in a pilot fieldwork; contact with local stakeholders and government officials are established, and preliminary information is available indicating that these two counties followed very different pathways to exit the blacklist. São Félix do Xingu would add an interesting contrast to those two successful cases. The county is located in the most recent agricultural frontier in the state of Pará. São Félix do Xingu had the highest absolute rate of forest loss in 2008, and by 2013 it was the county which had achieved the most significant reduction in deforested area. However, the constant arrival of new colonists, its location in a remote area of the state, among other factors have prevented the county from achieving the targets to exit the blacklist.

The *New Institutional Analysis and Social-Ecological Systems* (NIASES) framework proposed by Cole, Epstein, and McGinnis (2014) will be used as a tool to organize and analyze the set of potential variables affecting the response of different counties after their inclusion in the blacklist. The NIASES framework has been developed by scholars from the Workshop in Political Theory and Policy Analysis in Bloomington (hereafter Ostrom Workshop). It merges two previous theoretical frameworks designed by the Ostrom Workshop aimed at supporting institutional analysis: the Institutional Analysis and Development (IAD) and the Social-Ecological Systems (SES) frameworks.

The NIASES keeps the careful consideration of contextual factors the SES framework offers to characterize the social and biophysical variables affecting individual and collective decision-making into the dynamic organizational structure of the IAD framework (Figure 3). Therefore, the NIASES framework

provides a conceptual roadmap for the establishment of causal relationships between contextual variables (i.e. political-economic, social, and institutional attributes) affecting the individual and collective decision-making in blacklisted counties, on the one hand, and the institutional arrangements they devised to reduce deforestation and register rural landholdings.

Figure 1. Map of the Brazilian Amazon biome indicating blacklisted counties.



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