Toward integrating private conservation lands into national protected area systems: Lessons from a megadiversity country

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Abstract
Private conservation lands are essential for protecting biodiversity, but few national-level studies have assessed their coverage and the legal frameworks that support them. Here, we review the legal mechanisms enabling conservation on private lands in Brazil and evaluate these lands’ potential to reinforce the national protected area system. We found that conserving native vegetation on private lands is the most important mechanism to protect biodiversity in five out of the six Brazilian biomes. Because Brazil has a law that mandates landowners to set aside conservation areas, remnants of native vegetation were protected rather than converted to other land uses in areas of old economic frontiers. These remnants can be the cornerstones of effective regional conservation systems. Still, upgrading these remnants to privately protected areas and integrating these privately protected areas into the national protected area system remains a challenge. We suggest that the Brazilian experience provides important lessons on how other countries can design innovative policies to recognize and expand private land conservation.

KEYWORDS
biodiversity, Brazil, conservation, policy, private lands, protected areas, tropical forests

1 | INTRODUCTION

In 2021, under the auspices of the Convention on Biological Diversity (CBD), countries will set new area-based conservation targets because the progress achieved so far is not enough to curb biodiversity loss (CBD, 2020). Thus, it is expected that measuring progress toward such targets should go beyond the coverage of public protected areas by including conservation efforts on private lands (Maxwell et al., 2020). Millions of landowners worldwide protect natural ecosystems within their properties, and some countries have policies that support such practices. However, most countries neither formally recognize nor support conservation areas on private lands (Stolton, Redford, & Dudley, 2014). Without policies and incentives, many private conservation lands are often incorrectly registered, mapped, or reported as components of national protected area systems (Bingham et al., 2017; Mitchell et al., 2018).

There is a reported need for more in-depth studies on the potential and pitfalls of conservation on private lands (Drescher & Brenner, 2018) because few national-level studies have assessed the coverage of private conservation lands and the legal framework that...
supports them (e.g., Ivanova & Cook, 2020; Shumba et al., 2020). This gap inhibits cross-country comparative studies, which are fundamental in identifying the most effective mechanisms to support private conservation under different socioeconomic contexts (Bingham et al., 2017).

In this paper, we review the legal mechanisms enabling conservation on private lands in Brazil and assess these lands’ potential to contribute to the conservation of the country’s major ecological regions. Brazil is a good case study because it is a megadiversity country and has some of the most modern and inclusive environmental legislation globally, despite some recent setbacks (Abranches, 2020; Rylands & Brandon, 2005). We organized this review into four sections: (a) a summary of the national legislation that enables private land conservation; (b) an analysis of the potential contribution of private lands to the conservation of the country’s major ecological regions; (c) the main challenges and prospects drawn from the Brazilian experience in establishing privately protected areas to date, and (d) general policy recommendations on how countries can integrate privately protected areas into their national protected area systems.

2 | LEGISLATION ENABLING PRIVATE LAND CONSERVATION IN BRASIL

Brazil has around 851 Mha of land area distributed among six major ecological regions or biomes (IBGE, 2020; Figure 1). To protect native ecosystems on private lands, Brazil has two main policies: The Native Vegetation Protection Law (NVPL, also known as the “New Forest Code,” in reference to the upgraded legislation) and the National Protected Area System Law (in Portuguese, Sistema Nacional de Unidades de Conservação—SNUC). The Brazilian congress has approved both laws in the past two decades after a long debate between different interest groups.

The NVPL (Law No. 12727, passed on October 17, 2012) is the most important legislation regulating conservation on private lands. It considers the country’s native vegetation as an asset of common national interest and sets guidelines on how landowners can use it. The law upgraded legislation passed in 1965. It requires that landowners set aside mandatory conservation lands within their properties. These are termed permanent preservation areas (APPs, from the Portuguese acronym)
and legal reserves (LRs). APPs are areas, regardless of native vegetation cover, set to support human well-being by preserving water resources, stability (of the landscape, soil, and geology), and biodiversity (facilitating the gene flow of fauna and flora. APPs are defined by using parameters such as river widths, slopes, and altitude. LRs correspond to a given percentage of a rural property's area that should be set aside to ensure the sustainable economic use of its natural resources, assisting conservation and rehabilitation of biodiversity and ecological processes. The percentage to be protected in LR varies: (a) 80% in the forest area of the Legal Amazon; (b) 35% in the Cerrado region within Legal Amazonia; and (c) 20% everywhere else in Brazil. Although APP boundaries are set forever, LR boundaries can change if properties are divided over time. In both types of conservation lands, landowners are not obligated to design and implement management plans to achieve conservation goals.

The NVPL requires that all landowners submit a self-declared Rural Environmental Register to the government, describing the boundaries of the APPs and LRs within their properties. All information sent to the government becomes publicly available. If rural landowners or possessors fail to comply with the new legislation, they are subject to administrative, civil, and criminal liabilities. Those who abide by the NVPL receive modest tax breaks and privileged access to credit in public and private banks.

Landowners can protect more lands than the NVPL requires and may trade their surplus with those who have a conservation deficit in their properties. The law outlines compensation and offset mechanisms such as the *Cota de Reserva Ambiental* and *Servidão Ambiental* to guide such transactions (Silva & Ranieri, 2014). However, this potential market is still underdeveloped (Soares-Filho et al., 2014). In the Atlantic Forest, the most modified Brazilian biome, a special legislation (Atlantic Forest Law No. 11428, enacted on December 12, 2006) sets additional conservation requirements for private lands and complements the NVPL.

Although APPs and LRs are lands set aside for conservation, they are not formally protected areas (conservation units according to the Brazilian legislation) under the Brazilian National Protected Area System Law (SNUC). Therefore, they need to be integrated into the country's protected area system to be formally recognized as contributors to the national effort to achieve the long-term conservation of nature and its associated ecosystem services and cultural values.

SNUC (No. 9985, enacted on July 18, 2000) establishes that Brazilian protected areas compose a multilevel system, in which public and private protected areas can be gazetted by any of the country's three government levels: municipal, state, and federal. The law also recognizes two protected area groups: (a) strictly protected areas, with five categories corresponding to IUCN categories I to III, and (b) protected areas of sustainable use, with five categories equivalent to IUCN categories IV to VI (Fendrich, Rocha, & Rainieri, 2019).

Most protected areas in Brazil are created on public lands. However, SNUC has two mechanisms to integrate private lands into the national protected area system without ownership change. The first mechanism enables governments to create protected areas by combining public and private lands within their boundaries. Four protected area categories allow private lands within them. Two of these categories (wildlife reserve refuges and natural monuments) are strictly protected areas, in which private lands should follow rigorous rules defined by the protected area's management plans. In contrast, the two other categories (relevant ecological interest areas and environmental protection areas) are protected areas of sustainable use, which are more flexible on how landowners manage their properties. Environmental protection areas represent 98% of the total area of these four categories combined. The governments manage these four types of public protected areas. Hence, landowners are expected to abide by the rules defined by the protected areas' management plans. Usually, landowners’ contributions to these public protected areas are to ensure that their APPs and LRs are well conserved.

The second mechanism enables governments to create private natural heritage reserves (RPPN, as in the locally used acronym) under the landowner's request. Because a private entity owns it, RPPN is the only Brazilian protected area category that matches the IUCN’s definition of a privately protected area (Mitchell et al., 2018; Stolton et al., 2014). RPPNs are declared in perpetuity; hence their boundaries cannot be altered once they are set, even when properties are sold or divided. They can legally only be used for research, conservation, education, and ecotourism. Because RPPNs are generally small, they are more likely to contribute to the conservation of key habitats and species rather than entire ecosystems. Thus, they fit better with IUCN’s protected area category IV and help fill conservation gaps by improving the national protected area system’s connectivity and resilience against climate change (Lapola et al., 2020; Pegas & Castley, 2016; Rambaldi, Fernandes, & Schmidt, 2005). Despite showing a long-term commitment to biodiversity conservation, landowners who maintain RPPNs receive only a modest tax break and technical and financial support from governmental programs or organized civil society (Pegas & Castley, 2016).
3 | THE CONSERVATION POTENTIAL OF PRIVATE LANDS IN BRAZIL

Brazil has a legally consolidated land tenure system but with deficient implementation (Reydon, Fernandes, & Telles, 2015). Most current problems emerged from the governments’ complicated political mechanisms to transfer public lands to the private sector as the country’s economic frontiers moved inland (Reydon et al., 2015). Furthermore, the lack of a unified and transparent national land registration and regularization system has limited the communication among the country’s land tenure agencies, which has resulted in ownership overlaps, land tenure insecurity, and social conflicts (Sparovek et al., 2019). Spatial modeling that accounts for current data shortfalls estimates that 63% of the country’s land can be regarded as private, including unregistered private lands, transport networks, and urban areas (Sparovek et al., 2019). However, this proportion varies across Brazilian biomes (Table 1). According to Freitas et al. (2017), who combined official datasets and spatial modeling to estimate the area of private lands, area of native vegetation within private lands, APPs, and RLs in all Brazilian biomes, private lands represent >77% of the land in most Brazilian biomes, except in the Amazon (Table 1). The proportion of private lands in Brazil may increase in the future if the government decides to transfer undesignated public lands to the private sector. Estimates of the actual extent of undesignated public lands – most of them in the Amazon—range from 55 Mha (Sparovek et al., 2019) to 91.3 Mha (Freitas et al., 2017).

Although private lands conserve large areas of native vegetation and maintain APPs and RLs in all Brazilian biomes, private lands represent >77% of the land in most Brazilian biomes, except in the Amazon (Table 1). The proportion of private lands in Brazil may increase in the future if the government decides to transfer undesignated public lands to the private sector. Estimates of the actual extent of undesignated public lands – most of them in the Amazon—range from 55 Mha (Sparovek et al., 2019) to 91.3 Mha (Freitas et al., 2017).

The information available points out that in five of the six Brazilian biomes, large-scale conservation can only be achieved if private conservation lands are integrated into the national protected area system through RPPNs. Although APPs and RLs can be considered important policy mechanisms that helped to maintain native vegetation in the country’s old and consolidated economic frontiers (Metzger et al., 2019), they cannot be considered places where biodiversity and ecosystem services can be conserved long-term. This is due to their recurrent compliance problems (Brancalion et al., 2016; Nunes et al., 2019; Rajão et al., 2020) and lack of mandatory management plans approved and monitored by governments or independent organizations working on the government’s behalf. Because of these shortfalls, we

| Total area | Private lands | Private native vegetation | APP + RL | RPPN |
|------------|---------------|-------------------------|----------|------|
| Amazon | 421.5 | 137.6 | 95.8 | 91.4 | 0.05 |
| Cerrado | 198.4 | 181.1 | 90.9 | 53.7 | 0.18 |
| Atlantic Forest | 110.7 | 98 | 19.7 | 29.2 | 0.23 |
| Caatinga | 86.2 | 77.3 | 47.1 | 18.2 | 0.08 |
| Pantanal | 15.1 | 13.7 | 11.8 | 3.7 | 0.26 |
| Pampa | 19.4 | 15 | 6.6 | 3.2 | 0.0004 |
| Brazil | 851.3 | 522.7 | 271.9 | 199.4 | 0.8004 |

aData from Freitas et al. (2017).

bData from Confederação Nacional de RPPNs (www.rppn.org.br).
suggest that the proportion of APPs and LRs converted into RPPNs is the most accurate indicator of integrating privately protected areas into the Brazilian system of protected areas. Expanding the number and the area of privately protected areas in Brazil can positively impact the country’s conservation. Currently, public terrestrial protected areas in Brazil cover around 151 Mha, excluding overlap with indigenous lands (Brasil, 2021). This area could expand to 206 Mha if all undesignated public lands estimated by Sparovek et al. (2019) are declared protected areas. To this total, it is possible to add 122 Mha of indigenous lands that, despite being managed by an agency (FUNAI, Fundação Nacional do Índio) that is subordinate to the Ministry of Justice, require management plans with explicit conservation objectives (FUNAI, 2013) and, therefore, should be formally considered an essential component of the country’s protected area system (Garnett et al., 2018). If all LRs and APPs that are not RPPNs are converted into RPPNs, Brazil will gain 198.6 Mha of new privately protected areas in all biomes. This gain, in turn, can make Brazil one of the first countries to officially protect more than 50% of its lands, as proposed by Wilson (2017).

4 | BRAZILIAN PRIVATELY PROTECTED AREAS: CHALLENGES AND PROSPECTS

Although RPPNs have increased exponentially in recent years and their owners have created vibrant communities of practice (see https://www.rppn.org.br/), several factors have limited the expansion and consolidation of this type of protected area in Brazil. Based on the literature (e.g., Pegas & Castley, 2016; Rambaldi et al., 2005) and our combined experience managing conservation programs in Brazil, we present a list of the main challenges, potential solutions, and key players that can be used as the backbone of an ambitious national-level conservation program that is focused on private lands and the long-term conversion of, all APPs and LRs into RPPNs (Table 2).

Despite the anti-environmental actions of the current government (e.g., Barbosa, Alves, & Grelle, 2021), prospects of broad support for a large-scale conservation program in private lands are high because water shortages in Brazil’s large cities, landslides and flooding caused by land mismanagement, and increased forest fire intensity (e.g., Nobre, Mareng, Soares, & Soares, 2019) have made the Brazilian private sector more aware and concerned about the environmental and social risks associated with their activities. Although individual companies are supporting some conservation actions, these isolated commitments are insufficient to scale up the large-scale conservation of the five Brazilian biomes that have been most affected by human activities over centuries.

To be feasible, an innovative and ambitious long-term conservation program directed toward Brazilian private lands should be led by the private sector, with support from governments, academia, and conservation organizations. The program’s targets can be set with different time horizons and aligned to the country’s commitments to the major global environmental conventions. Because public funding for public protected areas in Brazil is insufficient (Silva, Dias, Cunha, & Cunha, 2021), resources for supporting a national private land conservation program should come mostly from the private sector. Thus, the program’s costs would be covered by trust funds created and managed by the private sector (especially the agriculture, water, energy, and financial sectors), limited government green subsidies (e.g., tax breaks and privileged access to public credit to RPPNs owners), and, where feasible, by the expansion of market-based conservation mechanisms such as the payment for ecosystem services.

5 | GENERAL POLICY RECOMMENDATIONS

Ideally, each country should establish a national system for biodiversity conservation. According to the best global standards, this system should be composed of interconnected public and privately protected areas as well as indigenous and community conserved areas managed in perpetuity. To achieve this globally, private conservation lands under fragile management regimes ought to be converted into privately protected areas under the request of landowners and then formally integrated into national protected area systems. Defining goals, metrics, and standards to guide such integration should be a key priority in the new cycle of negotiations of the CBD (Bhola et al., 2021; Mitchell et al., 2018).

Given the scarcity of national policies fostering biodiversity conservation on private lands, four lessons can be drawn from the Brazilian experience to guide other countries’ efforts: (a) establish a well-defined and transparent land tenure system, in which landowners can be identified and made accountable for their activities (in the case of Brazil, the Rural Environmental Registry framed by the NVPL offers such a tool); (b) implement national laws that set context-specific rules on how natural ecosystems must be conserved within private lands; (c) use and provide formal mechanisms that define how private conservation areas can be converted into privately protected areas and how privately protected areas can be integrated
into national protected area systems; and (d) create programs for providing financial and technical support to landowners who want to integrate their conservation areas into the national protected area system. Supporting programs can be public, philanthropic, or market-based. To be effective, they should be stable, transparent,
reliable, and provide long-term security to landowners. Moreover, they must be implemented in a complementary manner to reduce their costs and increase their impacts.

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CONFLICT OF INTEREST
The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS
The idea for this paper was developed by all authors. José Silva wrote most of the manuscript with Fábio Scarano and Luiz Pinto contributing to every section including writing and research.

ETHICS STATEMENT
Institutional ethics review was not required. The manuscript only used the opinions of the authors.

DATA AVAILABILITY STATEMENT
All data used in this paper are publicly available.

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