Rural Environmental Registry: An innovative model for land-use and environmental policies

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ABSTRACT

Large-scale land governance and environmental monitoring are huge challenges for tropical countries with significant forest cover. In this discussion paper, we analyzed the conditions and achievements of the implementation of the Brazilian Rural Environmental Registry (CAR). CAR was an important breakthrough of the Native Vegetation Protection Law for environmental monitoring in Brazil. CAR is the mandatory and self-declaratory registry for rural properties. Owners must provide georeferenced delimitation of their property's boundaries and legally protected areas, such as Areas of Permanent Preservation and Legal Reserves. We used the example of the State of Mato Grosso (transition between the two largest biomes in Brazil – Amazon and Cerrado) to discuss how CAR and its national information system (called SICAR) provide important inputs for land-use, environmental, economic, territorial, and food security policies. Future policies should include increasing investments and coordination between different sectors to integrate CAR and conservation efforts with agricultural production and sustainable management.

1. Introduction

Governance is a key factor in land management and has a central role in mitigation and reduction of greenhouse gas (GHG) emissions from Agriculture, Forestry and Other Land Uses (AFOLU) (IPCC et al., 2014). Globally, deforestation and forest degradation can lead to massive impacts on carbon emissions and biodiversity loss. Carbon stocks in forest biomass decreased by approximately 0.22 Gt per year worldwide in the 2011–2015 period, mainly due to global reduction in forest area (UNFCCC, 2017). Emissions from the AFOLU sector represents 24% of global emissions (IPCC et al., 2014), but the relative contribution is higher in tropical countries. In 2010, the land use, land-use change and forest (LULUCF) sector in Brazil was responsible for 42% of national net carbon emissions (Brazil, 2016a). Recent estimates

from the GHG-emission estimates systems (SEEG[1], Portuguese acronym) show that this number increased to 52% in 2016 (SEEG, 2017).

Land-use changes in Brazil have important consequences to global climate change and biodiversity. Brazil is one of the leading producers of agricultural commodities (e.g. soybean and livestock) (FAO, 2017). Brazil's agricultural expansion has driven worldwide concern over emissions associated to land-use changes (Nepstad et al., 2014; Novaes et al., 2017).

Revisions to the Forest Code of 1965 resulted in the controversial Native Vegetation Protection Law (NVPL) (Soares-Filho et al., 2014). Academic community (Silva et al., 2011), social movements and environmental organizations opposed to many environmentally detrimental changes of the law. The NVPL allowed agricultural activities in environmentally sensitive areas previously protected by law.

Fig. 1. Example of a Rural Environmental Registry (CAR), with the delimitation of the property and respective Area of Permanent Preservation (APP), Legal Reserve (RL), and area deforested prior to July 22, 2008 (consolidated area).

Furthermore, it established different treatments to environmental liabilities of areas deforested prior to July 2008, according to property size. In small properties, farmers were not required to restore areas that had been deforested prior to July 2008 (Soares-Filho et al., 2014; Brancalion et al., 2016).

However, there was one potentially promising mechanism of the law: the Rural Environmental Registry (CAR, *Cadastro Ambiental Rural* in Portuguese) (Soares-Filho et al., 2014; Jung et al., 2017). CAR is the mandatory and self-declaratory electronic registry for rural properties. Rural property owners must provide georeferenced data on their property's boundaries, Areas of Permanent Preservation (APPs), Legal Reserve Areas (LRs), Restricted Use Areas (RUs), and areas deforested prior to July 22, 2008 (consolidated areas) (Fig. 1). In LRs, property owners can perform forest management but not clear-cut forests and native vegetation. The size of LRs depends on the biome, vegetation type and deforestation date. RUs consist of environmentally sensitive areas (such as wetlands and hillsides with slope between 25° and 45°), and have a more limited use. APPs have the most restrictive use and comprise riparian vegetation buffers (associated to watercourses and water bodies), and vegetation along hilltops and hillsides with slopes greater than 30 degrees.

In Brazil, 681 million ha (i.e. > 50% of the territory) are registered as rural properties (Brazil, 2016b). The CAR national information system (called SICAR) may provide valuable large-scale data to improve understanding of the different land-uses in the country. SICAR will facilitate compliance with the NVPL and may assist the implementation of the Environmental Regularization Program (PRA, *Programa de Regularização Ambiental* in Portuguese), targeted at resolving environmental liabilities at property level. In this discussion paper, we analyzed the conditions and achievements of CAR implementation. We used the example of the State of Mato Grosso to discuss how CAR and SICAR provide important inputs for land-use, environmental, economic, territorial, and food security policies. The state of Mato Grosso is located in Central Brazil, in a transition area between two biomes, the Amazon forest and the Brazilian Savanna, locally named Cerrado. The state is the main producer and exporter of agricultural commodities,

especially soybeans and beef (IBGE, 2017). Despite only having approximately 50% of its territory in the Amazon biome, the cumulative deforestation in that portion of the state amounts to roughly one third of all deforestation registered in the Amazon Biome (INPE, 2017).

2. CAR: from state regulation to federal law and policy

The implementation of CAR and its incorporation into federal law and policy is the result of the country's commitment to building a strong network of tools, programs, and policies to monitor and control deforestation over the past three decades (Fig. 2). International agreements and the support of national and international funding agencies were very important to the success of such initiatives.

In 1988, Brazil and China signed a Cooperation Agreement to launch a complete satellite-monitoring program: the China-Brazil Land Resources Satellite (CBERS) (Furtado and Costa Filho et al., 2003). In the same year, the National Institute of Space Research (INPE) started the Amazon Deforestation Monitoring Program (PRODES), providing high-quality data on Amazon deforestation (Kintisch, 2007). PRODES uses several images (like those produced by LANDSAT and CCD of the CBERS project) to identify clear-cut deforestation in the Amazon at a 30 m resolution. It has assisted command and control actions and influenced environmental policies. INPE later developed important Amazon monitoring systems, such as Real-time Deforestation Detection System (DETER) in 2004, the Forest Degradation Monitoring System (DEGRAD) in 2007, which detects selective logging activities, and the Land-use Changes in Deforested Areas Monitoring System (Terra Class).

In response to increasing Amazon deforestation rates detected by PRODES, in 2004, the Ministry of the Environment (MMA) created the Plan of Action for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAM). PPCDAM aimed to reduce deforestation with integrated actions among federal agencies, state governments, municipalities, civil society entities, and the private sector. The Pilot Program for the Conservation of Brazilian Rainforests (PPG7) was also important. This multilateral initiative started in 1992, with international financial support from Germany, the Netherlands, Italy, France, Japan,