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Review Article

The Fate of an Amazonian Savanna: Government Land-Use Planning Endangers Sustainable Development in Amapá, the Most Protected Brazilian State

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Abstract

Although Amapá is the most protected Brazilian state, the same level of protection does not extend to its savannas. These are currently suffering increased pressure from threats including large-scale agriculture, particularly the expansion of soybean plantations. In September 2016, the Government of Amapá presented a zoning proposal (Zoneamento Socioambiental do Cerrado [ZSC]) that reserves most of the savannas for agricultural activities. Here, we outline how the methodology employed is flawed because it does not include fauna surveys, evaluations of ecosystem services or an assessment of the social importance of the savannas. The ZSC authors admit that, contrary to Brazilian legislation, the zoning was carried out with the single intention of increasing agriculture production. Current knowledge indicates that Amapá's savannas are rich in biodiversity, including endemic and threatened species, and are also home to a rich culture of traditional populations. These savannas are important providers of ecosystem services that, if intact, could represent around US$ 1.52 billion annually. We hold that the ZSC should be reformulated, with fair participation of stakeholders, in accordance with Brazil's legal requirements. At least 30% of the savannas should be protected, local family farming should be supported, and the rights of traditional peoples must now be assured through recognition of their land rights.

Keywords

agriculture, Amazon, biodiversity conservation, Cerrado, ecosystem services, land-use policy, soybean plantation

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Introduction

Brazil is a key player in global biodiversity conservation. The state of Amapá, situated in the far north-east of the Amazon region, plays an important role in Brazil's conservation network with more than 95% of its original vegetation being well-preserved and close to 70% of its extent lying within protected areas (PAs) (Drummond, Dias, & Brito, 2008; Secretaria de Estado do Meio Ambiente—Estado do Amapá [SEMA-AP], 2015). However, this protection does not extend to the 10,021 km^2 of savanna vegetation that stretches along the eastern side of the state (Figure 1), forming a patchwork of savanna interspersed with moist broad-leaf forests, flooded forests, floodplains, and mangroves in an "Amazonian savanna complex" (Carvalho & Mustin, 2017; SEMA-AP, 2012).

Only 917.69 km^2 (~9.2%) of the savannas in Amapá are legally protected, and even less (40.24 km^2 [0.4%]) are in "strictly protected" areas. A further ~27 km^2 (~0.3%) are protected by Indigenous Lands, and ~850.42 km^2 (~8.5%) by PAs within which various kinds of use are allowed (Mustin et al., 2017; see also Nogueira, Yanai, Vasconcelos, Graça, & Fearnside, 2017). This lack of adequate protection is of particular concern because the savannas of Amapá are under increased pressure from threats such as large-scale agriculture and commercial silviculture (Carvalho & Mustin, 2017; Silva, 2016). Similar to those in the state of Roraima before them (Barbosa, Campos, Pinto, & Fearnside, 2007), the savannas of Amapá are now considered to be the "final frontier" for soybean plantations in Brazil (Silva, 2016). Low land costs and expected improvement in infrastructure to allow for the export of soybeans are attracting farmers to Amapá (Silva, 2016). The federal government transferred the ownership of large tracts of land, including savannas, to the state government (Federal Decree 8713/2016—Brazil, 2016), which is accelerating the process of "regularization" of land ownership by local farmers who can then sell their lands to soybean farmers at cheap prices. This situation is evolving rapidly, with the area planted with soybeans in Amapá increasing by >200%

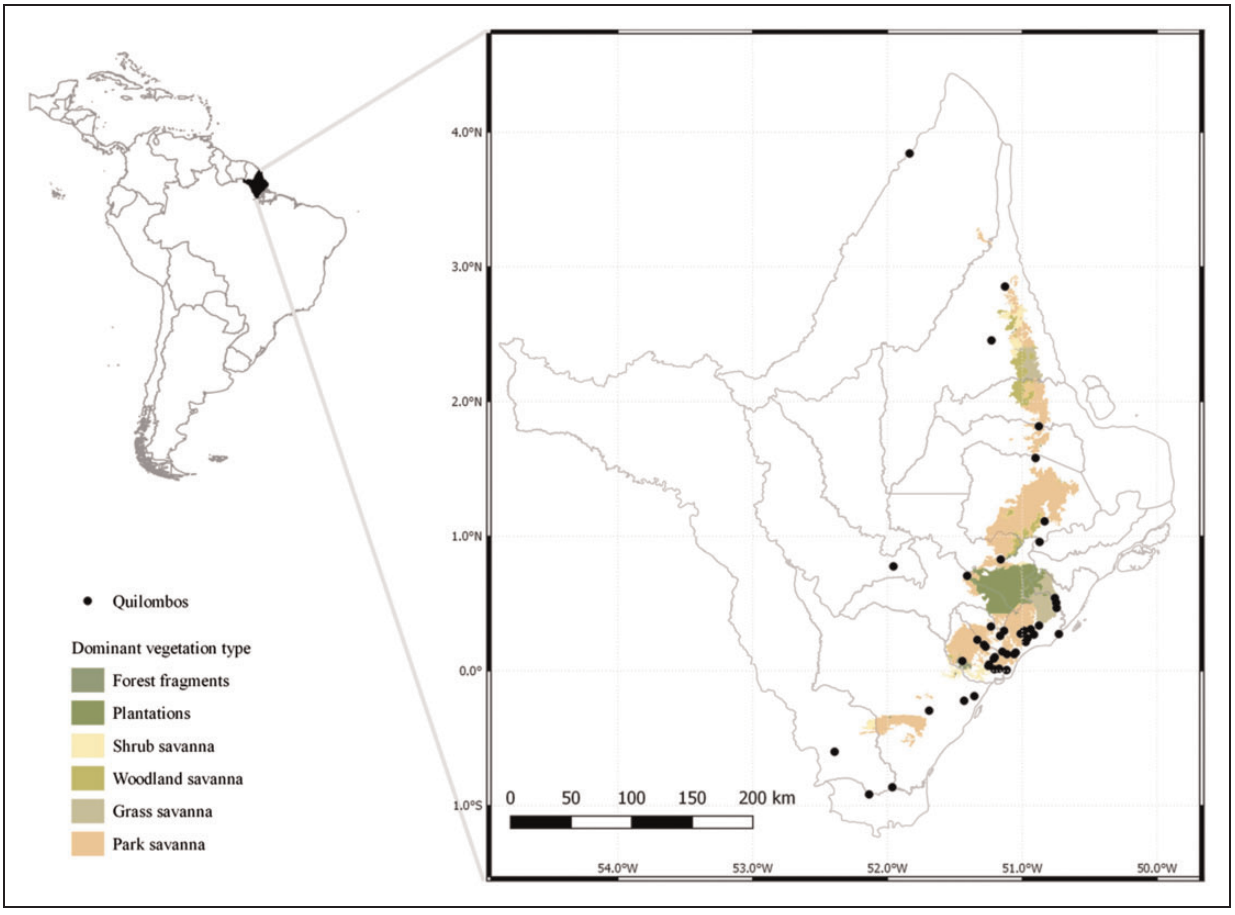

Figure 1. Distribution of the four main savanna habitat types, eucalyptus plantations, and forest patches within the savanna domain, in the state of Amapá (based on the Brazilian Ministry for the Environment's vegetation cover map for the Amazon (IBGE, 2004). Gray lines show the boundaries of the 16 municipalities that make up the state. Black dots show the locations of "*quilombos*" (traditional communities of descendants of escaped African slaves) mapped using data from SEMA-AP (2016).

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in just three years (from 45.5 km^2 in 2013 to 148.6 km^2 in 2016; Instituto Brasileiro de Geografia e Estatística [IBGE], 2017). This increase has been entirely concentrated in two municipalities plus the state capital: Itaubal, Tartarugalzinho, and Macapá (Figure 2(a)). Tartarugalzinho and Macapá each also contain more than 1,700 km^2 of savanna (Figure 2(b)), and their savannas are some of the least protected in the state (Figure 2(c)). Projections suggest that the area planted with soybeans in the savannas of Amapá could increase up to 4,000 km^2 by 2026 (Silva, 2016), which would represent ~40% of the total area of savanna habitat in the state. In addition, of the 138 "*quilombos*" (traditional communities of descendants of escaped African slaves) that reside in the savannas of Amapá, 27 are located within these three municipalities (Figure 1), highlighting the sociocultural importance of these areas. Therefore, before considering the expansion of large-scale agriculture in the region that is planned by the state government in its recent "socioenvironmental zoning" of the savannas in Amapá (*Zoneamento Socioambiental do Cerrado* [ZSC] in Portuguese; Governo do Estado do Amapá, Secretaria Estadual de Ciência e Tecnologia em Macapá, Instituto de Pesquisas Científicas e Tecnológicas do Estado do Amapá, Núcleo de Ordenamento Territorial, & Empresa Brasileira de Pesquisa Agropecuária, 2016), we hold that social and environmental factors must be considered.

On September 21, 2016, the ZSC was presented to the members of four state committees (Water Resources, the Environment, Sustainable Rural Development, and the Amapá Fund for Rural Development). The aim of this zoning document is to facilitate land-use planning for the areas of savanna in the state of Amapá. The ZSC quantifies the current use of Amapá's savannas and recommends the expansion of agricultural activities (Figure 3). However, the zoning document is flawed. Here, we highlight its key shortcomings and suggest ways in which the proposed land-use plan could be improved to better balance the three pillars of sustainable development: social, environmental, and economic (United Nations, 2016).

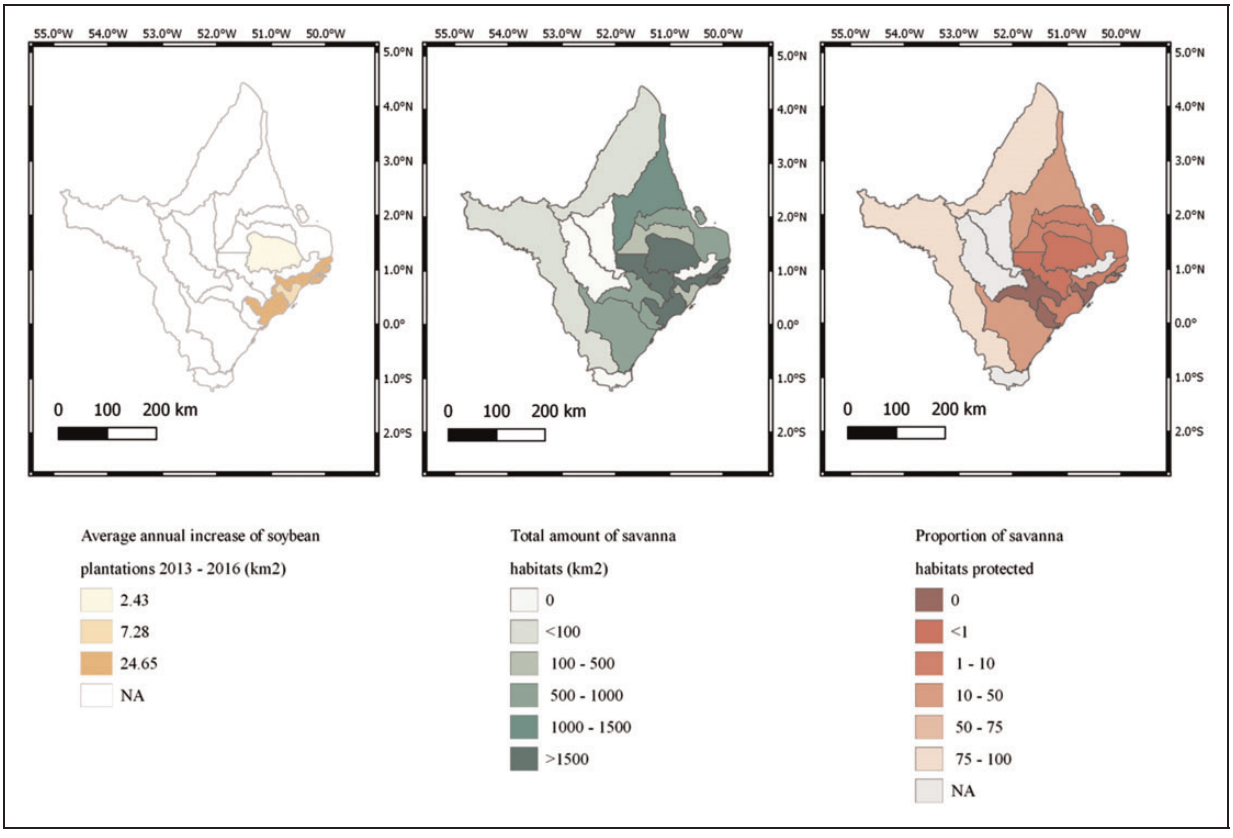

Figure 2. (a) Average annual increase in area planted with soybeans between 2013 and 2016 (IBGE, 2017), per municipality in the state of Amapá. (b) Total amount of savanna habitats (based on the Brazilian Institute of Geography and Statistics vegetation cover map for the Amazon) (IBGE, 2004). (c) The proportion of total area of savanna habitats contained within any kind of protected area, calculated using the shapefiles of "Conservation Units" and Indigenous Lands available from the Amapá State Environmental Secretariat (SEMA-AP, 2016) and the World Database on Protected Areas (WDPA, 2016).

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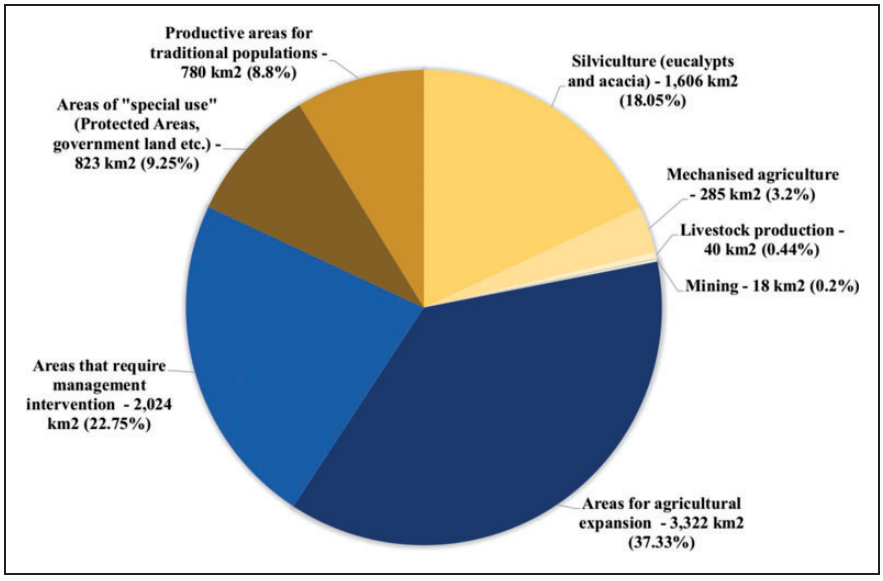

Figure 3. Current (brown) and planned future (blue) land uses in the savannas of Amapá, according to the state government's Socio-Environmental Zoning of the Cerrado (ZSC).

Brazilian Zoning Legislation Versus the ZSC

The new Brazilian Forest Code (Brazil, 2012) specifies a deadline of 2017 for all Brazilian states to submit an Ecological-Economic Zoning (*Zoneamento Ecológico Econômico* or "ZEE"), which should be prepared following the specific guidelines laid out by the Federal Ministry of the Environment (Brazil, 2006). The ZSC document uses nomenclature different from that which is legally recognized (i.e., ZSC vs. ZEE) and openly admits to not having followed the legal guidelines that would allow for its consideration as a ZEE (Governo do Estado do Amapá et al., 2016). For example, according to the guidelines, a ZEE should be carried out for the entire state, in contrast with Amapá's ZSC that considers only areas of savanna vegetation. Further, the ZSC was presented to the four state committees without having been previously presented to civil society in the state. This goes against Decree 4.297/2002 (Brazil, 2002a), which states that for a ZEE to be approved at the federal level, it must have resulted from an open and participatory process involving key stakeholders. The government decision to issue a zoning document that does not meet the requirements set out in Brazilian federal law (Brazil, 2002a) appears to represent a step in the direction of a business-as-usual scenario rather than a prioritization of sustainable development and biodiversity conservation.

The methodology used to develop the ZSC is not adequate as a basis for a socioenvironmental zoning of the savannas. The ZSC is based on soil classification and mapping derived from just 16 soil pits and an unspecified number of inventories of woody vegetation. Contrary to Brazilian legislation (Brazil, 2002a), no assessments were made in the field regarding fauna, ecosystem services or the social importance of the savannas, and no plans were included for monitoring and minimising social and environmental impacts. Indeed, the ZSC authors themselves admit that the zoning was carried out with the single intention of increasing the production of "*grãos*" (grains and pulses), especially soybeans, as a way to promote the economic development of the state. Despite obvious inadequacies in the methodologies used, the ZSC presents a plan to zone the savannas in Amapá. The conclusions made in the report regarding appropriate land uses across the savanna habitats cannot be supported by the methodology employed, and, as such, the ZSC should be disregarded. In the following sections, we highlight some specific requirements that should have been considered in the ZSC and that are essential for an appropriate zoning.

Biodiversity Inventories

No information was included in the ZSC regarding the faunal diversity of Amapá's savanna habitats. Despite just a small number of inventories having been carried out, evidence already shows a rich faunal community that varies across the savannas. Three hundred fifty species of invertebrates, 200 species of birds, 108 mammals (including 38 bat species), 26 species of fish and 41 species of amphibian, and 26 reptile species have already been recorded from Amapá's Amazonian savannas (Mustin

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et al., 2017). The known fauna includes six mammals considered to be threatened, following the classification of the World Conservation Union (International Union for Conservation of Nature [IUCN]): *Myrmecophaga tridactyla* Linnaeus, 1758, *Priodontes maximus* (Kerr, 1792), *Tapirus terrestris* (Linnaeus, 1758), *Tayassu pecari* (Link, 1795), *Alouatta belzebul* (Linnaeus, 1766), and *Pteronura brasiliensis* (Gmelin, 1788) (IUCN, 2016). In addition, Amapá's savanna habitats are considered to be an "important bird area" due to their relevance for the conservation of two bird species—the shrike-like tanager *Neothraupis fasciata* and the rufous-sided pygmy tyrant *Euscarthmus rufomarginatus* (De Luca, Develey, Bencke, & Goerck, 2009).

Floristic diversity was only partially evaluated, considering only three woody species (Governo do Estado do Amapá et al., 2016). As such, the ZSC ignores the fact that 378 species of plants have been recorded in the savannas of the state, of which ~60% are nonwoody (Costa-Neto, Miranda, & Rocha, 2017). Amapá's Amazonian savannas are also home to two endemic plant species—*Axonopus amapaensis* G.A. Black and *Borreria amapaensis* E.L. Cabral & Bacigalupo (Costa-Neto et al., 2017; Rocha, Miranda, & Costa-Neto, 2014)—whose distribution was also not included in the ZSC.

Stakeholder Participation

Amapá's savannas are also home to a rich culture of traditional and indigenous populations that have strong links with the land upon which they live. In particular, 138 *quilombos* are located in these savannas (Silva, 2012), of which 31 have their lands officially recognized by the Brazilian Federal Government (Colares, 2010). Brazilian law states that these lands, once recognized, cannot be sold, mortgaged, rented, donated, or acquired by adverse possession, and that the deed to the land must be collective and in the name of an association of inhabitants (Prioste, Alves, & Camerini, 2011). This means that recognized *quilombos* represent land that is unavailable for the market as it stands in the current agribusiness model (Prioste et al., 2011). As such, this discrepancy between the number of *quilombos* in Amapá's savannas and the officially recognized number could be, in part, due to conflict with powerful agricultural producers and businesses who own large tracts of land and who seek to block the recognition of these *quilombos* in order to maintain these lands available for purchase (Prioste et al., 2011). Indeed, 44.4% of the agricultural land in Brazil is owned by just 1% of the landowners (OXFAM, 2016). Large landholders, therefore, have a strong influence in Brazilian politics and, by extension, on the granting of land rights to the *quilombolas* (people who live in *quilombos*) (Prioste et al., 2011). As such, the lack of recognition of the other 107 *quilombos*, together with the land-use changes proposed in the ZSC that identify large areas of Amapá's savannas for large-scale agriculture, leaves large areas open to procurement and development for agribusiness.

Economic Importance

Beyond their importance for local communities and for biodiversity conservation, the savannas in Amapá are important providers of ecosystem services, such as carbon storage, climate regulation, water and nutrient cycling, pollination, seed dispersal, natural pest control, ecotourism, and the production of fruits, fish, and other natural products. Considering the average value of ecosystem services provided by the world's savannas (Costanza et al., 2014) and the area occupied by savannas in the state, we estimate that, if intact, Amapá's savannas could provide the equivalent of around US$ 1.52 billion annually in ecosystem services. However, it is important to note that a significant part of this value has already been changed, given that 30.7% of the area has already been converted to agriculture, silviculture, and other productive uses (Governo do Estado do Amapá et al., 2016). The loss of ecosystem services would increase further if the zoning suggested by the ZSC were to be implemented, converting a further 37.3% of the area to soy plantations and pasture (see Figure 3). Most of Amapá's savannas are moderately vulnerable to erosion (Brazil, 1974), meaning that the land could rapidly degrade if converted to plantations and pasture, reducing the ecosystem value of these areas. In addition, the application of pesticides close to water bodies can compromise water quality, with impacts on biodiversity, fish production, ecotourism, and human health (Schwarzenbach, Egli, Hofstetter, von Gunten, & Wehrli, 2010), since some of the flooded environments in the savannas are used for swimming by the local population and by weekend visitors.

Conclusions

The relevance of Amapá's savannas to biodiversity, local communities, and ecosystem services indicates that these habitats need greater protection. Specifically, most of the areas currently within PAs are not sufficiently protected. It is also essential that new PAs should be created to increase the area protected to at least 30%. Highly biodiverse areas in which less than 30% of the original vegetation remains can be considered "hot spots" for conservation (Myers, Mittermeier, Mittermeier, Da Fonseca, & Kent, 2000), and 30% is also considered to be the "fragmentation threshold" (Pardini, Arruda Bueno, Gardner, Prado, & Metzger, 2010). Indeed, the Brazilian Ministry of Environment recognizes Amapá's savannas as being in the highest level of priority for

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conservation and indicates the need for establishment of a strictly PA in the central portion of Amapá's savannas (Brazil, 2002b). However, expansion of PAs should not focus only on one area of the state (Figure 2). Amapá's savannas encompass different soil types and phytophysionomies (Figure 1; Brazil, 1974; Governo do Estado do Amapá et al., 2016), indicating a heterogeneous distribution of biodiversity. Protecting just one part of the savanna complex risks leaving part of its biodiversity unprotected.

Amapá's savannas are host to a rich and heterogeneous biodiversity that remains little-known and that must be considered before any kind of large-scale land-use change takes place. A more complete inventory of the biodiversity of these savannas, covering their full extent and including longer term sampling, would certainly increase the list of known species. Indeed, we assert that the ZSC could have been used as an opportunity to increase knowledge of biodiversity in the state's savannas; instead, the ZSC in its current form represents a real and serious threat to savanna conservation.

The ZSC also represents a threat to the way-of-life of the *quilombola* populations. We recommend that any zoning document must be produced in partnership with representatives of these communities and should identify strategies to avoid cultural deterioration and other negative impacts on the traditional and indigenous populations, including impacts resulting from modification of the ecosystem.

We recognize that agricultural production has the potential to generate wealth for the state of Amapá, but we emphasize that the savannas in their preserved state also provide economic benefits to the state via their ecosystem services. We are not against agricultural production. Indeed, we all require food production. However, given that a substantial part of the food consumed in Brazil is produced by family farming, and that this employs 70% of the country's rural workers (Brazil, 2011), we see small-scale family farming as the solution required to support truly sustainable development in the state of Amapá. In contrast, the type of agribusiness suggested in the ZSC generates very few jobs for local people and threatens traditional ways of life. In addition, since most of the production will be destined for export, soy plantations in Amapá will not contribute to reductions in the price of local food and will represent various negative environmental threats that may also translate into impacts on the health and well-being of local populations (e.g., Fearnside, 2001; Fearnside, & Figueiredo, 2015). Furthermore, owing largely to inefficient policies, lack of support for local family farmers (either financial or technological) and lack of investment in infrastructure, the production of rice, beans, maize, and oranges, which are among the most important family-farm products in the state, shrank continuously in Amapá over the course of the last decade (Governo do Estado do Amapá et al., 2014; IBGE, 2017). This highlights a rationale for the state government to consider increasing support to family farms in order to recover their productivity and increase employment instead of choosing to facilitate commodity production in a highly unequal land-distribution system. Sustainable development, which is among the stated objectives of the ZSC, requires economic development in concert with the maintenance of environmental equilibrium and guarantees of social justice. As such, achieving sustainable development in Amapá will not be possible without a participatory and open planning process that provides for the conservation of representative areas of Amapá's savannas, generates employment for local people, and protects and endorses the rights of traditional and indigenous populations.

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