

# Overlap between Conservation Units and Traditional Territories: Socio-environmental Implications

## Sobreposição entre Unidades de conservação e Territórios Quilombolas: Implicações Socioambientais

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<http://dx.doi.org/10.5380/raega.v65i1.103532>

### Abstract

This paper analyzes the socio-environmental conflicts arising from the territorial overlap between Conservation Units (CUs) and Traditional Territories (TTs) in Brazil, focusing on Indigenous Lands (TIs) and *Quilombola* Territories (TQs). The study employs geoprocessing techniques applied to official data from INCRA, FUNAI, MMA, and IBGE, aiming to map and quantify the intersections between different CU and TT categories, as well as identify the affected biomes. The results reveal a critical scenario of overlapping, especially in strict protection units and areas lacking management plans, which exacerbates legal uncertainty and the criminalization of traditional practices. Although most overlaps are concentrated in the Amazon biome, significant cases are also found in the Cerrado and Mata Atlântica biomes. The study concludes that the absence of effective management instruments and participatory mechanisms intensifies territorial conflicts and undermines both conservation goals and the territorial rights of traditional peoples. It recommends the integration of environmental and land policies and the strengthening of co-management strategies to promote socio-environmental justice.

### Keywords:

Land conflicts, Socio-environmental justice, Territorial governance, Public policies.

### Resumo

Este artigo analisa os conflitos socioambientais gerados pelas sobreposições territoriais entre Unidades de Conservação (UCs) e Territórios Tradicionais (TTs) no Brasil, com foco em Terras Indígenas (TIs) e Territórios Quilombolas (TQs). A pesquisa se fundamenta em técnicas de geoprocessamento aplicadas a dados oficiais do INCRA, FUNAI, MMA e IBGE, com o objetivo de mapear e quantificar as áreas de interseção entre diferentes categorias de UCs e TTs, assim como identificar os biomas afetados. Os resultados revelam um cenário crítico de sobreposições, afetando 45,8% da área total dos TQs e 10,7% da área total das TIs. A maior tensão reside na sobreposição com UCs de Proteção Integral (PI), que impõem restrições de uso e geram insegurança jurídica, sendo mais acentuada nas TIs (63 casos) do que nos TQs (27 casos). A concentração das

sobreposições de TIs na Amazônia e a dispersão dos TQs em outros biomas (Mata Atlântica, Cerrado, Caatinga) indicam a necessidade de abordagens regionalizadas. Conclui-se que a ausência de instrumentos eficazes de gestão e de mecanismos participativos acentua os conflitos e compromete tanto os objetivos de conservação quanto os direitos territoriais dos povos tradicionais. O estudo propõe a integração de políticas ambientais e fundiárias e o fortalecimento de estratégias de gestão compartilhada como caminhos para a promoção da justiça socioambiental.

**Palavras-chave:**

Conflitos fundiários, Justiça socioambiental, Gestão territorial, Políticas públicas.

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## I. INTRODUCTION

Growing concern about environmental degradation, manifested by phenomena such as deforestation, habitat loss, and biodiversity decline, has consolidated the creation of protected areas as an essential global conservation strategy (Pereira; Silveira Junior, 2023). In Brazil, this approach was formalized by the National System of Conservation Units (NSCU), Law No. 9,985/2000, which establishes a unified system of Conservation Units (CUs) to protect national ecosystems and recognize associated cultural values (Eckel; Vieira; Poglia, 2025).

The CUs are categorized into two groups: Sustainable Use (SU), which seeks to reconcile conservation with rational use; and Integral Protection (IP), which is slightly more restrictive, focusing on the preservation of natural resources (Cavalheiro; Santilli, 2005). The implementation of these areas, however, faces challenges, especially in the presence of traditional populations. The Brazilian National Plan for Protected Areas (PNAP) recognizes the importance of integrating CUs, Indigenous Lands (ILs), and *Quilombola* Territories (QTs) to harmonize environmental policy (Madeira et al., 2017).

The overlap of different categories of protected areas in the same territory is a central issue, which can generate both complementarity and conflicts (Eckel; Vieira; Poglia, 2025). The superposition of IP CUs over Traditional Territories (TTs) is particularly complex, as these units, in theory, do not allow human habitation (Leite, 2017). This situation creates a conflict of rights: the right to a balanced environment (Art. 225 of the Federal Constitution) versus the cultural and territorial rights of communities (Arts. 215 and 216 of the Federal Constitution) (Leite, 2017).

Historically, the creation of CUs, especially parks, has disregarded the presence of local populations, resulting in exclusion and violation of rights (Alarcon; Torres, 2014). Although the NSCU provides for compensation and relocation, regulating permanence through Terms of Commitment (Law No. 9,985/2000, Art. 42), this approach is criticized for failing to recognize the fundamental right of these populations to their territory, where their ways of life are intrinsically linked to conservation (Diegues, 2001). The identity of these

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groups is linked to the territory, and their forced removal represents an expropriation of immeasurable values (Torres, 2008). The resulting socio-environmental conflicts are multifaceted, involving disputes over resources, restrictions on traditional economic activities, and denial of basic rights (Alarcon; Torres, 2014). The absence of integrated and participatory management that values traditional knowledge and practices aggravates the situation, generating distrust and resistance (Pereira; Silveira Junior, 2023).

However, the current trend points to the need for a new paradigm, recognizing traditional populations as crucial agents in maintaining the natural attributes that justify the protection of these areas (Madeira et al., 2017). The presence of these communities can generate beneficial synergies, contributing to the conservation of biodiversity and biocultural heritage (Rios Paula, 2022). Shared management and the creation of instruments such as Terms of Commitment and management agreements emerge as solutions to conflicts (Alarcon; Torres, 2014).

This study aims to analyze the socio-environmental conflicts arising from the overlap between CUs and TTs in Brazil, with a focus on ILs and QTs. Using geoprocessing techniques, the study mapped and quantified these overlaps, identifying the categories of CUs involved (indigenous parks, CUs with or without management plans). By understanding the relationship between environmental conservation and territorial rights, the study sought to contribute to a debate on fairer and more effective territorial management, reconciling ecosystem conservation with the recognition and appreciation of traditional ways of life.

### **Conservation Units (CUs)**

CUs are territorial areas, including jurisdictional waters, legally established by the government for the conservation of relevant natural characteristics, under a special regime of administration and protection (Brazil, 2000). Their creation and management in Brazil are mainly governed by Law No. 9,985/2000, which established the NSCU. The NSCU classifies CUs into two main groups: IP and SU.

Integral Protection CUs focus primarily on nature preservation, prioritizing the maintenance of ecosystems and biodiversity with minimal human interference. Sustainable Use CUs, on the other hand, seek to reconcile environmental conservation with practices that ensure the continuity of traditional populations' ways of life, allowing for the responsible use of natural resources in accordance with the management plan (Brazil, 2000).

The constitutional basis for the creation of CUs lies in paper 225 of the Federal Constitution of 1988, which guarantees the right to an ecologically balanced environment and imposes on the government the duty to protect and preserve these spaces for present and future generations (Brazil, 1988).

Table 1 shows the main characteristics by type of conservation unit.

Table 1 – Groups of CUs and their characteristics.

Group	Category	Main objective	Is it privately owned?	Does it allow human presence?
Integral Protection (IP)	Ecological Station (ECST).	Preserve nature and allow controlled scientific research.	No	No, except for educational purposes.
	Biological Reserve (BIORE).	Preserve biota; restrict access to authorized research.	No	No
	National / State / Municipal Park (NAPAR)	Preserve ecosystems with opportunities for visitation, environmental education, and ecological tourism.	No	Yes, for controlled visitation.
	Natural Monument (NAMO).	Protect rare or beautiful natural sites.	Yes, with restrictions.	Yes, if compatible with the objectives.
	Wildlife Refuge (WR).	Protect natural environments for resident or migratory flora/fauna.	Yes, with restrictions.	Yes, if compatible with the objectives.
Sustainable Use (SU)	Environmental Protection Area (EPA).	Protect biodiversity and regulate the sustainable use of resources.	No	Yes, human occupation permitted.
	Area of Ecological Interest (AEI).	Protect small areas with unique or rare natural features.	Yes, with restrictions.	Little or no occupation.
	National Forest (NF).	Sustainable multiple use of the forest and scientific research.	Yes (with regulated use).	Yes
	Extractive Reserve (EXRES).	Protect the livelihoods of extractive populations and ensure the sustainable use of resources.	Use granted to the community.	Yes, with community management.
	Wildlife Reserve (WILRE).	Protect animal species for sustainable use and scientific research.	Yes, with restrictions.	Yes, if compatible.
	Sustainable Development Reserve (SDR).	Reconciling conservation and sustainable forms of resource use by traditional populations.	Yes, with regulated use.	Yes.
	Private Natural Heritage Reserve (PNHR).	Private initiative for long-term environmental protection.	Yes	Yes, for educational, tourist, and scientific purposes.

Source: Brasil (2000).

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## Traditional Territories (TTs)

Folk Communities are defined by Decree No. 6,040/2007 as culturally distinct groups that recognize themselves as such, possessing their own forms of social organization and using territories and natural resources for their cultural, social, religious, ancestral, and economic reproduction, through knowledge and practices transmitted by tradition (Brazil, 2007, Art. 3, I). This definition covers a wide diversity of communities, including indigenous peoples, *quilombola* communities, riverine communities, extractivists, artisanal fishermen, among others, historically linked to specific territories and ways of life.

TTs are essential spaces for the cultural, social, and economic reproduction of these peoples, whether they are used permanently or temporarily (Brazil, 2007, Art. 3, II). This concept goes beyond the legal notion of land ownership or possession, encompassing tangible and intangible elements such as rivers, forests, sacred sites, and other natural resources vital to the continuity of traditional ways of life. It is crucial to emphasize that specific regulations apply to indigenous peoples and *quilombola* communities, such as Art. 231 of the Federal Constitution and Art. 68 of the Transitional Constitutional Provisions Act, which reinforce their original territorial rights (Brazil, 2007).

These territories constitute the material and symbolic basis that sustains the common life of the populations that inhabit them, shaping their social organizations, beliefs, and productive practices. For these groups, the perception of territory is integrated, encompassing social, political, economic, and cultural dimensions, where identity and affective values are constitutive elements. This deep connection with the environment, manifested through intergenerational knowledge and practices, not only ensures cultural continuity and sociopolitical reproduction, but is also often associated with biodiversity conservation and sustainable management of natural resources (Pimentel; Ribeiro, 2016).

The legal recognition of these territories is a complex process that is fundamental to the analysis of socio-environmental conflicts. Although Brazilian legislation, through the National Policy for the Development of Folk Communities, defines these groups as culturally distinct communities that depend on their territories and resources, the creation of CUs, often based on a vision that dissociates society and nature, generates territorial overlaps. Such conflicts reveal the tension between the territoriality of communities and the management models imposed by the government (Pimentel; Ribeiro, 2016).

Guaranteeing the right to territory is central to the realization of the cultural and environmental rights of traditional peoples and communities. Access to and continued use of these spaces are indispensable conditions for their sustainable development, the preservation of sociocultural diversity, and the maintenance

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of their ways of life (Brazil, 2007; Madeira et al., 2017). However, the overlap between TTs and other forms of land use and appropriation, such as IP CUs or large economic enterprises, represents one of the main contemporary challenges to territorial management and the promotion of socio-environmental justice in Brazil.

### **Rights Guaranteed to Indigenous and Quilombola Populations Over Their Lands**

For indigenous peoples, the Federal Constitution guarantees the use of ecosystem services related to soil, rivers, and lakes on their lands (Brazil, 1988, Art. 231, § 2). This means that, although indigenous territories are federal property, the right to use and manage these resources belongs exclusively to the indigenous peoples. In addition, respect for their customs and traditions is guaranteed, as well as the right to their own social organization. The use of water and mineral resources on these lands can only occur with the authorization of the National Congress, after consultation with the affected communities and with their participation in the results of the mining (Brazil, 1988, Art. 231, § 3). The inalienability, unavailability, and imprescriptibility of Indigenous Territories are constitutional guarantees that aim to protect them from misappropriation.

For *quilombola* communities, paper 68 of the Transitional Constitutional Provisions Act (ADCT) of the 1988 Constitution recognizes their definitive ownership of their lands (Brazil, 1988). The title deed is issued collectively, in the name of the community association, guaranteeing possession and common use of the territory. This right to land is fundamental to the maintenance of their cultural, economic, and social practices, which are intrinsically linked to the territory. The title aims to protect these communities from external pressures and guarantee their autonomy in managing their resources and ways of life. Decree No. 4,887/2003 reinforces the importance of self-definition as a fundamental criterion for the recognition of these communities (Brazil, 2003).

### **Socio-Environmental Conflicts**

The creation of CUs in Brazil, although essential for the protection of biodiversity, is often marked by intense socio-environmental conflicts. These arise from the complex interaction between conservation policies, territorial rights, and the ways of life of local and traditional populations. The origin of these conflicts lies largely in the historical conception of protected areas, based on a model of “untouched nature,” dissociated from human presence (Silva et al., 2017). This vision, applied since the creation of the first parks, such as Yellowstone in the USA, promoted the forced removal of inhabitants, generating a legacy of disputes that is still reflected today in Brazil (Silva et al., 2017).

The problem is exacerbated by the overlap of different territorialities. On the one hand, the state imposes territoriality based on environmental legislation, with rules of use and restrictions. On the other hand, traditional communities have their own territoriality, built historically and based on knowledge, practices, and a deep cultural and subsistence relationship with the environment (Pimentel; Ribeiro, 2016). The imposition of CUs on traditionally occupied territories, as in the case of the Terra do Meio Ecological Station in Altamira, Pará, places residents in a situation of great vulnerability, criminalizing their subsistence practices and violating their historically established rights (Alarcon; Torres, 2014). Legislation such as the NSCU, which provides for the removal and compensation of populations in IP CUs, directly conflicts with the rights guaranteed by the 1988 Federal Constitution and the National Policy for the Sustainable Development of Traditional Peoples and Communities (PNPCT) (Nascimento, 2020).

The causes of conflicts are multifaceted and vary according to the local context and the category of the CU. In IP CUs, the most evident conflicts are deforestation, fishing or hunting, and cultivation for family farming, reflecting the direct clash between the subsistence needs of communities and the restrictive rules of the unit (Pereira; Silveira Junior, 2023). In SU CU, urban expansion and real estate speculation are the main sources of tension (Pereira; Silveira Junior, 2023). The introduction of economic activities, such as shrimp farming in mangrove areas in the Potiguara Indigenous Territory, also generates conflicts, pitting the interests of indigenous communities against those of environmental agencies (Sampaio, 2015). The lack of dialogue and community participation in the process of creating and managing CUs exacerbates these conflicts, resulting in distrust and resistance (Pereira; Silveira Junior, 2023).

### **The Problem of Overlapping**

The relationship between ILs and CUs in Brazil has been widely discussed in academic and socio-environmental literature, mainly due to recurring territorial overlaps and the resulting conflicts in management and conception. Research indicates a growing consensus on the relevance of indigenous territoriality for biodiversity conservation and on the need to reformulate Brazilian environmental policy to integrate traditional knowledge into conservation processes.

A landmark study by the Socio-Environmental Institute (Ricardo, 2004) outlines the core of this issue by demonstrating that, although both ILs and CUs are essential for environmental protection, the coexistence of these categories of protected areas generates complex tensions arising from legal, conceptual, and administrative differences. The publication emphasizes that Indigenous Territories, due to their proven

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effectiveness in maintaining biodiversity, should be recognized as models of conservation in their own right. Thus, overcoming these impasses depends on the effective integration of indigenous knowledge and territoriality into environmental management strategies, breaking with the historical marginalization of these populations in public policies.

Complementarily, Zanatto (2015) deepens the geographical analysis of conflicts and reinforces that the high biological diversity observed in indigenous territories is a direct result of the management and knowledge traditionally built by these peoples, which makes their presence intrinsically linked to nature conservation. The author argues that the persistence of territorial overlap conflicts masks the true cause of the impasses, which lies not in the management of the areas, but rather in the development model promoted by the Brazilian government. By privileging economic interests and disregarding traditional territorialities, this model perpetuates instability and conflicts in overlapping areas.

In addition to the indigenous issue, the analysis expands to consider the plurality of traditional communities and their roles in natural resource management. Diegues and Viana (2004) and Diegues (2004) highlight the relevance of the *caiçara* peoples and other traditional populations of the Mata Atlântica, emphasizing that their ways of life and ancestral knowledge are fundamental to the maintenance of biodiversity and the sustainable use of ecosystems. This perspective is reinforced by Adams (2000), who discusses the relationship between traditional knowledge, scientific research, and environmental planning in the region, and by Begossi (2004), who analyzes artisanal fishing practices from an ecological and anthropological approach, demonstrating the inherent sustainability of these management systems.

In the Amazonian context, Adams, Murrieta, and Neves (2006) highlight the sociocultural complexity of caboclo populations, contrasting with the reductionist view that classifies them only as rural populations. The authors emphasize their importance in the conservation of natural resources and the invisibility they still face in public policies, despite developing autonomous and sustainable strategies for land use.

In summary, the literature consulted establishes that biodiversity conservation in Brazil is inseparable from the recognition of the diversity of territorialities and management systems of traditional communities. Conflicts of overlap and the marginalization of these populations are symptoms of an environmental policy that fails to integrate traditional knowledge as a fundamental pillar for the country's socio-environmental sustainability.

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## II. MATERIALS E METHODS

The methodological approach of this study was structured based on the steps described in the flowchart in Figure 1, which provides sequential guidance for the development of the analyses.

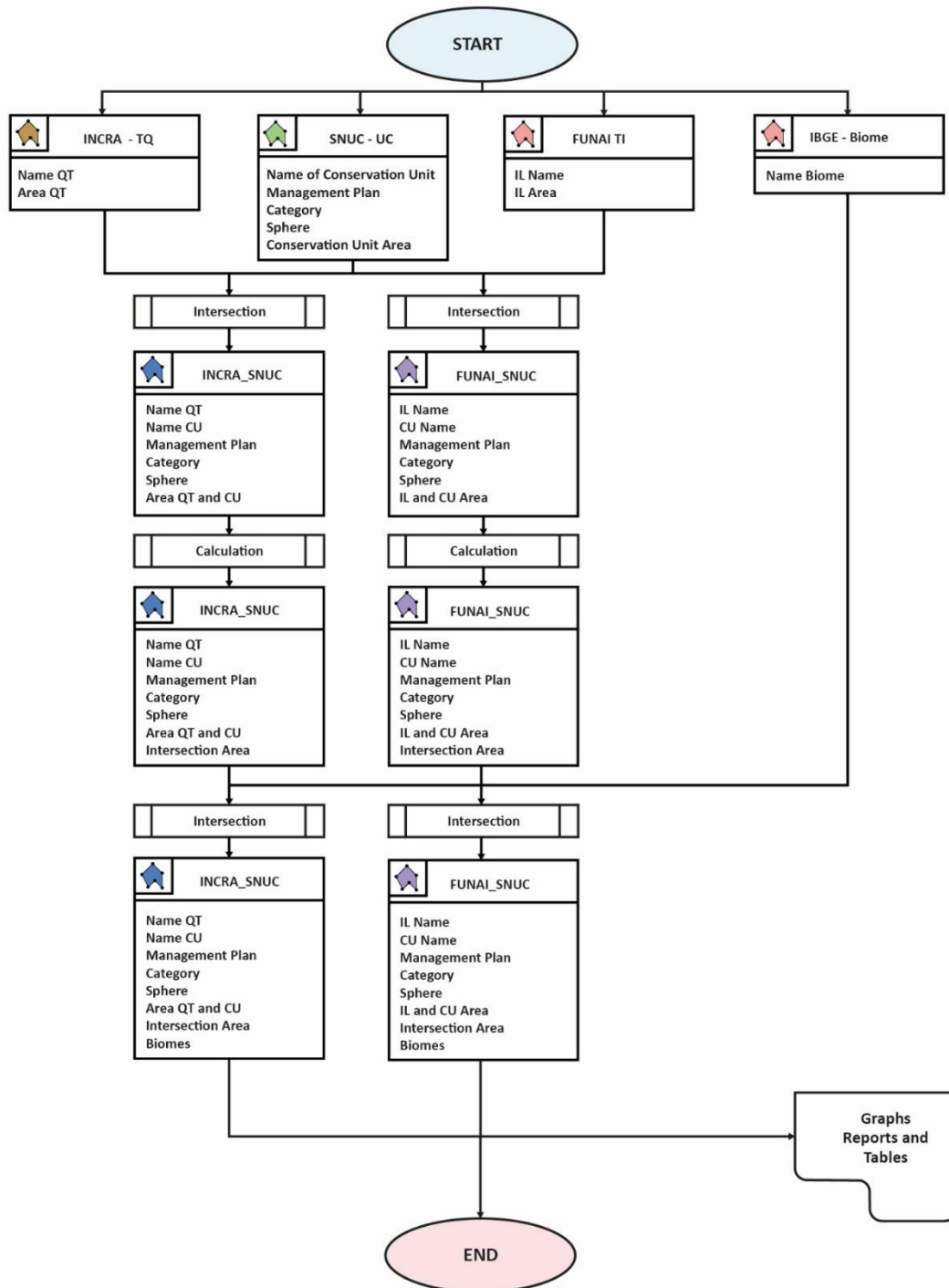


Figure 1– Methodology Flowchart.

The presented flowchart illustrates the methodological sequence adopted for analyzing territorial overlaps between ILs, *Quilombola* Territory, CUs, and Brazilian biomes. The entire process was carried out using QGIS software, using official data from institutions such as the National Institute of Colonization and Agrarian Reform Paraná (INCRA), the National Indigenous Peoples Foundation (FUNAI), the Ministry of the Environment, and the Brazilian Institute of Geography and Statistics (IBGE).

In the initial stage, vector layers representing the official boundaries of QT, IL, CU, and Biomes were loaded, all in vector format. The geometries underwent topological consistency checks to ensure the integrity and reliability of the spatial data used.

The spatial analysis began with the application of the intersection tool, executed separately between the QT and IL layers with the CU layer. The aim was to identify and extract the polygons resulting from overlaps between protected areas of different categories. As a result, the intermediate layers INCRA\_CU ( $QT \cap CU$ ) and FUNAI\_CU ( $IL \cap CU$ ) were generated.

In the next step, the intersection areas were calculated using the QGIS Field Calculator tool, allowing the quantification of overlaps in hectares. To add an ecological dimension to the analysis, the resulting layers were again intersected with the biome layer, making it possible to identify the predominant biome in each overlap area.

Finally, the data obtained were organized into tables and exported for the preparation of graphs and analytical representations, with the aim of facilitating the interpretation of the results and supporting reflections on the conflicts and convergences in the use and protection of the national territory.

## Study Area

The study area corresponds to Brazilian territory, which covers approximately 8.5 million km<sup>2</sup> and is home to one of the greatest biological, ecological, and sociocultural diversities in the world. According to the IBGE (2019), Brazil is divided into seven major continental biomes: Amazônia, Cerrado, Caatinga, Mata Atlântica, Pampa, Pantanal e o Sistema Costeiro-Marinho.

In this context, different forms of appropriation and management of natural resources coexist, notably ILs, QTs, and CUs, as well as various conflicts and convergences between these categories of land use and protection.

The country has a significant network of CUs established through the NSCU. According to the National Register of Conservation Units (NRCU), there are currently 2,699 CUs in Brazil, of which 1,383 are fully protected

and 1,316 are for SU, covering approximately 18% of the national territory (MMA, 2024). Most of these areas are concentrated in the Amazon, although there is also significant presence in the Cerrado and Mata Atlântica biomes.

At the same time, FUNAI recognizes around 750 ILs, of which approximately 480 are approved or regularized, representing around 13.8% of the national territory. Most of these areas are in the Amazon, where more than 98% of the ILs is concentrated (FUNAI, 2023; ISA, 2023).

About QTs, INCRA has registered more than 1,800 certified communities, of which around 180 have full or partial title. These territories are mainly distributed in the Mata Atlântica, Cerrado, and Caatinga biomes, reflecting the historical processes of occupation and resistance of afro-descendants (INCRA, 2023).

### **Data Used**

The data used in this study were obtained from official databases and refer to four main categories: QTs, ILs, CUs, and Brazilian biomes, as shown in Table 2. The information was organized in vector format (shapefile), using the SIRGAS 2000 reference system, and underwent topological review to ensure spatial consistency. All data were already standardized within the same coordinate reference system, with no need for reprojection.

The TQ layer was obtained from INCRA and brings together polygons of regularized areas or areas in the process of regularization, containing attributes such as the name of the territory and the officially delimited area. The ILs were represented by data provided by FUNAI, covering the recognized territorial boundaries, also accompanied by information on nomenclature and area, considering the different stages of the demarcation process.

The CUs were extracted from the MMA geospatial database, covering protected areas belonging to the federal, state, and municipal levels. This database includes attributes such as the name of the unit, category (IP or SU), existence of a management plan, and responsible administrative. Finally, the layer of Brazilian biomes was obtained from the official mapping provided by the IBGE, being used as an ecological reference to spatially contextualize the results obtained and associate the overlaps identified with the country's major natural regions.

The data were integrated and processed in the QGIS software, enabling intersection analyses and the calculation of overlapping areas between the different territorial sections analyzed.

Table 2 – Data used in the document.

Category	Type of Data	Attributes Used	Digital Format	Source	Access at
QT	Vector	Name of territory and area	Shapefile	INCRA	Access at: 03 jul. 2025
IL	Vector	Name of indigenous land and area	Shapefile	FUNAI	Access at: 03 jul. 2025
CU	Vector	Name of conservation unit, category, management plan, jurisdiction, and area	Shapefile	ICMBIO	Access at: 03 jul. 2025
Biomes	Vector	Biome name	Shapefile	IBGE	Access at: 03 jul. 2025

Source: Brasil (2000).

## Geoprocessing

To conduct this study, geoprocessing techniques were applied to identify and quantify overlaps between CUs, traditional territories, indigenous territories, and Brazilian biomes. All procedures were performed using QGIS software, a free, multiplatform Geographic Information System (GIS) environment, version 3.26.

Initially, the thematic bases were standardized, consisting of vector layers referring to QTs (INCRA), CUs (ICMBIO), ILs (FUNAI), and national biomes (IBGE). The information in each layer was structured to ensure compatibility between cartographic projections, scales, and descriptive attributes.

Next, intersections were performed between the polygons of the CUs and the territorial boundaries of the QTs and ILs, using the “Intersection” tool available in the Processing > Toolbox > Geoprocessing menu. The first operation resulted in features representing the overlaps between QTs and CUs, while the second identified the overlaps between ILs and CUs. The generated features retained the descriptive attributes of the CUs, such as name, management plan, category, and administrative units, allowing for integrated analysis of the overlapping territories.

Subsequently, the intersection areas were calculated, both in absolute values (km<sup>2</sup>) and relative values, using the “Field Calculator”, tool to generate new attributes based on the geometry of the features. This quantification allowed us to assess the extent and intensity of the overlaps, expressed in hectares and percentages in relation to the original areas of each thematic layer involved.

The geometries obtained in the previous steps were crossed with the biome layer using the intersection tool again, allowing the identification of the biome corresponding to each overlapping area. This made it possible to verify the distribution of intersections according to the country's major ecological regions, contributing to the environmental contextualization of the identified territorial conflicts or convergences.

Finally, the results generated were organized into tables, graphs, and analytical reports, facilitating the visualization and interpretation, in addition to providing technical support for integrated management and territorial planning in overlapped areas between TTs and CUs.

### III. RESULTS AND DISCUSSION

#### Overview of Overlaps

According to the data analyzed, overlaps with values close to 0% will not be quantified because they are the result of topological errors or inaccuracies in the vector boundaries of the layers used and may not reflect actual conflict situations. Thus, considering the set analyzed, the 440 QTs total an area of approximately 31,780.85 km<sup>2</sup>. Of these, 124 overlapped with CUs, corresponding to 21.4% of the total QTs and an overlapping area of 14,561.30 km<sup>2</sup>, equivalent to about 45.8% of the total area occupied by these lands.

In the case of ITs, 637 areas were identified, covering a total area of 1,177,168.56 km<sup>2</sup>. Among them, 173 overlapped with CUs, representing 19.5% of the total number of indigenous territories and an overlapping area of 125,469.99 km<sup>2</sup>, corresponding to approximately 10.7% of the total area of these lands. This information is summarized in Table 3.

Table 3 – Quantity and total area of overlaps with CUs

TTs	Total Quantity	Total Area (km <sup>2</sup> )	Number of Overlaps	Total Overlap Area (km <sup>2</sup> )
QTs	440	31,780.85	124	14,561.30
ITs	637	1,177,168.56	173	125,469.99

Sources: the authors (2025).

Figure 2 illustrates the spatial distribution of these overlaps, showing that the largest areas of territorial conflict are mainly concentrated in northern Brazil, where there is a high density of indigenous territories and communal lands, as well as extensive CUs and other land uses. The figure shows the intersections between communal lands and indigenous territories, visually highlighting some locations with intense overlap.

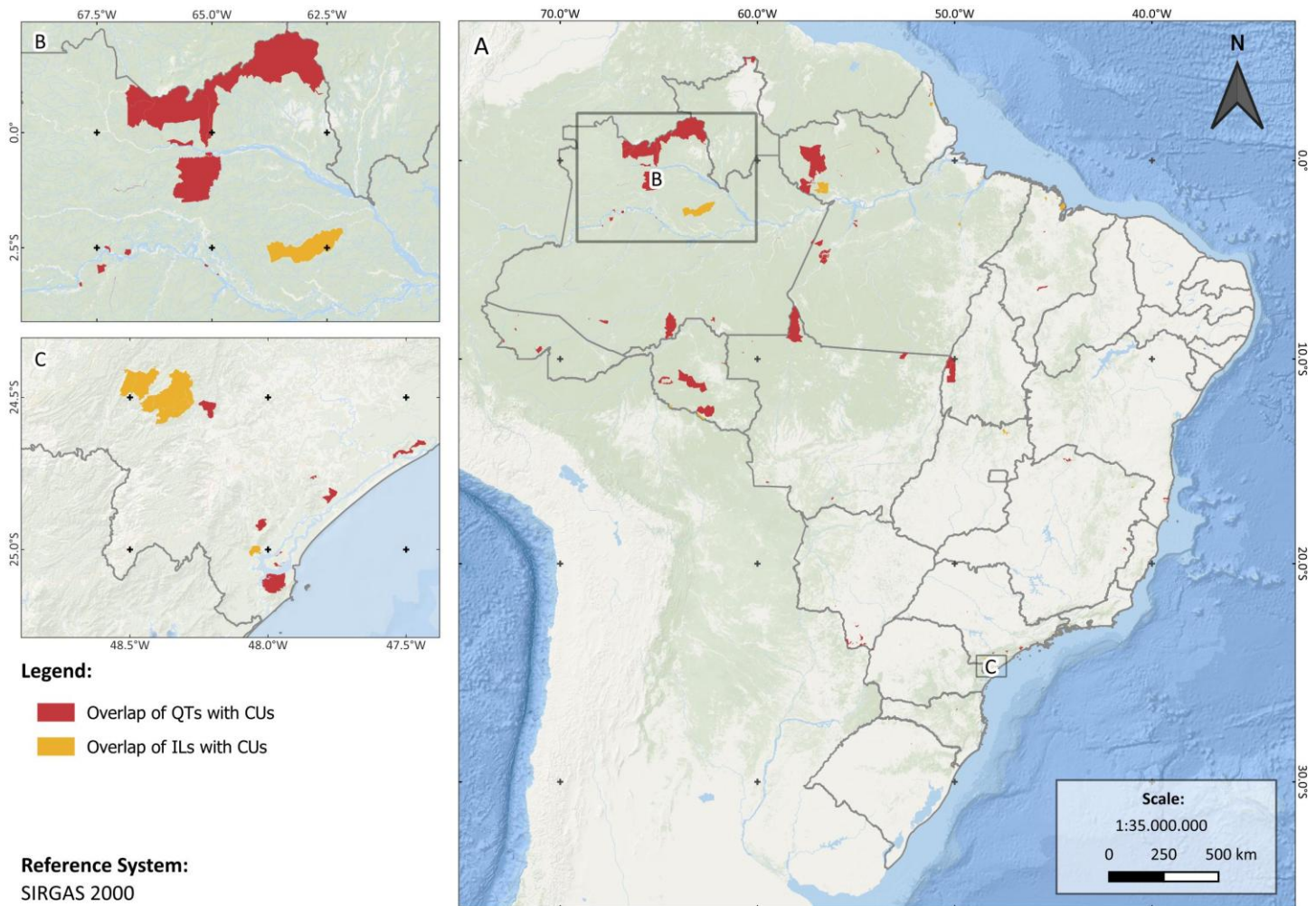


Figure 2 – Area with overlaps of QTs and ILs with CUs.

### Percentage of Overlap

The graph in Figure 3 illustrates the percentage distribution of overlaps between QTs and CUs, showing a wide variation in the intensity of these intersections, ranging between values. This range reveals the territorial heterogeneity of overlap cases, indicating that while some QTs only partially overlap with CUs, others are entirely within their boundaries.

It can be observed that most occurrences, corresponding to approximately 61% of cases, have overlap percentages above 75% (range (75%, 100%)). This data suggests that, in most cases, *quilombola* communities are totally or almost totally contained within legally protected areas. This situation tends to intensify land and regulatory conflicts, since the restrictions imposed by environmental legislation can limit the traditional use of the territory and compromise activities essential to the physical and cultural reproduction of these populations.

On the other hand, cases of low overlap, in the range [1%, 25%], represent the second largest category, with about 39 occurrences. This proportion indicates situations in which the boundaries between QTs and CUs only partially coincide, reflecting transition zones, areas of shared use, or topological errors. Intermediate overlaps, in the ranges (25%, 50%] and (50%, 75%], are the least frequent, totaling about 11 and 13, respectively. Although less intense, these partial overlaps also require attention, as they can generate disputes over jurisdiction and uncertainties regarding natural resource management.

The disparity between the extreme ranges (low and high overlap) underscores the need for differentiated territorial management approaches that consider the intensity of the intersection to mitigate impacts on the rights and way of life of *quilombola* communities.

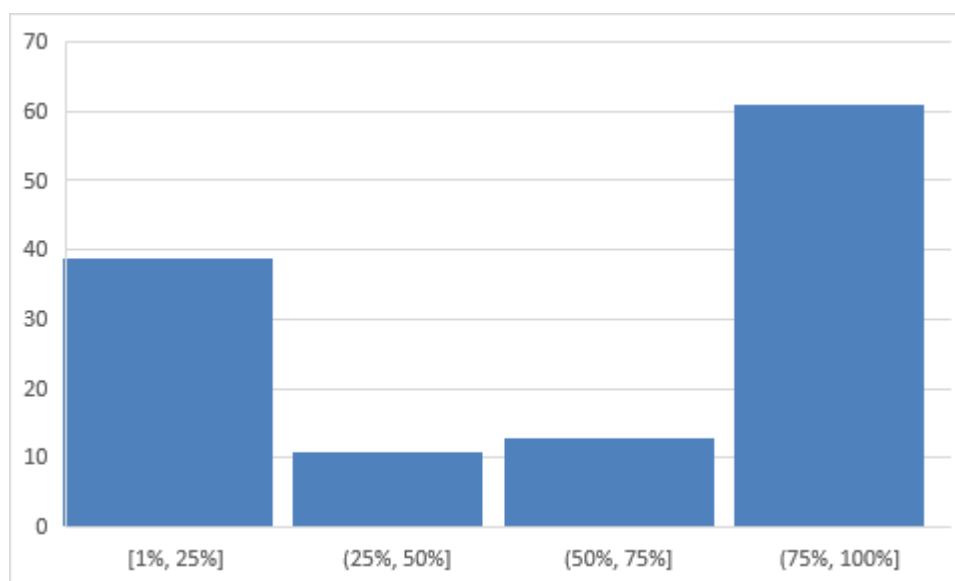


Figure 3 – Percentage of TQ overlaps with CUs.

The graph in Figure 4 shows the overlaps between QTs and CUs, highlighting a predominance in the SU categories, especially in SDR and EPA. On the other hand, the presence of QTs in IPUnits reveals the persistence of structural conflicts between conservation policies and the territorial rights of traditional communities.

It should be noted that the percentages presented represent the average proportion of the area of each *quilombola* territory that overlaps with a CU. In other words, the averages express the average degree of overlap per community, considering both cases in which the territory is totally inserted (100%) within the unit and those partially overlapped (for example, 30% or 50%). Thus, the values reflect the average intensity of territorial coincidence between QTs and the different categories of CUs.

The SDR have the highest average overlap, at 87%. This figure is particularly significant, as it indicates that, for most of the affected *quilombola* communities, a large part of their territories lie within the boundaries

of these units. As the basic objective of SDR is to protect the livelihoods and culture of traditional populations, ensuring the sustainable use of natural resources, this result suggests that many of them were created in areas already occupied and managed by *quilombola* communities, reflecting a convergence between conservation and traditional permanence.

EPAs, also for SU, have an average overlap of 74% per community. By allowing human presence and certain productive activities under specific restrictions, this result reinforces that conservation policy sought to incorporate traditional occupation into its scope. However, the coexistence of environmental restrictions and traditional productive practices can generate conflicts in management and land use, especially when the management plan imposes limitations on community activities.

EXRESs, with an average of 22%, show more modest values, although still representative of the interaction between conservation and traditional presence. This pattern confirms the vocation of EXRESs for coexistence with local communities, articulating sustainable use with the conservation of natural resources.

Overlaps in IPUnits are the most critical aspect of the analysis, since these categories do not allow human presence or direct use of natural resources. BIORE registers an average of 60% overlap per community, revealing situations in which a large part of the *quilombola* territory is in areas designated for integral preservation. This result highlights the possibility of historical and structural conflicts, in which traditional territories were later converted into restricted protection areas.

NAMOs have an average of 48%, indicating a significant overlap between natural sites of unique value and historically occupied territories, reflecting the overlap between cultural and ecological values. NAPAR, with an average of 39%, demonstrates the persistence of land and rights conflicts, since the legislation requires the expropriation and removal of resident populations.

WR have an average of 27%, reinforcing that, even in categories of integral protection, there are significant occurrences of overlap. Finally, PNHR have the lowest average, 8%, which is to be expected given their private and voluntary nature.

The results indicate that SU Units have the most intense overlaps, revealing that the affected communities have a large part of their territories included in CUs of this category. This suggests that the creation of several units occurred in areas of pre-existing traditional occupation, or even as a form of recognition of these occupations.

On the other hand, the IPUnits highlight highly complex land and regulatory conflicts. The presence of QTs in areas legally prohibited for human occupation reveals contradictions between conservation policy and the constitutional rights of *quilombola* communities.

Given this scenario, it is essential to adopt integrated and differentiated management strategies that recognize the prior occupation of *quilombolas* and promote conciliatory solutions between conservation and territorial justice. Reconciling environmental protection and collective rights requires a review of management plans and the implementation of participatory governance mechanisms capable of simultaneously ensuring ecological sustainability and legal security for *quilombola* communities located in CUs, especially those in indigenous territories.

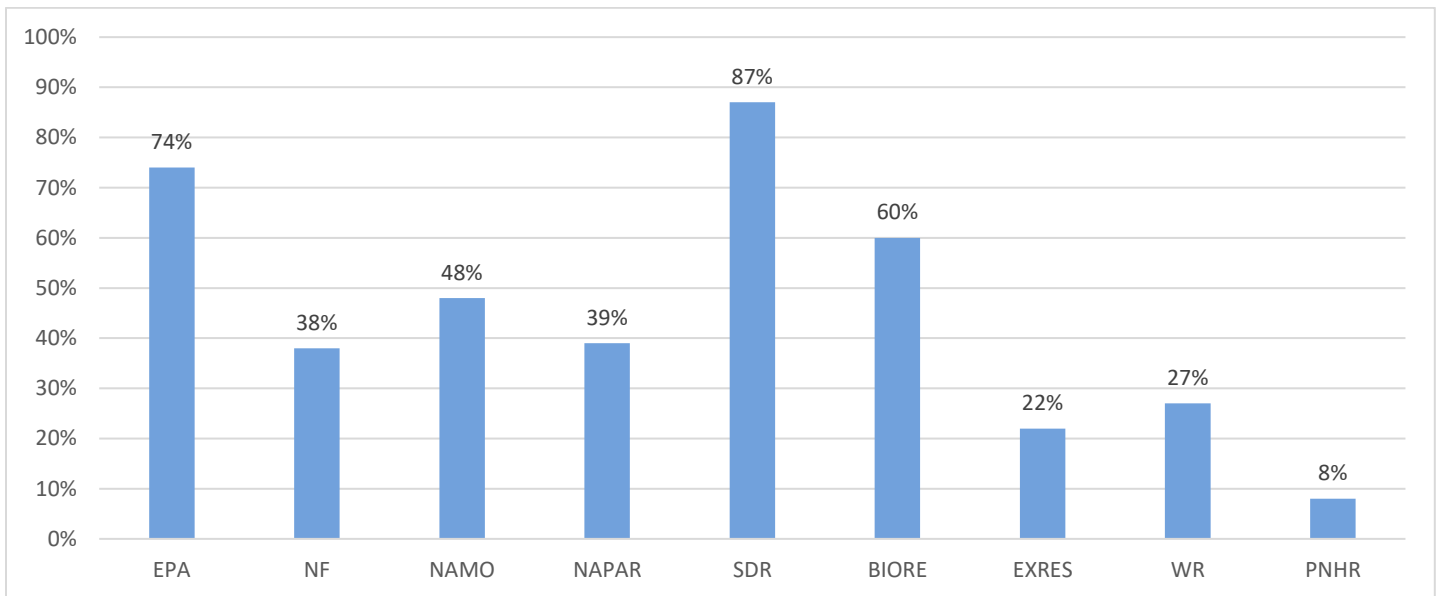


Figure 4 – Average Percentage of Overlaps between QTs and CU categories.

The graph shown in Figure 5 illustrates the distribution of the relative frequency of percentage overlap between two territorial categories, ILs and CUs. The analysis considers four ranges of overlap intensity, allowing the identification of patterns of incidence between cases of partial and total intersection.

The results reveal a distribution with two peaks of concentration: one of low intensity and the other of almost total overlap. The first, located in the range [1%, 25%], concentrates approximately 93 occurrences, indicating that, in most cases, the area of intersection between ILs and CUs is small, not exceeding a quarter of the total reference area (either the IL or the CU). This pattern suggests the existence of marginal or tangential contacts between the boundaries of the two territorial categories, possibly associated with independent administrative delimitation processes, localized territorial adjustments, or even topological errors in the creation of these boundaries.

In contrast, the intermediate overlap ranges are substantially less frequent, accounting for 17 of the cases for the interval (25%, 50%) and 13 for (50%, 75%). The second significant peak is concentrated in the high overlap interval (75%, 100%), which accounts for about 50 of the occurrences. This result is particularly significant, as it highlights the existence of cases in which the IL almost completely overlaps with the CU. Such situations may correspond to processes of creating CUs over areas already recognized as ILs or vice versa, reflecting historical and institutional overlaps and, potentially, conflicts over management and territorial rights.

In general, it suggests that the phenomena of overlap between ILs and CUs tend to be concentrated at two extremes: marginal or almost total overlaps. This configuration reflects the coexistence of two distinct logics of territorial formation. The first, associated with low-intensity overlaps, seems to result from specific border adjustments or residual interactions. The second, high-intensity overlap indicates cases of full overlap, in which territorial boundaries have been defined in such a way that the IL coincides with the CU, creating situations of complete overlap that require specific arrangements for governance and shared management.

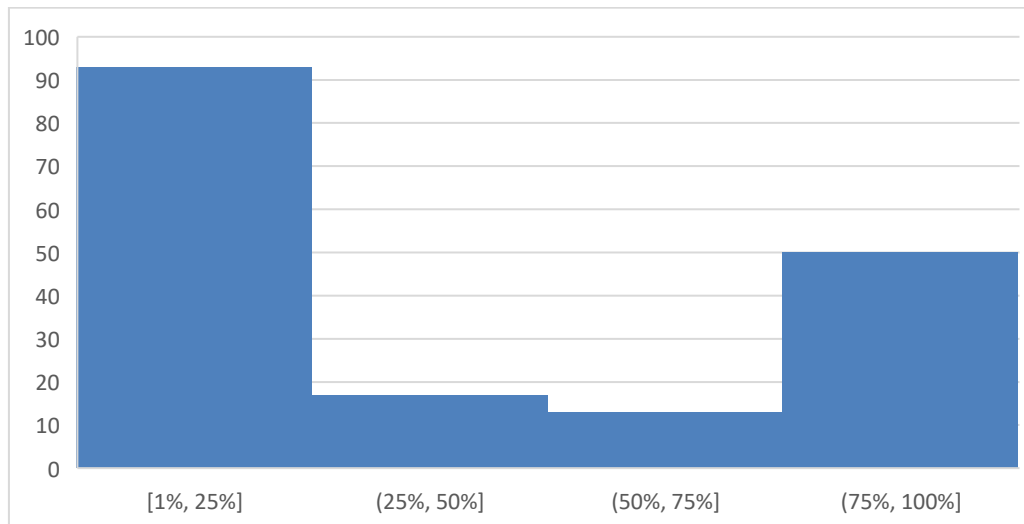


Figure 5 – Percentage of IL overlaps with CUs.

The graph shown in Figure 6 shows that SU Units, designed to reconcile environmental conservation and rational use of natural resources, had the highest rates of individual overlap with ILs. The main categories were: EPAs, with 57%; SDR, with 40%; and NFs, with 38%.

The high overlap with EPAs is particularly relevant, since these units have a more flexible protection regime, allowing human occupation, productive activities, and direct use of resources. This pattern indicates a convergence between conservation policies and the permanence of traditional ways of life, in which ILs and EPAs tend to coexist in a relatively harmonious manner.

Similarly, the significant presence of ILs in SDRs (40%) and NFs (38%) reinforces the role of indigenous populations in the active management of forest ecosystems. SDRs are legally focused on protecting the livelihoods and culture of traditional populations, which explains the high territorial overlap with ILs. These results corroborate the literature that points to the effectiveness of traditional management practices in environmental conservation and the importance of ILs as de facto conservation areas, even if not formally recognized as such.

Although IPCUs show, on average, lower percentages of overlap with ILs, the values observed remain relevant from a territorial and political point of view. The most representative categories were NAPAR, with 45%; BIORE, with 16%; ECST with 6%; and WR, with 5%.

The spotlight falls on NAPAR, national parks that have been the focus of tensions between conservation policies and indigenous territorial rights, since their protection regime restricts direct use and human occupation. The high incidence of ILs within NAPARs highlights historical processes of institutional overlap and persistent management conflicts.

The most restrictive categories, such as ECST and WR, exhibit the lowest overlap rates (6% and 5%, respectively), which is consistent with their stricter preservation rules and prohibition of permanent human presence. Even so, their existence within indigenous areas demonstrates that even the strictest forms of conservation are not entirely dissociated from traditionally inhabited territories, highlighting complex overlaps between conservation and ancestral occupation.

The results obtained allow us to identify two distinct patterns of spatial relationship between ILs and CUs in Brazil. First, the high rates of overlap with SU Units indicate structural compatibility between traditional indigenous management and conservation principles based on the sustainable use of resources. In this context, ILs not only coexist with CU, but also enhance their conservation objectives, acting as strategic allies for the maintenance of ecosystems and sociocultural diversity.

On the other hand, overlap with IPUnits, especially with National Parks, highlights areas of institutional tension, where indigenous territorial rights clash with strict legal protection regimes. Such situations require shared management arrangements and revisions of regulatory instruments to reconcile biodiversity protection with the recognition of indigenous autonomy and permanence in their territories.

ILs are central agents in environmental conservation, contributing to the ecological integrity of vast protected areas. Thus, overlaps with CUs should be interpreted not only as a source of conflict, but as opportunities to strengthen integrated policies capable of recognizing indigenous leadership in conservation

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and overcoming the exclusionary paradigm of integral protection that still guides part of Brazilian environmental policy.

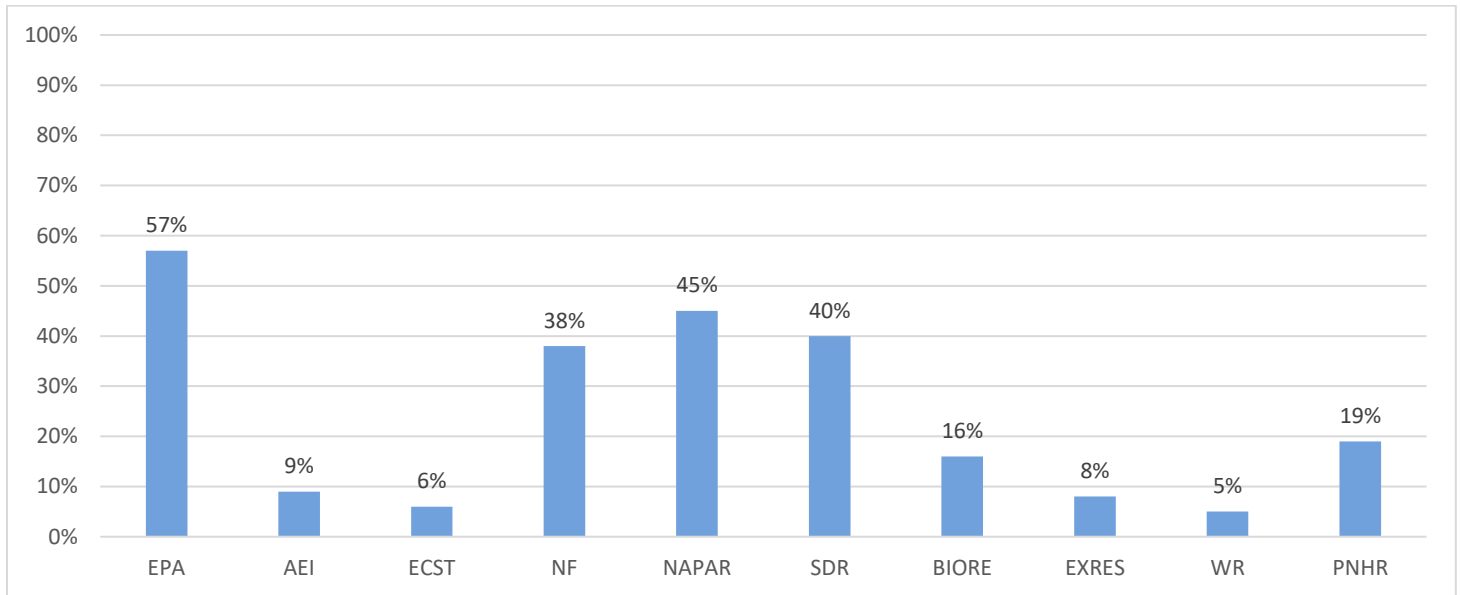


Figure 6 – Average Percentage of Overlaps between IL and CU categories.

### Number of Overlaps by CU Category

A detailed analysis of the territorial overlaps between QTs, ILs, and CUs, as shown in Figures 7 and 8, reveals a complex and multifaceted picture of land conflicts, institutional weaknesses, and challenges for environmental and territorial governance in the country.

The highest volume of overlaps for both territorial categories (QTs: 97; ILs: 110) occurs with SU CUs. This scenario is dominated by the EPA, which alone accounts for 79% of QT overlaps with CUs and 63% of IL overlaps with CUs.

The high incidence of overlap with EPAs, even though they are SU CUs, indicates a management challenge. EPAs have a more flexible protection regime, allowing human occupation and regulated economic activities. However, the massive overlap suggests that the creation of these CUs did not adequately consider the boundaries and territorial rights of QTs and ILs, creating legal uncertainty and potential conflict over management plans and land use guidelines.

In contrast, overlap with categories such as EXRES and SDR is less significant, but of a different nature. These CUs are explicitly created to protect the livelihoods and culture of traditional populations, such as *quilombolas* and indigenous peoples. The overlap with these categories, although less numerous (EXRES: 8 QTs and 18 ILs; SDR: 1 QT and 7 ILs), may indicate formal recognition of the presence of these communities, but still

requires integrated and participatory management to ensure the realization of territorial rights and conservation.

Overlaps with IPCUs (QTs: 27; ILs: 63) are less frequent in absolute numbers, but represent the core of the land and cultural conflict mentioned in the introductory text.

NAPAR is the IP category with the greatest overlap (19 QTs and 48 ILs). Overlap with NAPAR is particularly critical, as IP legislation prohibits the permanence of traditional populations and the direct use of resources, directly conflicting with the constitutional rights of QTs and ILs to possession of their lands and maintenance of their ways of life. This impasse requires urgent reassessment, as the legal restriction imposed by IP CUs effectively nullifies the territorial and cultural rights of communities.

The greater overlap of ILs with IP CUs (63 cases) compared to QTs (27 cases) suggests that ILs face an even greater challenge in relation to the use restrictions imposed by these stricter conservation categories.

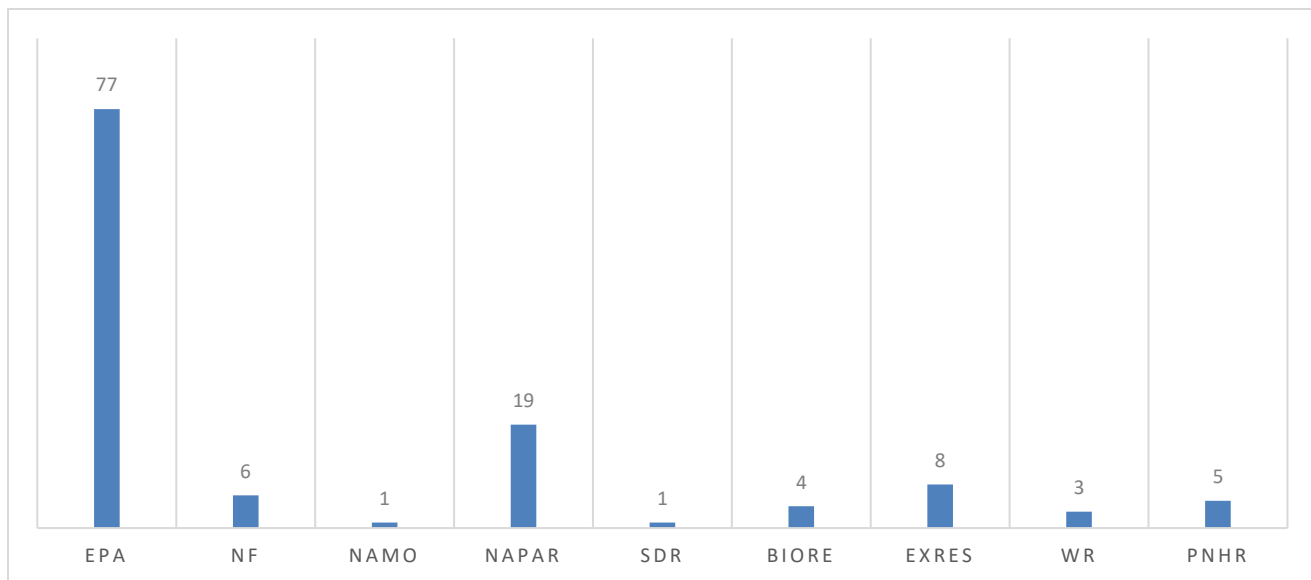


Figure 7 – Number of overlaps between TQ and CU categories.

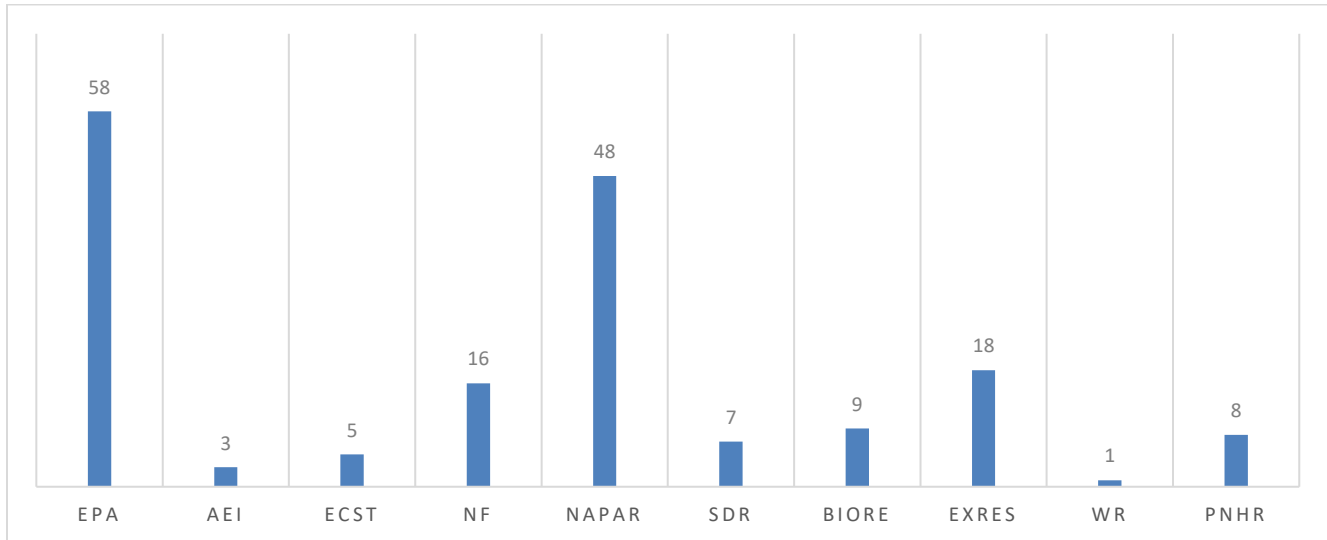


Figure 8 – Quantity (units) of IT overlaps with CU categories.

The analysis of the quantity and area of overlaps between TTs and CUs by biome reveals distinct spatial patterns between ILs and QTs, highlighting the importance of considering regional specificities in territorial planning.

Among the ILs, there is a strong concentration of overlaps in the Amazon, with 71 records and a total area of 11,662,436.12 ha, which reflects not only the extent of the biome, but also the widespread presence of these territories in the region. Next is the Mata Atlântica, with 74 overlaps and 199,079.91 ha overlapping, highlighting significant territorial conflicts also in more densely populated areas. The Cerrado has 17 overlaps (676,447.21 ha), followed by the Caatinga, with 8 records (11,414.79 ha). In the Pantanal and Pampa biomes, there were 2 and 1 overlaps, with areas of 13,548.78 ha and 525.66 ha, respectively.

In the case of QTs, the distribution of overlaps is more balanced between biomes. The Mata Atlântica has the highest number of records, with 66 overlaps and a total area of 53,200.93 ha, followed by the Amazon, with 43 overlaps and 1,344,460.24 ha. The Caatinga has 8 records (10,539.12 ha), the Cerrado has 4 (47,850.48 ha), and the Pampa has 3 (371.45 ha). The Pantanal did not show any overlaps involving QTs in the databases analyzed.

These results, summarized in Table 4, show that although the Amazon has the largest total area overlapping between ILs and CUs, Traditional Communities are more widely dispersed, especially in biomes outside the Amazon region. This pattern reinforces the need for public policies that consider the socio-environmental particularities of each biome, with differentiated approaches to land regularization and territorial management.

Table 4 – Number of overlaps and total overlap area

TTs	Biomes	Number of Overlapping Territories (units)	Area with Overlap (ha)
ILs	Amazônia	71	11,662,436.12
	Caatinga	8	11,414.79
	Cerrado	17	676,447.21
	Mata Atlântica	74	199,079.91
	Pampa	1	525.66
	Pantanal	2	13,548.78
	QTs	Amazônia	43
Caatinga		8	10,539.12
Cerrado		4	47,850.48
Mata Atlântica		66	53,200.93
Pampa		3	371.45

Source: the authors(2023).

#### IV. CONCLUSION

A detailed analysis of the territorial overlaps between CUs and territorial territories, focusing on QTs and ILs, revealed a scenario of complex socio-environmental and institutional conflicts in Brazil. The study, based on geoprocessing techniques applied to official data, quantified and spatialized these intersections, confirming the thesis that Brazilian conservation policy, in many cases, has developed in dissonance with the territorial rights constitutionally guaranteed to traditional peoples and communities.

The results show that overlap is a significant phenomenon, affecting 45.8% of the total area of QTs and 10.7% of the total area of ILs. The most critical aspect is the high incidence of overlap with IPCUs, which, due to their restrictive use regime, generate legal uncertainty and the criminalization of traditional practices. Notably, ILs show greater overlap with IP CUs (63 cases) compared to QTs (27 cases), indicating an even greater challenge for indigenous permanence and autonomy.

The concentration of IL overlaps in the Amazon and the dispersion of QTs in biomes such as the Mata Atlântica, Cerrado, and Caatinga underscore the need for differentiated and regionalized territorial management approaches. The prevalence of overlaps with SU CUs, such as WPAs and SDRs, although less restrictive, still requires the urgent implementation of management plans and shared management mechanisms that recognize and integrate traditional knowledge and management as central elements for conservation.

In short, the persistence of these overlaps is a symptom of the failure to harmonize land and environmental policies. Overcoming these conflicts necessarily involves recognizing the effectiveness of traditional territorialities in biodiversity conservation and adopting a new management paradigm. This paradigm must prioritize socio-environmental justice, shared management, and the revision of regulatory instruments that currently place the constitutional rights of traditional peoples in conflict with environmental protection objectives. The effective integration of traditional knowledge into the planning and implementation of conservation policies is the way to ensure both the ecological integrity of the national territory and the full exercise of cultural and territorial rights.

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