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Leveraging Carbon Offsets: A Multidisciplinary Analysis of Climate Action in Brazilian Indigenous Territories

Working Paper nº 07/2025

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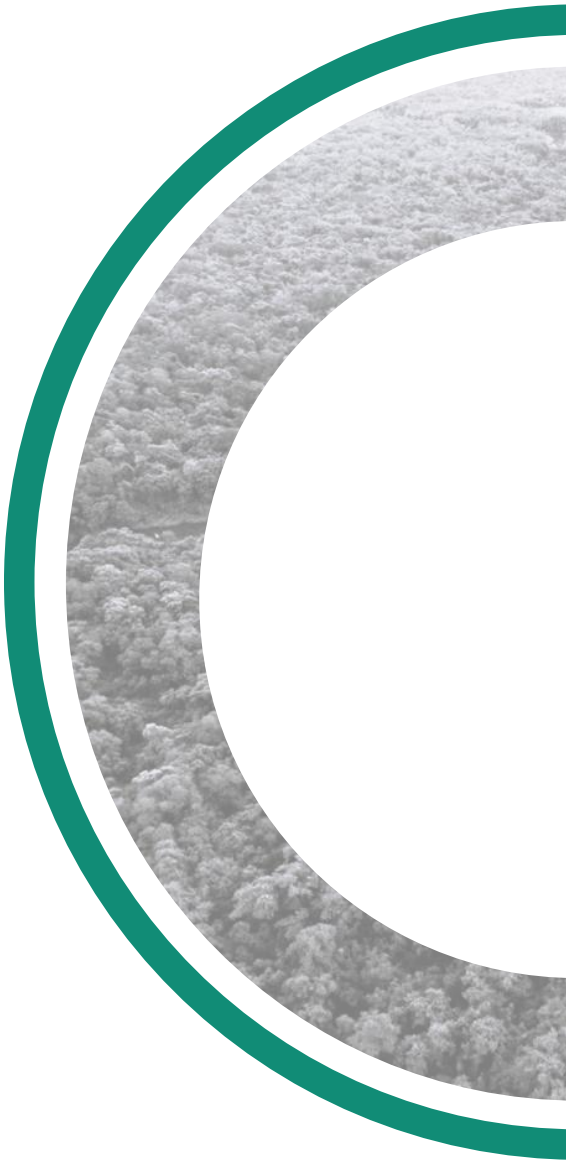

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Abstract

As the global climate crisis intensifies, Indigenous lands-particularly those in Brazil, which contain over 19% of the country's remaining native vegetation-are increasingly recognized as vital carbon sinks and frontline territories in the fight against deforestation. However, despite their critical role in climate mitigation, these territories remain underrepresented in carbon market strategies. This article presents a multidisciplinary investigation into the potential, risks, and regulatory challenges of implementing equitable carbon credit mechanisms on Indigenous lands, using the Suruí Forest Carbon Project (SFCP) as a case study. By integrating multiple research methods, we assess the current landscape of REDD+ (Reducing Emissions from Deforestation and Forest Degradation) and voluntary carbon market initiatives in Brazil. The study includes a systematic literature review and highlights structural barriers such as weak governance, lack of regulatory clarity, and risks of "carbon grabbing". It also outlines enabling factors-including Free, Prior and Informed Consent (FPIC), Indigenous governance protocols, and transparent benefit-sharing systems-that can guide ethical implementation. The Suruí case demonstrates both the transformative potential and operational complexities of Indigenous-led climate initiatives. It showcases how traditional knowledge, territorial self-determination, and environmental stewardship can converge in effective climate action-if properly supported by public policy, legal safeguards, and respectful corporate engagement. This research offers actionable recommendations for policymakers and private actors seeking to develop just and sustainable carbon markets. It emphasizes that Indigenous inclusion is not only a matter of rights but a cornerstone for climate solutions that are both socially fair and ecologically robust. The findings contribute to an emerging body of knowledge that seeks to align climate justice with Indigenous autonomy in the context of global decarbonization efforts.

Leveraging Carbon Offsets: A Multidisciplinary Analysis of Climate Action in Brazilian Indigenous Territories

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ABSTRACT
As the global climate crisis intensifies, Indigenous lands — particularly those in Brazil, which contain over 19% of the country's remaining native vegetation — are increasingly recognized as vital carbon sinks and frontline territories in the fight against deforestation. However, despite their critical role in climate mitigation, these territories remain underrepresented in carbon market strategies. This article presents a multidisciplinary investigation into the potential, risks, and regulatory challenges of implementing equitable carbon credit mechanisms on Indigenous lands, using the Suruí Forest Carbon Project (SFCP) as a case study. By integrating multiple research methods, we assess the current landscape of REDD+ (Reducing Emissions from Deforestation and Forest Degradation) and voluntary carbon market initiatives in Brazil. The study includes a systematic literature review and highlights structural barriers such as weak governance, lack of regulatory clarity, and risks of "carbon grabbing". It also outlines enabling factors — including Free, Prior and Informed Consent (FPIC), Indigenous governance protocols, and transparent benefit-sharing systems — that can guide ethical implementation. The Suruí case demonstrates both the transformative potential and operational complexities of Indigenous-led climate initiatives. It showcases how traditional knowledge, territorial self-determination, and environmental stewardship can converge in effective climate action — if properly supported by public policy, legal safeguards, and respectful corporate engagement. This research offers actionable recommendations for policymakers and private actors seeking to develop just and sustainable carbon markets. It emphasizes that Indigenous inclusion is not only a matter of rights but a cornerstone for climate solutions that are both socially fair and ecologically robust. The findings contribute to an emerging body of knowledge that seeks to align climate justice with Indigenous autonomy in the context of global decarbonization efforts.

KEYWORDS
Carbon Market, Indigenous Lands, REDD+, Indigenous Peoples, Social Justice, Sustainability, Brazil.

INTRODUCTION

Indigenous territories around the world are among the most ecologically preserved landscapes, playing a critical role in climate regulation, biodiversity protection, and cultural resilience. Their stewardship is increasingly recognized as essential to achieving global climate goals [1].

In Brazil, Indigenous lands represent approximately 13% of the national territory and safeguard nearly 19% of the country's native vegetation, positioning them as vital carbon sinks with unparalleled relevance for climate mitigation [2]. However, carbon offset mechanisms that aim to incentivize forest conservation have historically marginalized Indigenous peoples, either excluding them from decision-making processes or failing to ensure the equitable benefit sharing [3].

This study explores the potential and limitations of integrating Indigenous territories into carbon markets in ways that uphold environmental sustainability and Indigenous self-determination. Using a multidisciplinary approach, it combines legal analysis and qualitative social research to assess both enabling conditions and systemic barriers to Indigenous participation in carbon offset initiatives.

At the center of this analysis is the Suruí Forest Carbon Project (SFCP), the first Indigenous-led REDD+ initiative in Brazil. Through a detailed examination of this case, the study interrogates governance structures, benefit distribution, and the implementation of Free, Prior, and Informed Consent (FPIC), offering insights that may inform future public policies and corporate climate actions [4]. Programs like REDD+ and the SFCP, when well-designed and effectively implemented, not only contribute to the preservation of critical ecosystem services but also generate positive socio-economic impacts for communities that directly depend on forests. These benefits include the creation of new income streams and the conservation of essential ecological functions. In doing so, REDD+ strengthens the resilience of local populations in the face of challenges posed by climate change and the increasing frequency of extreme weather events [5].

By synthesizing findings from a systematic literature review with a case study, this article aims to: (i) map the current landscape of carbon market initiatives in Indigenous lands in Brazil; (ii) identify regulatory, institutional, and operational challenges; and (iii) provide actionable policy and governance recommendations for more just and effective carbon mechanisms.

Despite its analytical contributions, this study also acknowledges key limitations. The absence of direct interviews with Indigenous communities and the restricted access to detailed geospatial data limited both the depth of sociocultural analysis and the precision of spatial assessments. These constraints reflect the exploratory nature of this initial phase in a broader research project that will incorporate additional case studies, participatory fieldwork, and more robust datasets.

Nonetheless, the article offers a timely and meaningful contribution to a field that remains underexplored in Brazilian academic literature. Its national scope is justified not only by Brazil's immense territorial and ecological significance but also by the global strategic importance of its Indigenous territories in combating climate change. By highlighting both the transformative potential and the persistent structural inequities in carbon markets, this study advances critical debates at the nexus of Indigenous rights, climate governance, and environmental justice.

The article is structured as follows. Section 2 presents the method framework and systematic review. Section 3 explores the theoretical and legal context of carbon markets in Indigenous lands. Section 4 examines the Suruí case. Section 5 discusses broader implications and policy recommendations. Section 6 outlines method limitations, and Section 7 concludes with final reflections and future research directions.

METHOD AND LITERATURE REVIEW

For this research, a systematic literature review was conducted with the aim of identifying contributions related to the implementation of public policies focused on reducing greenhouse gas (GHG) emissions, as established by the REDD+ mechanism. The review specifically focused on the integration of carbon market projects within Indigenous Territories (TIs) in Brazil. The analysis sought to understand how these initiatives have been structured and identifying the challenges and opportunities associated with Indigenous communities' participation in this context [6].

The recent approval of the Brazilian Emissions Trading System (BETS), formalized by Law No. 15,042, enacted on December 11, 2024, has further increased the relevance of this investigation. This legislation establishes the framework for a regulated carbon market in Brazil, aiming to reduce GHG emissions and promote sustainable practices across various economic sectors. By setting a regulatory foundation for the sale of carbon offset generated from environmental preservation initiatives, the law also raises critical questions about its implications for Indigenous peoples and their traditional lands [7]. Accordingly, this research sought to map the existing literature on the topic and identify knowledge gaps, providing a theoretical foundation for the objectives of the present article. Among these objectives, particular attention was given to public policies related to carbon offset and the rights and autonomy of Indigenous communities regarding activities that impact their territories.

Three major academic databases were selected for the literature search: "Periódicos CAPES", SciELO, and Scopus. These platforms were chosen due to their broad coverage of both Brazilian and international literature, ensuring access to high-quality, peer-reviewed, and up-to-date scientific articles. Each database offers distinct advantages: "Periódicos CAPES" aggregates a wide collection of scientific journals across multiple fields [8]; SciELO focuses on academic production from Latin America and the Caribbean, capturing critical local discussions [9]; and Scopus, with its international scope, is one of the most comprehensive indexes of high-impact scientific journals [10].

To ensure the relevance and alignment of the search results with the study's focus, a careful selection of keywords was conducted. The chosen terms reflected the core thematic areas of the investigation and were defined in both Portuguese and English to capture local production on the topic — given the study's focus on Brazil — while also maintaining an international perspective. The following terms were used: REDD+, carbon credit ("crédito de carbono"), Indigenous peoples ("povos indígenas"), Indigenous communities ("comunidades indígenas"), and Indigenous lands ("terras indígenas"). Boolean operators were employed to refine the search results and avoid dispersal into unrelated topics. The use of operators like "AND" was essential for logically combining keywords. For instance, by using "REDD+ AND carbon credit," the search was narrowed to documents addressing both concepts simultaneously. This strategy improved search precision, eliminated irrelevant results, and maximized the retrieval of useful materials.

The preliminary results of these search combinations are presented in Table 3, which shows the number of articles found in each database. In total, 113 articles were identified in "Periódicos CAPES", seven in SciELO, and 111 in Scopus, amounting to 231 initial entries. It is important to note that in Scopus, it was not feasible to apply keyword combinations in English during the final four search stages, as the returned results were excessively numerous, reaching hundreds or even thousands of publications. Consequently, the Scopus search was restricted to Portuguese terms. Despite this limitation, the findings were considered sufficient, providing a robust base of both national and international contributions, and fully meeting the research objectives.

Table 3 - Stage 3 of the Research, Partial Results

Research Stage	Keyword Combinations	Periódicos CAPES	SciELO	Scopus
i	REDD+ AND crédito de carbono	4	0	7
ii	REDD+ AND povos indígenas	3	3	27
iii	REDD+ AND comunidades indígenas	4	1	21
iv	REDD+ AND terras indígenas	8	0	56
v	REDD+ AND *carbon credit*	32	0	-
vi	REDD+ AND *indigenous peoples*	20	3	-
vii	REDD+ AND *indigenous communities*	18	0	-
viii	REDD+ AND *indigenous lands*	24	0	-
	Total	113	7	111

After completing the preliminary data collection, a duplication analysis was conducted to identify repeated entries, both within individual databases and across different databases. Subsequently, a qualitative screening was performed by reviewing titles and abstracts to eliminate articles that, although appearing in the search results, were not directly related to the study's scope. This filtering process was essential to ensure that only relevant documents aligned with the research topic were considered for the following stages. The consolidated data after this curation are presented in Table 4, providing a clear overview of the valid results and the exclusion criteria applied [11].

Table 4 – Stages 4, 5, and 6 of the Research: Final Results

Database	Initial Results	Duplicates (Same Database)	Duplicates (Across Databases)	Discarded	Final Count
CAPES	113	44	-	27	42
SciELO	7	3	2	0	2
Scopus	111	30	1	33	47
Total	231	77	3	60	91

At the end of this process, 91 articles remained, which were classified into seven main thematic areas for this research: (i) Environmental governance and legal frameworks of REDD+; (ii) Indigenous participation and leadership in the design and execution of climate policies; (iii) Measurement, Reporting, and Verification (MRV) methods on Indigenous lands; (iv) Socioeconomic impacts of the carbon market on Indigenous communities; (v) Safeguards and territorial rights of Indigenous peoples; (vi) National and international case studies on REDD+ implementation; and (vii) Critical perspectives and limitations of the REDD+ model in complex sociocultural contexts [12].

The selected articles reflect a wide thematic diversity that directly engages with the central pillars of this research, particularly concerning the carbon market within the context of the SFCP Discussions on environmental governance and legal frameworks for REDD+ highlight the complexity of integrating international carbon compensation mechanisms within national regulatory structures, revealing challenges related to regulation, transparency, and the alignment between environmental policies and socio-environmental rights [13]. These debates demonstrate how the legal framework can either enable or constrain initiatives like the SFCP, particularly regarding the legal security for Indigenous peoples involved.

Indigenous participation and leadership emerge as central themes in the literature, emphasizing the need to recognize and strengthen the role of Indigenous communities in the formulation, management, and implementation of climate projects. The success of initiatives in Indigenous territories is closely tied to autonomy, respect for traditional practices, and the effective application of Free, Prior, and Informed Consent (FPIC). This is particularly critical in the Suruí case, where Indigenous leadership was a key differentiator in the project's design [14].

Although less frequently explored, Measurement, Reporting, and Verification methods are identified as essential tools to ensure the credibility and environmental integrity of REDD+ projects. The literature suggests that MRV systems on Indigenous lands must be adapted to local realities, incorporating traditional knowledge while addressing infrastructure and technological access challenges. In the case of the SFCP, such adaptations are crucial to ensure recognition by international carbon markets [15].

The socioeconomic impacts of carbon market initiatives on Indigenous communities also surface as a recurring theme, highlighting both the potential financial benefits and the risks of economic dependency and internal conflicts arising from uneven resource distribution. The literature stresses that for these projects to be sustainable, economic gains must be aligned with the strengthening of the communities' social and cultural structures, as evidenced in discussions surrounding the SFCP [16].

Safeguards and the territorial rights of Indigenous peoples are consistently emphasized as essential to prevent market mechanisms from leading to new forms of pressure or exploitation over Indigenous lands. Articles reinforce the importance of protective mechanisms that ensure environmental conservation efforts do not serve as a pretext to limit traditional land use or restrict the autonomy of Indigenous communities [17].

Case studies, both national and international, provide practical examples of REDD+ implementation, offering valuable lessons on governance, community participation, and operational challenges. These experiences closely parallel the SFCP, offering insights into best practices and warnings about issues such as internal governance, negotiations with external actors, and maintaining long-term environmental commitments [18].

Finally, critical perspectives on the REDD+ model highlight its limitations in complex sociocultural contexts, such as those experienced by Indigenous peoples. The literature questions the effectiveness of REDD+ as a market-based solution to structural environmental problems, pointing to the need for more integrated approaches that consider not only carbon metrics but also climate justice and human rights [19]. These critical reflections are vital for understanding both the true impact and the limitations of the carbon market in the case of the Suruí Forest, underscoring the importance of policies that move beyond purely economic logic and value the social and cultural sustainability of the communities involved.

These thematic areas allowed for a comprehensive identification of the key academic debates and practical experiences associated with the inclusion of Indigenous peoples in climate change mitigation strategies through REDD+. They reveal approaches ranging from the valorization of Indigenous identity to critiques of power asymmetries in global environmental governance [20].

It is acknowledged that a literature-based analysis focused on a single case study presents inherent limitations, particularly regarding a deep understanding of the sociocultural dynamics and perceptions of Indigenous communities engaged in REDD+ projects in Brazil. However, the choice to focus on a single case study, such as the SFCP, is justified by its emblematic relevance as a pioneering initiative within the Brazilian Indigenous context. This approach allows for an in-depth analysis of governance dynamics, community participation, and safeguard applications — critical elements for understanding the integration of Indigenous territories into carbon markets. In a field that remains underexplored, the study of the SFCP provides concrete and applicable insights, contributing to the improvement of public policies and environmental management models aligned with climate justice and Indigenous self-determination [21].

These method limitations will be further discussed in Chapter 6 of this article, where the chosen approach will be justified and potential directions for future research will be outlined, given that this article is part of a broader research project. Despite these constraints, the findings presented here offer a valuable initial contribution to the emerging debate on a topic that remains underrepresented in the Brazilian context, serving as a foundation for deeper and more participatory future investigations [22].

THEORETICAL CONTEXT: CARBON MARKETS AND CHALLENGES ON INDIGENOUS LANDS

The carbon market emerged as an international response to the challenges posed by climate change, with the creation of the Kyoto Protocol in 1997, which entered into force in 2005. This treaty established greenhouse gas emission reduction targets for developed countries and introduced the Clean Development Mechanism (CDM), which allowed the implementation of emission-reduction projects in developing countries, thereby contributing to the climate targets of industrialized nations [23].

In 2015, the Paris Agreement was adopted by 195 countries, aiming to limit global temperature rise to well below 2°C above pre-industrial levels, preferably to 1.5°C. The agreement reinforced the importance of market-based mechanisms such as REDD+, which incentivizes forest conservation in developing countries by offering financial compensation for avoided emissions. The recognition of REDD+ within the Paris Agreement ensured the continuation of

funding for forest conservation efforts, emphasizing the crucial role of tropical forests in mitigating climate change [24].

Over the past decades, growing global concern about climate change has driven the development of mechanisms aimed at reducing GHG emissions, notably through carbon markets, especially after international milestones like the Kyoto Protocol and the Paris Agreement. In this context, forest conservation and carbon offset projects have expanded worldwide, including initiatives on Indigenous lands, recognizing the strategic role these territories play in protecting biodiversity and regulating the climate. In Brazil, this movement is supported by the 1988 Constitution, which guarantees Indigenous territorial rights and encourages their participation in environmental policies. Seeking funding for sustainable projects, including those linked to the carbon market, has become a strategy for Indigenous communities to reconcile environmental preservation with socioeconomic development, in alignment with public policies and the demands of the global climate market [25].

Indigenous Territories in Brazil cover about 13% of the national territory, with 573 officially recognized areas — meaning lands that have been identified, demarcated, and homologated by the Brazilian State in accordance with the Constitution. These lands play a critical role in environmental conservation, having lost only 1% of their native vegetation over the past 38 years, compared to a 17% loss in private areas during the same period [25].

Nevertheless, deforestation within TIs remains a concern. Between 2019 and 2021, 40.5% of TIs experienced some level of deforestation, amounting to 232 affected areas. Of these, 2% suffered losses exceeding 500 hectares. From 2008 to 2022, total deforestation within TIs reached approximately 1,708 km², representing 2.38% of all deforestation recorded in the Brazilian Amazon during that period [26].

By 2024, 139 carbon market projects had been registered in Brazil under the Verra standard, employing various methodologies and distributed across different regions. Among them, seven projects followed the VM0007 methodology and thirteen adopted VM0015. A review of the Verra platform identified only one project developed by an Indigenous group and implemented within Indigenous Lands—the initiative led by the Paiter Suruí [27].

The remaining projects primarily involve traditional extractivist communities, notably riverside and rubber tapper populations, and are mostly located on private lands, albeit in some cases with historical occupation by traditional peoples. Mentions of Indigenous Peoples in other projects are generally limited to their presence in surrounding areas, with potential indirect benefits from environmental improvements [27].

The lack of transparency and detail in public information provided by the Verra registry further hampers the clear distinction between different types of proponents. Moreover, recent reports indicate weaknesses in the implementation of some projects, particularly regarding the fulfillment of Free, Prior, and Informed Consent (FPIC) obligations as required by international Indigenous rights standards. Cases like the ER139 project in Juína highlight issues such as inadequate community consultation and problems with benefit distribution, reinforcing the need for stronger governance and monitoring mechanisms [27].

Thus, although data suggests that PIPCTFAs participate in some carbon market initiatives in Brazil, the true inclusion and leadership of Indigenous peoples remain unclear, and safeguards need to be strengthened. A critical analysis of these numbers reveals not only the quantitative

growth of initiatives but also highlights qualitative challenges related to protecting Indigenous rights and ensuring the social legitimacy of such projects [27].

Integrating Indigenous communities into the carbon market offers an opportunity to enhance the already strong environmental stewardship of their territories. However, it is crucial that this integration respects their territorial and cultural rights, ensuring that benefits are distributed fairly and that communities have an active voice in the management of projects impacting their lands and ways of life. In this regard, ILO Convention No. 169, ratified by Brazil in 2004, guarantees Indigenous and tribal peoples the right to free, prior, and informed consultation on legislative or administrative measures that may affect them. Article 6 of the Convention states that "governments shall consult the peoples concerned, through appropriate procedures and in particular through their representative institutions, whenever consideration is being given to legislative or administrative measures that may affect them directly." Proper implementation of this consultation process fosters an environment of mutual respect and collaboration, ensuring that carbon offset projects are conducted ethically and sustainably, based on established consultation protocols [28].

The integration of Indigenous communities into the carbon market represents a strategic opportunity not only for environmental conservation but also for strengthening the political, economic, and cultural autonomy of Indigenous peoples. When designed and managed directly by the communities, these projects can generate substantial financial benefits that support local initiatives in education, health, food security, and institutional strengthening. Community management of carbon credits ensures that the resources are reinvested according to collectively defined priorities, promoting sustainable, self-determined development.

Moreover, removing private intermediaries tends to increase transparency, reduce contractual asymmetries, and ensure that a greater share of resources effectively reaches the communities. This approach reinforces Indigenous territorial and cultural rights by ensuring active and informed participation in all project phases — from initial design to result verification and benefit distribution. Thus, carbon credits can become not only climate mitigation tools but also instruments of environmental justice and historical reparation, provided they are implemented based on FPIC and respect for Indigenous governance systems.

In Brazil, the National Policy on Climate Change, established in 2009, laid the legal foundation for mitigation actions, referring to GHG emission reductions and the strengthening of carbon sinks like forests. However, this framework did not specifically address the implementation of carbon projects on Indigenous lands, creating both challenges and opportunities for communities interested in forest conservation and carbon credit generation. This legal gap has forced Indigenous communities to operate in a dynamic and uncertain legal environment, further complicated by the need to reconcile technical knowledge of carbon markets with traditional cultural values and governance practices [29].

Carbon projects on Indigenous lands have thus emerged not only as climate mitigation strategies but also as tools with the potential to strengthen Indigenous autonomy and territorial protection. The historical context of these projects includes both promising experiences and problematic cases, such as exploitative contracts by external agents. These experiences have underscored the need for clear regulatory frameworks, strong governance mechanisms, transparent consultation processes, and safeguards to ensure that carbon projects genuinely benefit Indigenous communities and contribute to conservation goals.

The implementation of these projects is also embedded in the broader struggle for Indigenous rights and self-determination. By taking leadership roles in carbon initiatives, Indigenous communities seek not only financial compensation for environmental services but also affirmation of their legitimacy in environmental governance and climate policymaking. This political and symbolic dimension is fundamental for understanding the significance of these projects beyond their immediate environmental and economic impacts, as they promote the visibility and historical recognition of Indigenous peoples' contributions to ecosystem conservation and climate solutions.

Indigenous lands in Brazil play a vital role in maintaining ecosystem services and preserving biodiversity. These territories host rich biological diversity and are essential for climate regulation. Traditional Indigenous land management practices contribute to the formation and sustainability of landscapes such as the Amazon, “Cerrado”, and Atlantic Forest, promoting environmental resilience. TIs have demonstrated remarkable resistance to deforestation, serving as refuges for biodiversity and protected areas [30].

Among the main types of carbon projects in Brazil, REDD+ initiatives stand out for their focus on forest conservation. REDD+ provides financial incentives for countries or communities that reduce emissions from deforestation and forest degradation. In Brazil, REDD+ is particularly relevant given the country’s emission profile, heavily linked to land-use change. REDD+ projects generate carbon credits that are certified and sold in voluntary markets, contributing to global emission reduction efforts [31].

The Brazilian legal framework recognizes Indigenous territorial rights, as enshrined in the 1988 Constitution. These rights are fundamental to environmental protection because they guarantee Indigenous peoples' ability to maintain traditional ways of life that contribute to ecosystem conservation. However, challenges remain in harmonizing public policies that respect Indigenous rights while promoting environmental sustainability.

Historically, Indigenous peoples have faced marginalization and territorial loss, resulting in socioeconomic challenges that hinder full participation in carbon compensation mechanisms. Ensuring the effective participation of Indigenous peoples in the design, implementation, and monitoring of carbon projects is essential, respecting their rights and traditional knowledge.

Poorly implemented carbon projects risk exploiting Indigenous communities, especially in the absence of transparency and respect for territorial rights. Cases of "carbon grabbing" — unauthorized land appropriation for carbon projects — highlight the need for stronger oversight. Notably, carbon market initiatives involving Indigenous lands in Brazil have raised concerns about transparency and rights violations. A case involving the company Carbonext, partially owned by Shell, showed contracts signed with Indigenous communities without broad consultation or proper knowledge by the National Foundation for Indigenous Peoples (FUNAI) and the Federal Prosecutor’s Office (MPF). Allegations include pressuring community members to sign blank documents and offering substantial advance payments to secure exclusive rights to carbon credit sales [32].

These contracts included potentially harmful clauses, leading to their referral for legal review. Following investigations, Carbonext rescinded the contracts, citing the need for greater legal security and committing to revising its practices to better respect Indigenous rights. Another case in August 2024 involved the MPF recommending the immediate suspension of carbon credit projects in Indigenous and traditional community territories in the Amazonas state due

to the lack of prior consultation, violating constitutional and international Indigenous rights [33].

Amid this contentious environment, the Brazilian Congress advanced efforts to establish the Brazilian Emissions Trading System (BETS), representing a significant step toward a regulated carbon market aligned with Brazil's Paris Agreement commitments. Enacted in December 2024, Law No. 15,042 establishes the foundation for a market aimed at reducing emissions and promoting sustainable development [34].

The BETS is divided into two segments: a regulated market, setting emission caps for specific sectors, and a voluntary market, allowing companies to offset emissions through the purchase of carbon credits linked to conservation projects. In the voluntary carbon market, companies and individuals buy credits to offset emissions without a legal mandate, with projects often involving REDD+, reforestation, and renewable energy.

This regulatory framework aims to incentivize GHG emission reductions and align Brazil with global climate goals. The mechanisms offer significant opportunities for conservation and sustainable development on Indigenous lands. Law No. 15,042 recognizes Indigenous and traditional community ownership of carbon credits generated on their lands and mandates socio-environmental safeguards, such as FPIC and fair benefit-sharing [6].

However, given its recent enactment, full implementation will require continuous regulatory development, monitoring, and technical capacity-building. The system's complete structure, including the establishment of management bodies and method guidelines, is expected to be finalized by 2030. Until then, it is critical to ensure transparency, equity, and respect for traditional rights to avoid distortions or exploitation in the low-carbon transition process.

Following this contextual overview of carbon offset mechanisms and their relevance to Indigenous lands in Brazil, this study will now focus on the Suruí Forest Carbon Project. This case study is essential for understanding the challenges, opportunities, and lessons learned from implementing carbon projects on Indigenous lands, offering insights into the complex intersection of environmental conservation, sustainable development, and the protection of Indigenous cultural and territorial rights.

CASE STUDY: THE SURUÍ FOREST CARBON PROJECT – INDIGENOUS PERSPECTIVES AND LESSONS LEARNED

Indigenous Territories play a key role in environmental conservation and in combating climate change, particularly in Brazil's Legal Amazon, where 21.2% of the Amazon is occupied by Indigenous lands. These areas represent 89.7% of all Indigenous territories in the country, covering over 106.2 million hectares. Data from the Institute for Conservation and Sustainable Development of the Amazon (IDESAM) indicate that, of the 633 officially recognized Indigenous territories in Brazil, 51.3% (325) are located in the Amazon, reinforcing their importance for biodiversity protection and for the implementation of carbon projects that value forest preservation and Indigenous leadership in reducing greenhouse gas emissions [11].

This study focus on the Forest Carbon Project of the Paiter Suruí people, who inhabit the "Sete de Setembro" Indigenous Territory (TISS), located in the Brazilian Amazon, between the states of Rondônia and Mato Grosso. The Suruí territory was officially recognized by Decree No. 88.867

of October 18, 1983, covering approximately 247,845 hectares across the municipalities of Cacoal and Espigão D'Oeste in Rondônia and the municipality of Rondolândia in Mato Grosso [36].

Historically, the Suruí made first contact with non-Indigenous people in 1969, triggering profound social and economic changes. Logging, which began in the 1980s, became a major source of income but also led to forest degradation and changes in traditional ways of life. From the 2000s onward, the Suruí began seeking alternative economic activities such as coffee production and livestock farming to replace timber revenues.

This local context is embedded within a broader regional landscape of intense environmental pressure. Mato Grosso and Rondônia together account for nearly half of the so-called "arc of deforestation," a region stretching across the southern Amazon from Maranhão and southern Pará to Acre. This 500,000 km² area is characterized by agricultural expansion, especially large-scale farming and cattle ranching, and is responsible for roughly 75% of deforestation recorded in the Legal Amazon. These two states cover an impressive 114 million hectares—larger than Texas and California combined, and nearly one-third the size of Western Europe [35].

Land pressure often translates into violence. Records from the Pastoral Land Commission (CPT) on land conflicts show that violence has intensified in Amazonian states where agribusiness is expanding. Between 2015 and 2017, 43.42% of the 3,461 land conflicts recorded in Brazil occurred in just five states — Tocantins, Pará, Maranhão, Mato Grosso, and Rondônia — where the impacts of this expansion are most evident [36].

Rondônia, specifically, stands out for having very few remaining forests outside of Indigenous lands and Conservation Units protected by federal or state environmental agencies [37]. This context underscores the importance of the Suruí Forest Carbon Project and Indigenous leadership in reducing greenhouse gas emissions. The SFCP was designed as a pioneering initiative led by the Paiter Suruí people to halt deforestation and related emissions within the TISS. It was driven by the need to find sustainable economic alternatives to ensure community well-being and preserve Suruí traditional culture [40].

To achieve these goals, the SFCP was developed based on four main themes: forest and environmental protection, food security and sustainable production, institutional strengthening, and the creation of a financial mechanism—the Suruí Fund. The project followed the Verified Carbon Standard (VCS) and method VM0015, which quantifies emission reductions by preventing unplanned deforestation through community-led forest protection and monitoring (REDD+) and was registered with the Verra platform [27].

The project used a land-use change projection model called SimSuruí, integrating demographic, economic, and vegetation data to estimate future deforestation in the TISS. Based on this model, the goal was to prevent the deforestation of 13,575.3 hectares of tropical forest by 2038, thereby avoiding the emission of 7,423,806.2 tonnes of CO_2 equivalent.

Understanding the governance and implementation of the project requires knowing the people who led it. The Suruí call themselves "Paiter", meaning "True People" in their own Tupi-Mondé language. Their social structure is based on clans, which define political organization, kinship, and marriage systems. The Paiter Suruí are divided into four clans: Gameb (black wasps), Gabgir (yellow wasps), Makor (bamboo), and Kaban ("mirindiba", a native fruit) [21].

The governance of the Paiter Suruí is built on this patrilineal, clan-based system, which strengthens their organization and fight for rights. In 2010, they revitalized this ancestral structure by formalizing their governance model. The Clan Council, with three representatives from each clan, is responsible for appointing the Labiway eSaga, the people's main leader. The governance model also includes five zones, each with five villages, with each zone electing two Labiway, totaling ten representatives. This system is supported by the Paiter Suruí Fund and by Indigenous and environmental NGOs that act as partners in territorial defense and development [40].

This governance structure enhances the Paiter Suruí's ability to exercise their right to self-determination, particularly in decision-making processes that affect their territories. In this sense, community consultation protocols—also known as autonomous protocols—are essential tools. They define the rules for the Free, Prior, and Informed Consent process, ensuring that cultural specificities, customary law, and collective decision-making systems are respected. These protocols are vital for safeguarding Indigenous and traditional peoples' rights in decisions that may affect their territories and ways of life, as outlined in ILO Convention 169, which has the force of law in Brazil.

Consultations must be transparent, free from coercion, and broadly participatory, respecting the cultural diversity of the peoples involved. Additionally, they must be binding, meaning that government decisions must incorporate the demands and positions expressed by the communities.

For the Paiter Suruí, political and normative autonomy is embodied in the creation of the Paiter Suruí Parliament, an institution grounded in their own values and responsible for decisions related to community life and natural resource use within the TISS. The Parliament promotes cultural revitalization, social equality, and sustainable development. Through collectively constructed codes and norms, it establishes principles, guidelines, rights, and duties that ensure quality of life, sustainability, and social organization [27].

The community's involvement in the SFCP was crucial to its planning and success. The FPIC process was carried out jointly with the Metareilá Association and ACT-Brasil, ensuring that the Suruí had access to all relevant information and could make informed decisions. This was a turning point that enabled the community to lead the project and ensure that its cultural values were respected. Indigenous governance in the SFCP was further strengthened through ethno-zoning, which identified sacred, productive, and conservation areas within the TISS. This zoning ensured that project activities respected Suruí traditions and territorial rights [27].

The project ultimately sought to protect the forest and the ecosystem services it provides. These services are essential to human well-being and include climate regulation, one of the key functions of forests, as they help balance atmospheric gases and mitigate global climate change. The Suruí's traditional economy reflects their social organization, which is divided into two halves: the forest half and the agricultural half. Families rotate between them each year, with one group focusing on agriculture and the other on hunting and gathering, ensuring diversity and balance in subsistence practices. Their economy is structured around kinship and this alternation, shaping the annual work calendar, rituals, and festivals [38].

The SFCP was designed to align with this reality and brought several socio-economic benefits to the Suruí community. The project created new sources of income through sustainable activities such as coffee production and agroforestry systems, reducing dependence on logging. It also generated direct and indirect jobs in land monitoring and management, improving the community's quality of life.

The Suruí Fund, a key financial mechanism for the project's sustainability, was created by the Brazilian Biodiversity Fund (FUNBIO) in response to a request from the Paiter Suruí for a transparent and autonomous way to manage revenues from carbon credit sales. Conceived by the Metareilá Indigenous Association and supported by FUNBIO and other organizations such as ECAM, Kanindé, IDESAM, and Forest Trends, the fund was launched at the 2010 United Nations Climate Change Conference (COP 16) in Cancún [12].

The fund was designed to operate for 50 years and support the implementation of the Ethno-Environmental Management Plan for the TISS, including activities for protection, surveillance, sustainable production, capacity-building, environmental conservation, and cultural strengthening. Initially, FUNBIO acted as the fund manager to ensure secure and transparent financial administration. Later, as originally planned, financial management was transferred to the Metareilá Association, enhancing the Paiter Suruí's autonomy and leadership in pursuing sustainable development [12].

The SFCP produced significant results in reducing deforestation and conserving biodiversity within the TISS, located in one of the most threatened parts of the Amazon. Prior to the project, the area had an average annual deforestation rate of 0.56%, driven by illegal activity and agricultural expansion. Following project implementation and effective management through the Suruí Fund, these rates dropped considerably, demonstrating the potential of Indigenous-led initiatives in promoting environmental conservation and sustainable development [39].

The estimate that the SFCP would avoid the emission of approximately 7.42 million tonnes of CO_2 equivalent was based on projections made in 2009, considering a 30-year period ending in 2038 and aiming to prevent the deforestation of around 12,217.8 hectares of tropical forest. These projections were formulated during the early phase of the project and reflect expectations for emissions reduction over time. However, the project faced major challenges, including the discovery of gold in the region, which led to increased external pressure and the project's suspension in 2018. As a result, actual outcomes may have diverged from initial estimates [40].

In addition to climate mitigation, the SFCP contributed to the preservation of threatened and endemic species, helping maintain the ecological integrity of the ethno-environmental corridor connecting the TISS to other Indigenous lands and nearby protected areas. This highlights the strategic role of Indigenous territorial conservation, not only for the local populations but also for the broader environmental resilience of the Amazon. The active participation of the Paiter Suruí in environmental monitoring and data collection was essential to the project's success. The combination of remote sensing technology with traditional knowledge and community mobilization strengthened deforestation control efforts and carbon stock monitoring, establishing the SFCP as an innovative reference in Indigenous-led climate solutions [40].

The Suruí case provides several key lessons for other REDD+ initiatives and Indigenous communities. One of the main challenges was ensuring effective community participation and respect for rights and traditions. The FPIC process and strengthened Indigenous governance were vital in overcoming these hurdles. Another important takeaway was the need to align the community's socioeconomic needs with conservation goals. The SFCP showed that income generation and forest protection can coexist when activities are participatory and sustainably managed [40].

The project also highlighted the importance of transparent financial mechanisms to guarantee the long-term sustainability of conservation initiatives. The Suruí Fund proved to be a successful model for managing financial resources to benefit both the community and the environment. Furthermore, the experience reinforces that a REDD+ approach based on rights, grounded in ILO Convention 169 and the UN Declaration on the Rights of Indigenous Peoples (UNDRIP), must prioritize the legal protection of traditional territories. This helps prevent states from appropriating Indigenous lands for REDD+ revenue, ensuring respect for Indigenous peoples' rights to ownership, use, and control of their territories [40].

While this analysis focuses on a single case study, it provides valuable insights that can contribute to broader understanding and inform future approaches to carbon project implementation in Indigenous territories. However, the selection of the SFCP as the object of analysis is justified by its pioneering relevance and the wealth of insights it provides. It stands as a leading example that offers valuable inputs for understanding the challenges and potential of carbon projects in Indigenous lands in Brazil — a still-emerging field with limited academic production. As such, this study represents an initial step in building a critical and reflective foundation to support the advancement of public policies and practices that are more just, sustainable, and aligned with the rights of Indigenous peoples.

ANALYSIS AND RECOMMENDATIONS: UNLOCKING THE POTENTIAL AND ADDRESSING BARRIERS TO EQUITABLE CLIMATE MECHANISMS

The SFCP stands as a pioneering initiative that integrates environmental conservation with global climate mitigation goals. Developed by the Paiter Suruí people, the project is implemented in the TISS located between the Brazilian states of Rondônia and Mato Grosso. Officially recognized in 1983, the TISS encompasses approximately 248,000 hectares and is home to around 1,200 Indigenous inhabitants. Situated within the so-called "arc of deforestation," the region faces intense environmental pressures, including illegal logging and agricultural expansion [40]. The SFCP aims to curb deforestation and associated greenhouse gas emissions in this high-pressure area within the TISS [35].

Beyond its positive environmental impacts, the project promotes sustainable development for the Paiter Suruí people through conservation-compatible economic alternatives, such as agroecological management, reforestation with native species, and the strengthening of sustainable value chains. These actions align with the "50-Year Life Plan," a political and strategic instrument guiding institutional strengthening, food security, and territorial control of the TISS [35].

However, the effectiveness of projects like the SFCP extends beyond the local sphere and depends on coordinated action by public institutions to combat illegal deforestation, especially in biomes under intense pressure, such as the Amazon. It is crucial for public policies to combine effective environmental monitoring, judicial accountability, and transparent data management, promoting coordinated action among various levels of government and civil society [17].

While this article focuses on already demarcated Indigenous lands, it is essential to recognize that in Brazil, there remains a vast array of Indigenous territories awaiting definitive demarcation, with communities advocating for recognition for decades [18]. This reality represents one of the greatest challenges faced by Indigenous peoples in the country, as the lack of full land regularization exposes these areas to intense pressures of invasion, environmental degradation, and violence, compromising both territorial rights and environmental conservation [16].

In this context of legal and environmental challenges, surveys conducted by the "Amazônia Protege" program, coordinated by the Federal Public Ministry initial phases of the program, encompassed significant areas of deforestation, with requested compensations amounting to billions of reais [13].

The states of Pará and Mato Grosso accounted for a significant portion of the filed lawsuits, while Pará and Rondônia also stood out in terms of the number of sentences issued or the volume of cases [13]. Additionally, the program identified 470 deforested areas located within 30-kilometers of Indigenous lands, with 13 situated within areas already recognized by FUNAI and inhabited by Indigenous populations [13]. These data underscore not only the increasing pressure on traditional territories but also the urgency of integrated public policies that link local actions, such as the SFCP, with national instruments for oversight and combating illegal activities [15].

The integrated analysis of the SFCP and data on deforestation pressure reinforces the need to align community-led initiatives by Indigenous peoples with structural actions for oversight, accountability, and environmental remediation [14]. Indigenous lands in Brazil, representing about 13% of the national territory, protect approximately 20% of the remaining native vegetation [1], highlighting their essential role in halting deforestation and preserving critical ecosystems [2]. These territories have proven to be more effective in environmental conservation than many conventional protected areas, even in the face of increasing external pressures [15]. The transformation toward climate and territorial justice in the Amazon will only be possible through the construction of multi-level and participatory governance that recognizes territorial rights, strengthens local institutional capacities, and integrates Indigenous knowledge into the formulation of environmental public policies [14].

Despite the advancements and pioneering nature of the SFCP, the project still faces challenges related to internal and external governance. Institutional complexity, involving multiple associations and the constant need for coordination among local and external actors, can weaken autonomous management [35]. There are also risks associated with external pressures, such as those exerted by loggers and land grabbers, which threaten Indigenous control and may lead to the misappropriation of project resources and benefits [28].

Reflecting broader concerns about the centrality of territorial rights, the Articulation of Indigenous Peoples of Brazil (APIB) maintains a firm stance against state initiatives that disregard the demarcation, protection, and sustainability of Indigenous territories [14]. The organization warns that a significant portion of lands traditionally occupied by Indigenous peoples in Brazil still await demarcation processes [18], exacerbating the social and environmental vulnerabilities of these communities. According to APIB, policies that ignore the urgent need to demarcate, protect, and ensure the sustainability of territories are merely palliative and do not address the real needs of Indigenous peoples [16].

In this context, initiatives like the SFCP become strategic by translating these demands into concrete actions on the ground [35]. To strengthen the autonomy of the Paiter Suruí in the face of these challenges, the SFCP includes actions aimed at leadership training, hiring specialized consultants, and acquiring equipment to enhance local governance and ensure the effective implementation of the life plan [35]. Notably, among these actions is the introduction of environmental monitoring systems based on remote sensing, which enhance territorial surveillance and combat deforestation [35].

Alongside local strengthening, effective public policies must incorporate technical tools that promote transparency and accountability for agents involved in environmental degradation. A prominent example is the Satellite Deforestation Monitoring Program (PRODES), developed by the National Institute for Space Research (INPE) [14]. Created in 1988 to monitor the Legal Amazon, PRODES expanded to cover the "Cerrado" biome in 2018 and, since 2022, monitors all Brazilian biomes [14], establishing itself as a strategic instrument for protecting traditional territories, especially Indigenous ones [2].

The national climate regulatory framework has also advanced. Law No. 15,042 of 2024, which establishes the Brazilian Emissions Trading System [7].In this regard, and recognizing the specificities of Indigenous territories, FUNAI has been advocating for the creation of a specific regulatory framework for carbon projects in Indigenous lands to avoid legal uncertainties and ensure respect for the constitutional rights of Indigenous peoples [3]. The Specialized Federal Prosecutor's Office at FUNAI (PFE-FUNAI) identifies the absence of clear regulations as one of the main obstacles to the free, prior, and informed consultation, as provided for in ILO Convention 169 [33].

The experience of the SFCP highlights the urgency of a legal framework that formally recognizes Indigenous REDD+ projects and ensures their land tenure security [35]. Additionally, it is necessary to facilitate access to public funds and payments for environmental services, with clear and inclusive rules that promote Indigenous participation in all phases of formulation, execution, and monitoring [14].

On the international stage, countries that have historically contributed most to the global climate crisis need to provide resources and support initiatives led by Indigenous peoples [4]. Brazil, with its significant ethnic diversity and vast forest territories, plays a central role in climate change mitigation [1]. Advancing the demarcation and protection of Indigenous Lands is essential for the country to fulfill its climate commitments[18].

Companies interested in acquiring carbon credits must strictly adhere to the principle of Free, Prior, and Informed Consent, adopted by the SFCP since its inception [35], and respect the territorial, cultural rights, and self-determination of Indigenous peoples [3]. Ethical and transparent partnerships are indispensable to ensure the legitimacy and effectiveness of these projects [27].

The Cancun safeguards, adopted within the framework of the United Nations Framework Convention on Climate Change (UNFCCC), provide fundamental guidelines to ensure equity and transparency in REDD+ projects [34]. Safeguard number three protects traditional knowledge and collective territorial rights, while safeguard number four emphasizes the importance of effective participation of Indigenous peoples in all stages [34], requiring that information be accessible, translated into native languages, and discussed in collective listening spaces [3].

Even during the critical years of 2019 to 2021, when deforestation rates increased in various regions of the country, Indigenous Lands recorded lower vegetation losses compared to unprotected areas [25]. This demonstrates the effectiveness of Indigenous territories as barriers against environmental degradation and underscores the importance of their protection [2]. Therefore, it is urgent to align Indigenous policies with climate policies, addressing the historical backlog of demarcating ancestral territories so that Brazil can advance in meeting its climate goals, particularly its mitigation commitments [6].

Finally, the structure of the Suruí Fund, managed by FUNBIO, serves as an example of transparent and participatory governance. With clear rules, advisory chambers, and deliberative councils that include Indigenous representatives and external partners, the fund ensures equitable allocation of resources and accountability to the community [35]. This shared governance serves as a model to be replicated in other REDD+ initiatives and payment for environmental services in Indigenous Lands [5].

METHOD CONSIDERATIONS

Indigenous territories are among the most ecologically preserved and climate-resilient regions in the world. They serve as vital carbon sinks, havens of biodiversity, and natural barriers against environmental degradation. In Brazil, Indigenous Lands cover approximately 13% of the national territory and safeguard around 20% of the country's remaining native vegetation [1]. Yet, despite their environmental significance, Indigenous communities often face acute socioeconomic vulnerabilities, systemic marginalization, and access to the institutional and financial mechanisms that underpin global climate governance [3]. Territorial rights violations, illegal exploitation of natural resources, and the imposition of development initiatives without Free, Prior and Informed Consent

This tension between ecological preservation and social vulnerability is not unique to Brazil; it reflects a global pattern. While Indigenous territories are key to global climate stability, they remain sidelined from decision-making spaces and economic opportunities [15]. Nonetheless, Indigenous-led projects rooted in traditional governance and local autonomy have shown transformative potential—not only delivering environmental outcomes, but also enhancing livelihoods and advancing environmental justice [16].

The SFCP offers a compelling case of Indigenous leadership in climate action. It achieved measurable reductions in deforestation, enhanced carbon sequestration, and generated socioeconomic benefits within the community [36]. This case demonstrates that Indigenous peoples are not merely guardians of biodiversity — they are capable designers and implementers of climate solutions when provided with the necessary support and autonomy [14].

While this study focuses on a single case and does not include direct fieldwork or interviews with community members — due to time and resource constraints — it draws from a comprehensive body of secondary literature to analyze key dynamics, including decision-making processes, governance models, and conflict management strategies [14]. Although indirect, this methodological approach is consistent with the study's exploratory scope. Future research would benefit greatly from participatory approaches and direct engagement with Indigenous communities to deepen our understanding of their perspectives and experiences [16].

Ultimately, the experience of the Suruí illustrates that when Indigenous peoples are empowered to govern their territories and access technical and financial resources, they make substantial contributions to global climate goals [5]. Though the study is grounded in the Brazilian context, the findings resonate with global challenges and opportunities facing Indigenous territories [4]. Expanding Indigenous-led climate initiatives can help address deep-rooted inequalities, integrate environmental protection with human rights, and foster more inclusive and sustainable development frameworks [6]. Strengthening Indigenous leadership is not only a technical necessity — it is an ethical imperative for building a more just, resilient, and sustainable future [27].

CONCLUSION

This should be followed by a systematic presentation of the results with discussion and then the conclusion. The conclusion should elaborate on the relevance of the results for addressing any identified gap in the literature. This study aimed to explore the challenges, opportunities, and regulatory pathways for developing carbon markets in Indigenous Lands through an in-depth analysis of the Suruí Forest Carbon Project. Drawing on a systematic literature review and institutional mapping of ongoing initiatives, the research found that TIs play a critical role in climate change mitigation, largely due to their low deforestation rates and extensive protection of native forests.

Key findings reveal that, despite their potential, carbon initiatives in TIs face significant normative, operational, and socio-environmental barriers. The absence of a dedicated regulatory framework for carbon projects on Indigenous lands — combined with weak FPIC processes — creates legal uncertainty and undermines constitutional rights. The Suruí experience underscores the importance of robust governance frameworks rooted in active participation and Indigenous self-determination to ensure that benefits are fair, tangible, and aligned with community priorities.

In the realm of public policy, the study highlights the urgent need for better integration between climate and Indigenous agendas. Implementing REDD+ initiatives in TIs requires clear guidelines, strong safeguards, and mechanisms to guarantee transparency, equity in benefit-sharing, and respect for territorial rights. From a private sector perspective, partnerships for the purchase of carbon offset must be grounded in ethics, accountability, and FPIC, in line with international standards and lessons drawn from practical experience.

Indigenous inclusion is not merely a legal or ethical requirement — it is a foundational condition for the success and sustainability of any carbon initiative on traditional lands. Indigenous peoples possess critical ecological knowledge for land stewardship and forest conservation, making them essential allies in the fight against climate change. Recognizing and valuing this knowledge also advances both environmental and social justice.

This study contributes to the growing dialogue on climate justice and Indigenous rights within carbon markets by identifying key obstacles and best practices. It offers insights that can inform more inclusive public policies and more effective climate finance mechanisms. However, additional research — especially with participatory and field-based methods — is necessary to deepen our understanding of local impacts and the resistance and adaptation strategies of Indigenous communities.

Ultimately, this study envisions a future for carbon markets in Indigenous Lands that is built on justice, equity, and sustainability. The success of these mechanisms will depend on inclusive legal frameworks, strong guarantees of territorial rights, and meaningful alliances among Indigenous peoples, governments, and society. Only through such convergence will it be possible to align environmental protection with the strengthening of traditional ways of life in the face of the global climate crisis.

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