RCMOS - Multidisciplinary Scientific Journal The Knowledge.
ISSN: 2675-9128. São Paulo-SP.

Year V, v.2 2025 | Submission: November 13, 2025 | Accepted: November 15, 2025 | Publication: November 17, 2025

Sustainable Development Projects (PDS) in the Legal Amazon as generators of carbon credits: An analysis from a legal and institutional perspective.

PDS Settlements in the Legal Amazon as Generators of Carbon Credits: An Analysis from the legal and Institutional Perspective

Alberlice Lira – https://lattes.cnpq.br/6403189258924599 – Undergraduate student in Accounting Sciences, State University of Amazonas – liraalberlice@gmail.com

Samasth Almeida – https://lattes.cnpq.br/8621366769654551 – Undergraduate student in Accounting Sciences, State University of Amazonas – samfhasth17@gmail.com

Elisangela Oliveira – https://orcid.org/0000-0002-8252-1437 – PhD in Environmental Sciences and Sustainability in the Amazon - UFAM – State University of Amazonas

eloliveira@uea.edu.br

SUMMARY

This study aimed to analyze the feasibility of implementing carbon credit projects in settlements in the Legal Amazon, focusing on Sustainable Development Projects (SDPs). The research seeks to understand how legal, institutional, and operational aspects influence this implementation, with emphasis on the analysis of Law No. 15.042/2024 and the actions of the National Institute for Colonization and Agrarian Reform (INCRA). Methodologically, a qualitative and descriptive approach was adopted, with data triangulation between legal documents, interviews with the competent body, and bibliographic analyses. The results indicate that SDP settlements have the potential to become carbon credit generating units, provided that adequate conditions are created for their implementation. The effectiveness of these projects depends on the regulation of Law No. 15.042/2024, the development of specific methodologies, and the institutional strengthening of INCRA to deal with the technical and operational complexity of the carbon market. Thus, it can be concluded that, although there is a favorable legal basis and growing interest in the subject, the consolidation of these projects still requires normative and structural advances that guarantee legal certainty, transparency, and the fair participation of settlers in the benefits generated.

Keywords: Carbon credits, Legal Amazon, PDS settlements, sustainability.

ABSTRACT

The present study aimed to analyze the feasibility of generating carbon credits in settlements of the The present study aimed to analyze the feasibility of implementing carbon credit projects in settlements located in the Legal Amazon, focusing on Sustainable Development Projects (PDS). The research seeks to understand how legal, institutional, and operational aspects influence this implementation, highlighting the analysis of Law No. 15,042/2024 and the role of the National Institute for Colonization and Agrarian Reform (INCRA). Methodologically, a qualitative and descriptive approach was adopted, using data triangulation among legal documents, an interview with the competent agency, and bibliographic analyses. The results indicate that PDS settlements have potential to become carbon credit–generating units, provided that adequate conditions for their implementation are established. The effectiveness of these projects depends on the regulation of Law No. 15,042/2024, the development of specific methodologies, and the institutional strengthening of INCRA to address the technical and operational complexity of the carbon market. Thus, it is concluded that although there is a favorable legal framework and growing interest in the subject, the consolidation of such projects still requires normative and structural advances to ensure legal security, transparency, and the fair participation of settlers in the benefits generated.

Keywords: Carbon credits, legal Amazon, PDS settlements, sustainability.

RCMOS - Multidisciplinary Scientific Journal The Knowledge.
ISSN: 2675-9128. São Paulo-SP.

Year V, v.2 2025 | Submission: November 13, 2025 | Accepted: November 15, 2025 | Publication: November 17, 2025

1. INTRODUCTION

During the late 20th century, the Kyoto Protocol established a mechanism for mitigating climate change, the carbon credit market, with the aim of acting as enabling the signatory nations of the United Nations Framework Convention on the

The United Nations Framework Convention on Climate Change (UNFCCC) could achieve its targets for reducing greenhouse gas emissions.

greenhouse effect (GHG) (Reisch, 2022). In 2015, after the release of negative results, the protocol It was replaced by the Paris Agreement, which aims to strengthen global action in the face of climate change. climate (Kruse, 2023).

The agreement was signed by 196 countries, stipulating that each nation must submit its own. Nationally Determined Contributions (NDCs), with mitigation targets and commitments. progressive reductions in greenhouse gas emissions. The Agreement also set a target. to contain the increase in the planet's average temperature, in order to avoid the consequences most serious effects of global warming, aiming to keep it well below 2°C relative to current levels. pre-industrial and adopting measures to limit it to 1.5 °C (Oliveira; Stakoviak Júnior, 2024).

However, according to the report published in 2025 by the World Meteorological Organization (WMO), climate forecasts for the years 2025 to 2029 indicate that the average global temperature It should remain between 1.2°C and 1.9°C above the pre-global warming period (1850-1900), with 80% of There is a chance that at least one of the years mentioned will be warmer than the year 2024, which It recorded 1.54°C, indicating that by 2030 the planet would be very close to 2°C (WMO, 2025).

These facts corroborate the current world scenario. In April 2024, the state of Rio The southern region of Brazil was hit by heavy rains that caused rivers to overflow. resulting in 183 deaths and 27 missing persons. In May, heavy rains also caused Flooding on highways in Saudi Arabia. Then, at the end of October of the same year, floods in... In southeastern Spain, more than 200 people died and dozens are missing (Luz et al, 2025). In this way, the growing urgency to reduce global emissions and the increasingly frequent risks of With extreme weather events occurring, mechanisms such as the carbon credit market are gaining prominence. as viable instruments to support the goals established by the Paris Agreement.

In this context, Brazil stands out, as its biomes are among the most biodiverse in the world. The world and provide numerous ecosystem services. Mature forests, such as those in the Amazon, They represent large carbon stocks and can generate credits through carbon reduction actions. Emissions from Deforestation and Forest Degradation (REDD+) focused on conservation and management.

sustainable management of threatened areas (Reisch, 2022). Furthermore, the country holds the second position worldwide. In terms of forest area extent, with 58% of the territory covered by natural or planted vegetation, the equivalent to approximately 493.5 million hectares, concentrating about 15% of the entire global potential for natural carbon capture (Brazil, 2025).

Year V, v.2 2025 | Submission: November 13, 2025 | Accepted: November 15, 2025 | Publication: November 17, 2025

In this scenario, the settlement projects of the National Institute for Colonization and Reform Agrarian Reform (INCRA), in the Legal Amazon, such as the Sustainable Development Projects (PDS), These spaces are strategically positioned for exploring this potential. This is because... Agrarian reform settlements maintain a large portion of their forest cover preserved, and the Introducing carbon credits in these areas could expand the sources of income for settlers and, Consequently, strengthen territorial management by basing it on sustainable economic practices. (Alves; Leite and Oliveira, 2024).

Although such places are legally protected by Law No. 12.651/2012, which establishes the New Despite the Brazilian Forest Code, there are still invasions and illegal activities such as burning and deforestation. in various agrarian reform settlements. As Santos, Salomão and Veríssimo also indicate. (2021), in the Report Territories and Paths of Environmental Crime in the Brazilian Amazon, in In the Legal Amazon, settlements occupy an area of 392,196 km², representing 8% of the region. Even though these territories are protected by law, they continue to be targets of illegal acts. The report points out... that, between 2016 and 2021, sixteen (16) operations by the Federal Police, which correspond to 5% of the total of the mapped operations, occurred in settlement areas, including the Projects of Settlement (PA), Sustainable Development Projects (PDS) and Settlement Projects Extractive worker (PAE).

Considering this scenario, the central problem of this research is: PDS settlements of INCRA located in the Legal Amazon can become generating units. of carbon credits, considering the challenges and opportunities inherent to these territories, as well What is the legal framework established by Law No. 15.042/2024?

The overall objective is to analyze the feasibility of implementing a carbon credit project. in PDS Settlements, taking into account legal, institutional and operational aspects. For To achieve this goal, the following specific objectives were defined: To examine and identify in Law No. 15.042/2024 contains provisions that favor or hinder the implementation of credit projects. Carbon in PDS settlements; Identify and analyze the institutional position and capacity INCRA's operational plan to enable the implementation of carbon credit projects in PDS Settlements; Identify and analyze, based on existing literature, the challenges and... Opportunities for implementing carbon credit projects in Sustainable Development Projects (PDS) settlements.

In this context, this research is justified by the need to encourage the implementation of projects focused on generating carbon credits as an economic and environmental tool, seeking To discourage the practice of deforestation, demonstrating that forests can generate a return on investment. economic gain is as satisfactory as its predatory exploitation, and the settlement territories of Agrarian reform projects have enormous potential for generating CO2 credits, specifically those... Sustainable Development Projects (SDPs), the subject of this research.

Year V, v.2 2025 | Submission: November 13, 2025 | Accepted: November 15, 2025 | Publication: November 17, 2025

2. THEORETICAL FRAMEWORK

2.1 Settlements and Legal Reserves

Rural settlements emerged as essential instruments of land reform policy.
Brazilian agrarian reform, with the objective of organizing territorial occupation and facilitating access to land, to regularize unproductive areas and reduce land conflicts, while simultaneously encouraging agricultural production. They are composed of plots intended for farming families or rural workers who are unable to afford their own land, who must reside on and work the plot for productive and subsistence purposes (INCRA, 2020).

Its formation occurs through the expropriation of unproductive large estates, being the
The National Institute for Colonization and Agrarian Reform (INCRA) is responsible for implementing the Land reform policy. This body handles the official transfer of land ownership to the rural workers, allowing them to cultivate and produce in the region. Its creation involves administrative and legal processes that ensure that the occupation is productive and organized (Costa, 2024).

Settlements are differentiated by their modalities, which vary according to their...
purposes and the profile of the beneficiary public. In Settlement Projects (PA), the Union, through Incra is responsible for obtaining the land, creating the project, selecting beneficiaries, and providing funding. of resources and implementation of basic infrastructure, in addition to land titling. The Projects, on the other hand, Agro-extractive settlements (PAE) are primarily intended for extractive communities. focusing on environmentally differentiated activities, while maintaining federal responsibility for Land, infrastructure and land titling (Brazil, 2020).

Forest Settlement Projects (PAF), in turn, prioritize sustainable management.
of forest resources, especially in the Northern region, being conducted by associations or Cooperatives under the guidance of Incra and Ibama. As for the Decentralized Settlement Projects... Sustainable Development Plans (PDAS) have shared management between Incra and local governments, seeking to promote the Family farming in areas near urban centers, focusing on food production and... Socioeconomic sustainability. Finally, Sustainable Development Projects (SDPs) are aimed at traditional populations, such as riverside communities and extractivists, and promote activities environmentally sustainable under a collective ownership regime, also under the responsibility of the Union. (Brazil, 2020).

Sustainable Development Projects (PDS) are subject to national environmental legislation and have specific regulations.
aimed at ensuring the sustainability foreseen for this type of property (Gomes; Brito and Porro, (2018). The Forest Code (Law 12.651/2012) stipulates that all rural properties must conserve a The area must cover native vegetation and be designated as a Legal Reserve, in addition to respecting the regulations concerning Permanent Preservation Areas (APPs). This obligation must follow the percentages...

RCMOS – Multidisciplinary Scientific Journal The Knowledge.
ISSN: 2675-9128. São Paulo-SP.

Year V, v.2 2025 | Submission: November 13, 2025 | Accepted: November 15, 2025 | Publication: November 17, 2025

minimums established by law, calculated according to the total size of the property, as per as set forth in Article 12.

The Legal Reserve corresponds to the area located within a rural property or holding. delimited according to legislation, whose purpose is to guarantee the sustainable use of natural resources, to contribute to the conservation and recovery of ecological processes, to preserve biodiversity and to provide shelter and protection to wildlife and native flora, as provided for in Article 3, paragraph III of Law 12.651/2012. Regarding its extent, this varies according to the biome. In the Amazon Legally, the requirement is more stringent, potentially reaching 80% in forest areas, 35% in the Cerrado, and... 20% in fields. In other regions of the country, the requirement is 20%, regardless of the type of vegetation (Tomas et al., 2024)

Maintaining the legal reserve is a fundamental requirement for land regularization. of rural properties in Brazil, and owners must fulfill this obligation to meet the environmental legislation. This instrument aims to reconcile agricultural production with environmental legislation. environmental preservation, ensuring that rural properties contribute to the protection of ecosystems. natural (Alves; Leite and Oliveira, 2024).

Therefore, Sustainable Development Projects (PDS) are subject to this legislation, being structured into Legal Reserve areas (RL) and Alternative Use Areas (AUA). The former can only be exploited economically through sustainable forest management projects, while the second, Generally divided into 20-hectare plots per family, they are intended for the productive activities of the settlers. In many cases, the AUAs include extensive Permanent Preservation Areas (APP), the which significantly reduces the space available for agriculture (Gomes; Brito and Porro, 2018).

2.2 Carbon Credit Market: theoretical foundations and historical evolution

International concern about climate change gained momentum at the beginning of the decade. in 1990, when the Intergovernmental Panel on Climate Change (IPCC) presented its first report, recommending the creation of a global treaty aimed at mitigating the effects of global warming (Oliveira; Stakoviak Júnior, 2024).

In response, in 1992, during the United Nations Conference on the Environment and Development, known as ECO-92, was created as the United Nations Framework Convention. on Climate Change (UNFCCC), with the aim of stabilizing greenhouse gas concentrations The greenhouse effect (GHG) in the atmosphere (Bessa, 2025). This convention recognized that countries Because they were the first to industrialize, developed nations had a greater responsibility for the increase in emissions, (Oliveira; Stakoviak Júnior, 2024).

As a follow-up to the UNFCCC, the Kyoto Protocol was signed in 1997, which It established mandatory targets for reducing greenhouse gas emissions for industrialized countries. To make it possible to meet these goals, the Clean Development Mechanism (CDM) was created.

RCMOS – Multidisciplinary Scientific Journal The Knowledge.
ISSN: 2675-9128. São Paulo-SP.

Year V, v.2 2025 | Submission: November 13, 2025 | Accepted: November 15, 2025 | Publication: November 17, 2025

which allows developed countries to invest in emissions reduction projects in nations in development (Basso; Delfino, 2015). Conversely, these projects can generate reductions. Certified Emission Receipts (CERs), also known as carbon credits, which can be traded on international market, functioning as a compensation mechanism for countries buyers (Reisch, 2022).

It was observed, however, that the Protocol was not sufficient to contain the advance of global warming, since only some countries have committed to reducing it. emissions. Given this scenario, and following the release of new IPCC reports pointing to results Due to negative outcomes, the Kyoto Protocol was replaced by the Paris Agreement, signed in 2015, during the 21st Conference of the Parties (COP-21) (Kruse, 2023).

This agreement defined the responsibility of all countries to participate in the commitment to reduce emissions, regardless of the level of development, determining that each nation Present your Nationally Determined Contribution (NDC), with mitigation and adaptation targets. to address climate change, reviewed every five years, with the aim of reducing and removing greenhouse gases. greenhouse effect (GHG) (Oliveira; Stakoviak Júnior, 2024). Therefore, the market for credits... Carbon has become a key tool for reducing GHG emissions. promoting sustainable practices and succeeding the Clean Development Mechanism (CDM) of Kyoto, through the Sustainable Development Mechanism (SDM) established in the Paris Agreement. (Santana, 2025).

Therefore, the Carbon Credit market can be defined as a system that allows the trading of credits linked to the reduction of greenhouse gas emissions, in which Different agents, both public and private, can buy and sell these environmental assets. One A carbon credit represents the non-emission of one ton of carbon dioxide (COÿ) or equivalent gases in the atmosphere. These credits function as a kind of currency, in which Companies or countries that exceed emission limits can buy them to offset their emissions. emissions, while those who reduce their emissions beyond the established targets can sell their surplus credits (Sequeira, 2024).

In this market, the role of the State is crucial, since this model establishes... specific rules govern its operation. This system is known as cap and trade, in which A central authority sets a maximum limit on carbon emissions for certain sectors. of the economy and distributes negotiable permits or licenses among companies. Thus, those that Those who exceed their targets can acquire credits from those who issued less, creating an incentive. Financial resources are available for investments in clean and low-carbon technologies. This type of market has... It plays a relevant role in sectors with high decarbonization costs and has its own rules. operation, with prices adjusted according to the dynamics between supply and demand (Athias; Sá, 2022).

RCMOS – Multidisciplinary Scientific Journal The Knowledge.
ISSN: 2675-9128. São Paulo-SP.

Year V, v.2 2025 | Submission: November 13, 2025 | Accepted: November 15, 2025 | Publication: November 17, 2025

Alongside this system, there is the Voluntary Market, which is characterized by participation.
spontaneous participation of companies, institutions, governments, non-governmental organizations, and individuals.
who seek to offset their greenhouse gas emissions. In this system, credits can be
generated anywhere on the planet, being called Voluntary Emission Reductions (Reisch,
2022).

These credits are verified and certified according to international standards defined by
verification bodies, such as the Verified Carbon Standard (VCS), the Climate, Community and Biodiversity Standard
(CCBS), and the Climate Action Reserve (CAR) (Aguiar; Ângelo, 2020). This
The market has shown increasing demand for forest-linked credits and solutions based on forestry.
in nature, which represents an opportunity for Brazil to achieve its goals of Contributions
Nationally Determined (Athias; Sá, 2022). Furthermore, it involves less bureaucracy and encompasses...
projects not covered by the regulated market, such as REDD+ (Reducing Emissions by
Deforestation and Forest Degradation) and the promotion of socio-environmental benefits (Reisch, 2022)

Although distinct, regulated and voluntary carbon markets are not mutually exclusive.
exclusive, since the regulated market can accept credits originating from the voluntary market.
to achieve their goals. In this way, regulated markets have the potential to become
the main source of demand for carbon credits in the future (Oliveira; Stakoviak Júnior, 2024).

2.3 Brazilian context and regulatory structure

Climate governance in Brazil is structured by a complex regulatory system, which
It encompasses international commitments and domestic laws. Internationally, the country follows the regime...
The United Nations climate change organization, primarily formed by the United Nations Framework Convention on Climate Change.
on Climate Change UNFCCC (1992), the Kyoto Protocol (1997) and the Agreement
Paris (2015). Nationally, Law No. 12.187/2009, which established the National Policy on Change
The National Climate Change Policy (PNMC) constitutes the main legal framework, incorporating elements of the UNFCCC and
defining objectives, principles and instruments to guide climate action in the country (FGV, 2025).

PNMC was responsible for establishing the Brazilian Emissions Reduction Market.
(MBRE), provided for in Article 9, with the objective of allowing the trading of securities representing
avoided greenhouse gas emissions, in stock exchanges and entities authorized by
Securities and Exchange Commission (CVM). Despite its creation, the market was not effectively...
implemented in the country (Meneguin, 2012).

The main reason for this ineffectiveness is not the absence of regulation, but the lack of...
domestic demand for carbon credits. As Brazilian companies do not have targets
Despite mandatory emissions reductions, there is no economic incentive to participate in this market.
Imposing internal targets, while it could stimulate the system's functioning, also
This would entail additional costs for companies, reducing national competitiveness compared to other countries.

Year V, v.2 2025 | Submission: November 13, 2025 | Accepted: November 15, 2025 | Publication: November 17, 2025

developing countries that have not yet adopted similar commitments (Meneguin, 2012).

However, the carbon credit market in Brazil has made significant progress with the enactment of Law No. 15.042/2024, which established the Brazilian Emissions Trading System. Greenhouse Gases (SBCE). The new legislation establishes the basis for the creation of a market. Regulated carbon emissions in the country, allowing emissions of polluting gases to be converted into assets. Negotiable financial instruments (Brazil, 2024).

This system aims to enable compliance with the National Policy on Climate Change (PNMC) and the commitments undertaken by Brazil in the Framework Convention on Climate Change United Nations on Climate Change, through the definition of environmental targets and the adoption of financial mechanisms for trading these assets (Brazil, 2024).

The operation of this regulated market is based on the cap-and-trade principle, in which The government establishes a total emissions ceiling and distributes or auctions off Brazilian Emission Quotas. (CBEs) to companies (Brazil, 2024). Also allowing the trading of Reduction Certificates or Verified Emission Removals (CRVEs) (Luz et al, 2025). Unlike the voluntary market, Participation in this system is mandatory and monitored, giving the government the power to impose... sanctions against companies that fail to comply with established standards (Brazil, 2024).

In this way, this mechanism sets targets for greenhouse gas (GHG) emissions to the economic activities covered by the law, enabling companies that do not meet their limits acquire CBEs from others that are below the ceiling (Brazil, 2024). Creating an incentive financial resources are available to encourage the adoption of cleaner and more efficient production practices, providing advantages. competitive for companies that invest in low-carbon technologies and imposing costs additional to those that do not conform (Brazil, 2024).

However, Law No. 15.042/2024 still requires several details, mainly Regarding the governance structure of the Brazilian Emissions Trading System (SBCE), it will be composed of three central bodies: the Superior Body, of an interministerial nature; the Technical Committee, responsible for scientific and technical input; and the Management Body, in charge of execution and allocation plans. However, the legislation is silent on the composition and functioning of the Management Body. Manager, an essential element for balancing the supply and demand of carbon credits and Verified Emission Reduction or Removal Certificates (VERCs) (Munhoz, 2025).

Furthermore, the effective operationalization of SBCE will depend on the creation of methodologies. specific to the development and accreditation of carbon projects, which must be approved by the Governing Body. In this context, it becomes fundamental that Brazil develops methods adapted to tropical climate, given that private certification companies do not yet widely offer this type of methodology (Munhoz, 2025).

Furthermore, Law No. 15.042/2024 establishes that primary agricultural production, as well as...

RCMOS - Multidisciplinary Scientific Journal The Knowledge.
ISSN: 2675-9128. São Paulo-SP.

Year V, v.2 2025 | Submission: November 13, 2025 | Accepted: November 15, 2025 | Publication: November 17, 2025

such as the assets, improvements and infrastructure existing within rural properties directly linked to this activity, they are not classified as regulated sources or facilities, and therefore, therefore exempt from the obligations imposed by the Brazilian Emissions Trading System (SBCE) (Brazil, 2024). The exclusion of the agricultural sector is seen as a factor that weakens the market. regulated, while at the same time conveying the idea that this segment does not have direct responsibility in actions aimed at mitigating climate change (Vieira, et al., 2025).

Furthermore, Brazil joins the group of nations that have established a regulated system of Carbon pricing, strengthening its position on the world stage in the fight against climate change. climate change. Becoming a protagonist in the search for environmental solutions, given the legislation The current legislation allows for the transformation of greenhouse gas emissions into tradable financial assets. attracting international investment, promoting environmental preservation and generating new Income opportunities for the population (Brazil, 2024).

3. MATERIALS AND METHODS

This research is characterized as basic in nature, with an approach... predominantly qualitative, being classified as exploratory, as it deals with a topic that is not widely known. as discussed in the literature, and descriptive, as it seeks to detail the possibilities, limitations, and implications. legal, economic and institutional aspects related to the implementation of carbon credit projects in PDS settlements.

Regarding the technical procedures, the research adopts a bibliographical approach and documentary. For the bibliographic survey, studies were sought on the Google Scholar website, Scielo, Capes Journals and Scopus, searching by keywords, plus Boolean operators. (logical operators, and, or and not, used as a search strategy to define how the (combination of search terms or expressions) (Freitas et al, 2023). The following combinations were used: "Carbon credits" and "Challenges", "Carbon credits" and "Opportunities", "Carbon credits "Carbon" and "Settlements", "Carbon Credits" and "Legal Reserve", "Carbon Credits" and “Additionality”. Articles published between 2020 and 2025 were selected.

For the documentary research, Laws No. 12.651/2012 (Code) were analyzed. Forestry) and Law No. 15,042/2024 (Brazilian Greenhouse Gas Emissions Trading System), with the goal of identifying devices that may hinder or facilitate the implementation of these projects. in the settlements.

Additionally, a structured interview was conducted with the department. specialized in carbon credits at the National Institute for Colonization and Agrarian Reform (INCRA). According to Leitão (2021), this interview format follows a pre-defined script, ensuring uniformity in responses and facilitating the comparison of collected data. The script was

RCMOS – Multidisciplinary Scientific Journal The Knowledge.
ISSN: 2675-9128. São Paulo-SP.

Year V, v.2 2025 | Submission: November 13, 2025 | Accepted: November 15, 2025 | Publication: November 17, 2025

developed with open-ended and multiple-choice questions about feasibility, difficulties, and potential. Regarding the implementation of carbon credit projects in settlements.

For data analysis, methodological triangulation was adopted, which consists of using different data collection methods with the aim of obtaining broader information about the phenomenon investigated (Azevedo et al., 2013). This approach allowed for a systematic confrontation legal, bibliographic, and interview data, seeking to understand the feasibility under different perspectives, seeking to identify convergences, divergences, and gaps between the sources.

4. RESULTS AND DISCUSSION

4.1 Carbon Credits in Settlements: Challenges and Criteria

Vargas, Delazeri and Ferrera (2022) point out that, despite being a sector with high prices, the High development, implementation, and monitoring costs represent barriers. significant, since detailed mapping by remote sensing and monitoring Environmental projects require advanced technologies and high investment. Furthermore, projects with... Additional co-benefit certifications present even higher costs, due to the need for... Monitoring of social and environmental indicators.

The authors point out that a minimum scale of 10,000 hectares is generally required for so that costs are diluted and projects become financially viable. Therefore, large Properties located in areas at high risk of deforestation tend to have greater potential for return. Lower-risk regions, however, face greater difficulties in economically justifying projects such as to avoid planned deforestation.

In the context of settlements, INCRA, through the interview, states that one of the major Challenges in implementing these projects in PDS settlements relate to the high investment required. initial amount, which can reach values between one and a half million and two million reais. In addition to this... The first obstacle highlighted is the difficulty in managing resources once they reach the communities. that the legislation, such as Law No. 15.042/2024, especially in its article 43, recognizes that the The credits belong to the settlers regardless of whether or not they already possess a title deed.

Therefore, the agency declares that, given the significant amounts of money that may be generated, Internal conflicts can occur, exacerbated by the communities' lack of experience in dealing with them. situations of this nature. Therefore, in his view, the most appropriate form of disposal would be to make essential collective investments, such as infrastructure, schools, health and transportation, instead to pass them on directly to families.

Another point raised is the harassment by some development companies. those responsible for structuring projects, attracting partners, and marketing credits, although there are Serious organizations, however, have caused significant problems. Added to this is the technical challenge,

RCMOS – Multidisciplinary Scientific Journal The Knowledge.
ISSN: 2675-9128. São Paulo-SP.

Year V, v.2 2025 | Submission: November 13, 2025 | Accepted: November 15, 2025 | Publication: November 17, 2025

given that the carbon market involves legal, environmental, climate, and statistical knowledge and inventory, as well as financial and economic aspects for the effective marketing of Credits.

Regarding the topic, INCRA notes that implementation is feasible, provided certain conditions are met. certain technical and economic assumptions. It emphasizes that carbon projects are complex and They depend on specific conditions, such as the minimum area size and feasibility. Economically, investments in the order of two million reais may not generate results. satisfactory in small areas, due to the limit on carbon credits that can be obtained. produced per hectare. Therefore, viability exists, but it is contingent upon meeting the requirements. of these fundamental requirements.

Finally, it was clarified that there are already ongoing initiatives aimed at debating the... The adoption of these projects, encompassing not only the PDS (Sustainable Development Plans), but all existing modalities. Being A specific internal regulation proposal is under discussion, but it is in its initial stages, given that Law No. 15.042/2024 is very recent and needs regulation to detail its operation. SBCE.

Regarding the types of projects that are possible, INCRA clarifies that, in the context of In settlements, nature-based carbon credits are used, structured in two ways. main sub-modalities. The first corresponds to REDD-type projects, aimed at exclusively to the preservation of existing forests. The second, called REDD+, encompasses both preservation as well as the recovery of previously degraded areas, including within reserves. legal. As indicated in the interview, both modalities allow for the generation of credits of carbon through specific methodologies and configure economically viable alternatives for the settlements.

According to Prolo et al. (2023), REDD+ activities can take two forms. main: (i) local projects, developed on private properties, reserves and parks, generally funded by non-governmental organizations; and (ii) jurisdictional approaches, implemented by subnational governments, such as states and municipalities, aimed at reducing emissions in defined political areas.

Regarding REDD+ Jurisdictional, Assunção et al. (2023) point out that it is applied to units of political geographic area, such as a state or province, aimed at reducing Emissions from deforestation and forest degradation, conservation of carbon stocks. Forestry and sustainable forest management. In these jurisdictions there is a government, so each The state can define a program that best fits the local reality.

REDD+ projects offer operational advantages by covering a large territorial area. Larger and bringing together several projects under the same program, which facilitates monitoring, avoids

Year V, v.2 2025 | Submission: November 13, 2025 | Accepted: November 15, 2025 | Publication: November 17, 2025

leaks from deforestation and reduces the risk of double counting of avoided emissions, a situation that This is common in individual initiatives. Furthermore, these programs should maintain reserves. non-traded carbon emissions to offset potential forest losses, ensuring greater permanence of credits and environmental integrity (Assunção et al., 2023).

However, despite their advantages, the authors point out that jurisdictional programs of REDD+ depends on federal authorizations and regulations and requires strong capacity to... Government coordination to reconcile the interests of different sectors, including communities. Indigenous and traditional peoples, who may not agree with the implementation of the projects. In these cases, The requirement for prior, free, and informed consultation stands out. Furthermore, the alternation of State governments every four years creates uncertainty regarding the continuity of forestry policies. and ongoing REDD+ projects, becoming a significant challenge for the programs.

As Muller (2023) points out, decision 1/CP.16 of COP-16 determines that the projects REDD+ observe the Cancun Safeguards, which require that actions be consistent with the national forest policies and international agreements, ensuring transparency in governance. They also include respect for the knowledge and rights of indigenous peoples and communities. local safeguards, as well as their full and effective participation in decision-making processes. They also include the conservation of biodiversity and the protection of native forests, in addition to need to adopt specific measures to prevent risks of reversal and reduce the Emissions displacement.

In the context of Law 15.042/2024, the SBCE encompasses two types of REDD+ originating from State initiatives: State REDD+ Programs, non-market approach and Programs Jurisdictional REDD+ market approach. Both differ in the nature of the incentives and the form of remuneration. In the case of the non-market approach, as provided for in Article 2, Paragraph XXV, the programs operate through policies and incentives aimed at reducing emissions from deforestation and forest degradation and the increase in carbon stocks due to natural regeneration in native vegetation, on a national or state scale, but without generating credits marketable.

As reinforced by paragraph 1 of article 42, the incentives granted do not generate credits. carbon credits or marketable or transferable CRVEs do not restrict the possibility of third parties to develop their own credit generation projects on their properties, with access to these resources regulated nationally by CONAREDD+.

In turn, the market approach, defined in paragraph XXVI, maintains the legal focus, but it allows for raising funds through the sale of credits, including on the market. voluntary. This modality follows national rules for the distribution of results between the Union and states guarantee owners and concessionaires the right to exclude their areas to avoid double

RCMOS – Multidisciplinary Scientific Journal The Knowledge.
ISSN: 2675-9128. São Paulo-SP.

Year V, v.2 2025 | Submission: November 13, 2025 | Accepted: November 15, 2025 | Publication: November 17, 2025

It counts and prohibits the advance sale of credits relating to a future period.

For private initiatives, paragraph XXVII of the aforementioned article provides for reduction or removal of greenhouse gases with a market approach, aimed at generating credits for carbon. These initiatives may include reducing deforestation and forest degradation, Conservation and sustainable management of forests, in addition to increasing carbon stocks (REDD+). They can be executed in partnership with the developer (legal entity that structures and executes). technically the project) or directly by the generator itself (owner of the area), provided that they are carried out in areas where there is legitimate ownership, concession or usufruct.

4.2 Legal Reserve and the Additionality Criterion

As stipulated in article 3, paragraph III, of Law 12.651/2012, the legal reserve corresponds to The area located within a rural property or holding, with the objective of guaranteeing sustainable use. of natural resources, contribute to the maintenance and recovery of ecological processes and to promote the conservation of biodiversity, as well as serving as shelter and protection for wildlife. wild and native flora.

Therefore, every rural property must maintain an area of native vegetation cover. observing the minimum percentages in relation to the totality of rural land ownership. For properties Located in the Legal Amazon, 80% of the territorial extension must be preserved in areas situated in forests, 35% in areas located in the Cerrado, and 20% in areas located in general fields. For the In other regions of Brazil, 20% of all rural land must be preserved (Brazil, 2012).

Given this requirement, in order for such areas to be eligible for generating credits of carbon, it is necessary that they meet the additionality criterion. According to Brito (2024), a project It only meets this requirement when the reductions in greenhouse gas emissions exceed those... that would occur naturally in the absence of its implementation, ensuring that the benefits The environmental benefits achieved represent a real gain, and not just the fulfillment of the requirement. legal.

In accordance with this definition, the forestry code stipulates that the activities of Maintaining legal reserve areas or permanent preservation areas is considered sufficient. to meet the additionality criterion, both in national carbon markets and international (Rodrigues, 2023). This definition is endorsed by Law 15.042/2024, which states in its article 46 that the restoration, maintenance and conservation of Permanent Preservation Areas, of Legal reserves, restricted-use areas, as well as conservation units, are suitable for generating carbon credits. Therefore, rural properties that preserve their native vegetation cover in addition to The minimum percentage required by law, they possess what are called legal reserve surpluses, which They characterize additionality (Cavalcante, 2024).

According to data from Embrapa (2021), adding up the 5,953,139 regularized rural properties

RCMOS - Multidisciplinary Scientific Journal The Knowledge.
ISSN: 2675-9128. São Paulo-SP.

Year V, v.2 2025 | Submission: November 13, 2025 | Accepted: November 15, 2025 | Publication: November 17, 2025

In the Rural Environmental Registry (CAR), the area designated for the conservation of native vegetation in Brazil It represented 227,415,630 hectares, which corresponds to 26.7% of the national territory. According to explains Cavalcante (2024), based on data extracted from the aforementioned study, in properties located in other regions of Brazil (Caatinga, Atlantic Forest and Pampa), which have a minimum requirement of Of the total area of the properties (137,056.5914 hectares), 47,209.851 hectares are designated for conservation. Thus, the minimum preservation requirement is equivalent to 34% of the total area of these biomes, which makes the The region has the potential to generate carbon credits due to the surplus of its reserves.

However, for properties located in the Legal Amazon, which have a minimum requirement The requirement of 80% for forests does not constitute additionality with respect to surplus legal reserves, since that the conservation of native vegetation corresponds to only 68% of the total area, falling below minimum requirement (Cavalcante, 2024). Regarding properties located in the Cerrado and Campos Gerais regions, Rodrigues (2023) points out that despite having a lower conservation percentage (35% and 20%, respectively), the region's potential is not significant, given that the owners indicate more Interest in acquiring carbon credits, rather than becoming generators.

Therefore, when discussing the surplus reserve in the context of INCRA settlements Located in the Legal Amazon, Alves, Leite, and Oliveira (2024) emphasize that it is necessary to consider the ownership of the property, as well as its conservation function. These areas, legally designated for environmental protection plays a relevant role in the implementation of the REDD+ mechanism, a since they have limited deforestation potential. Therefore, the conservation of forests in them existing [properties] align directly with the mechanism's objectives, representing an effective contribution. for the maintenance of carbon stocks and for the generation of credits resulting from preservation. environmental.

Thus, in environmental preservation projects framed within the REDD+ mechanism, the The additionality criterion depends on the existence of effective pressures for deforestation and degradation. about the project area and its surroundings. In this way, when there is a real risk of degradation if the If the initiative is not implemented, the additionality requirement is considered met, which makes it feasible. emission of carbon credits (Alves; Leite and Oliveira, 2024).

During the interview with INCRA, it was emphasized that additionality is an element This is essential for Legal Reserves to legitimately generate carbon credits. Therefore, It is essential that the calculation performed proves the project's effective contribution to reducing... CO2 emissions. Once this additionality has been demonstrated and consistent results presented, the The area becomes eligible for the sale of credits, provided that the following are strictly observed: the technical methodologies and requirements established by the certification bodies responsible for validation. of the projects.

In this sense, Law 15.042/2024, in its article 2, paragraph XXVII, recognizes the possibility

Year V, v.2 2025 | Submission: November 13, 2025 | Accepted: November 15, 2025 | Publication: November 17, 2025

implementation of private carbon credit projects in areas under ownership, concession or legitimate use by private entities, provided that it is aimed at reducing or removing greenhouse gases. Greenhouse. These projects may include activities related to Reducing Greenhouse Gas Emissions. Originating from Deforestation and Forest Degradation, Conservation of Carbon Stocks Forestry, Sustainable Forest Management and Enhancing Forest Carbon Stocks (REDD+).

Based on this, it is understood that the Legal Reserve areas present in the settlements Sustainable Development Projects (PDS) in the Legal Amazon region could become generators of carbon credits, fitting into the... project modality described in item XXVII of Law No. 15.042/2024, provided that it is proven the risk of deforestation or degradation.

FINAL CONSIDERATIONS

This work aimed to analyze the feasibility of implementing projects of carbon credits in PDS settlements located in the Legal Amazon, taking into account legal, institutional and operational aspects.

Based on the results obtained, it is concluded that settlements of the Project type Sustainable Development Projects (PDS), established and managed by INCRA, show potential. to become carbon credit generating units, provided that the criteria are observed. technical, legal and operational aspects that govern the carbon market in Brazil.

The research findings demonstrate that Law No. 15.042/2024 represents a milestone. Essential regulatory framework in this process, establishing guidelines for the Brazilian Trading System. of Emissions Control Board (SBCE) and recognize the eligibility of settlement areas, preservation areas, Environmental restoration and conservation, including legal reserves and restricted use areas.

It was also found that generating carbon credits in PDS settlements is feasible. but it depends on factors such as economic viability, minimum scale, monitoring structure and Participatory management. INCRA recognizes the potential of these areas, but points out significant challenges. such as the high implementation cost and the need for supplementary regulation of Law No. 15.042/2024.

Another relevant point identified is that the REDD and REDD+ modalities are proving to be... more suited to the reality of PDS settlements, as they reconcile forest conservation with sustainable development. However, for these projects to be viable, it is essential meet the additionality criteria, demonstrate the actual risk of deforestation, and adopt Recognized monitoring and certification methodologies.

Given these considerations, it becomes evident that, although there is legal potential for the Regarding the generation of carbon credits in the PDS settlements of the Legal Amazon, there is still a long way to go. The path to be followed for its effective implementation. The absence of specific regulations,

Year V, v.2 2025 | Submission: November 13, 2025 | Accepted: November 15, 2025 | Publication: November 17, 2025

the lack of specific methodologies for this type of project and the operational limitations of INCRA.

They hinder the eligibility of these areas and the consolidation of settlements as active agents in carbon market.

Finally, it is important to highlight the need to continue research on this topic, seeking to contribute to filling the gaps identified in this study. It is essential to develop

methodologies adapted to the Amazonian reality and creating instruments that guarantee that the Sustainable Development Projects (PDS) So that the Legal Amazon can generate carbon credits in a safe, legitimate way and with respect for rights of settlers.

REFERENCES

AGUIAR, Mário César; ÂNGELO, Humberto. **The voluntary forest carbon market: an integrative review.** Prospectus (ISSN: 2674-8576), v. 2, n. 2, 2020.

ALVES PESSOA, M.; DO ROZARIO VALLE DANTAS LEITE, F.; TABOADA OLIVEIRA, M. **AGU and ESG: 6 letters and 1 challenge. Carbon credit generation in INCRA settlements in the Legal Amazon.** Publications of the AGU Higher School, *[S. l.],* v. 16, n. 2, 2024. Available at: https://revistaagu.agu.gov.br/index.php/EAGU/article/view/3541. Accessed on: April 23, 2025.

ASSUNÇÃO, Marcos Venancio Silva; REYMAO, Ana Elizabeth Neirao; TUPIASSU, Lise. **Advantages and Disadvantages of Jurisdictional Approaches to REDD+ A TO BE CONSIDERED BY THE STATES OF THE LEGAL AMAZON.** Journal of Law, Economics and Sustainable Development, v. 9, n. 1, p. 01–15-01–15, 2023.

ATHIAS, Jorge Alex Nunes; SÁ, João Daniel Macedo. **Environmental policies and economic instruments: an analysis of the carbon credit market.** Atuação: Revista Jurídica do Ministério Público Catarinense, v. 17, n. 36, p. 65-80, 2022.

AZEVEDO, CEF et al. **The Triangulation Strategy: Objectives, Possibilities, Limitations and Similarities to Pragmatism.** IV Meeting on Teaching and Research in Administration and Accounting. Brasília, 2013.

BASSO, Ana Paula; DELFINO, Letícia de Oliveira. **Carbon Market and the (In)Definition of the Legal Nature of Carbon Credits in Brazilian Legislation. Revista de Direito Ambiental e Socioambientalismo,** Florianópolis, Brazil, v. 1, n. 1, p. 126–180, 2015. DOI: 10.26668/IndexLawJournals/2525-9628/2015.v1i1.172. Available at: https://indexlaw.org/index.php/Socioambientalismo/article/view/172. Accessed on: September 20, 2025

BESSA, LFM; PIRES, LHP; SILVA, SC da; SANT'ANNA, AJ de O. **Reflections on national challenges to the implementation of the carbon market.** Revista Brasileira de Desenvolvimento, *[S. l.],* v. 2, pág. e77325, 2025. DOI: 10.34117/bjdv11n1-017. Available at: https://ojs.brazilianjournals.com.br/ojs/index.php/BRJD/article/view/77325. Accessed on: October 12, 2025.

Year V, v.2 2025 | Submission: November 13, 2025 | Accepted: November 15, 2025 | Publication: November 17, 2025

BRAZIL. Ministry of Finance. **Law establishing the basis for a regulated carbon market in Brazil has been enacted.** Available at: https://www.gov.br/fazenda/pt-br/assuntos/noticias/2024/dezembro/Sancionada-a-lei-que-estabelece-as-bases-para-um-mercado-regulado-de-carbono-no-Brasil . Accessed on: September 25, 2025.

BRAZIL. Comptroller General of the Union. Report 1543004 – **Issuance of carbon credits from federal forest concessions: opportunities and risks.** Brasília: CGU, 2025. Available at: https://ecgu.cgu.gov.br/relatorio/1617836. Accessed on: September 1, 2025.

BRAZIL. National Institute for Colonization and Agrarian Reform. **Settlements.** Brasília: INCRA, 2020. Available at: https://www.gov.br/incra/pt-br/assuntos/reforma-agraria/assentamentos. Accessed on: September 19, 2025.

BRAZIL. Law No. 12,651, of May 25, 2012. Provides for the protection of native vegetation; amends Laws No. 6,938, of August 31, 1981, No. 9,393, of December 19, 1996, and No. 11,428, of December 22, 2006; repeals Laws No. 4,771, of September 15, 1965, and No. 7,754, of April 14, 1989, and Provisional Measure No. 2,166-67, of August 24, 2001; and provides other measures. **Official Gazette of the Union,** Brasília, DF, May 28, 2012. Section 1, p. 1. Available at: https://www.planalto.gov.br/ccivil_03/_ato2011-2014/2012/lei/l12651.htm. Accessed on: August 28, 2025.

BRAZIL. Law No. 15,042, of December 11, 2024. Establishes the Brazilian Greenhouse Gas Emissions Trading System (SBCE); and amends Laws No. 12,187, of December 29, 2009; 12,651, of May 25, 2012; 6,385, of December 7, 1976; and 6,015, of December 31, 1973. **Official Gazette of the Union,** Brasília, DF, December 12, 2024. Available at:

https://www2.camara.leg.br/legin/fed/lei/2024/lei-15042-11-dezembro-2024-796690-publicationoriginal-173745-pl.html. Accessed on: August 30, 2025.

BRITO, Frederico Apollo. **Economic potential of carbon credits: the use of APPs for the profitability of rural properties in Rio Grande do Sul.** 2024. Dissertation (Master's in Development Economics) Postgraduate Program in Development Economics, School of Business, Pontifical Catholic University of Rio Grande do Sul, Porto Alegre, August 23.

2024. Available at: https://tede2.pucrs.br/tede2/handle/tede/11424. Accessed on: October 25, 2025.

CAVALCANTE, Kaio Lincoln Souza. **Carbon credits generated from the maintenance of legal reserve areas: a reflection on additionality.** 2025.

COSTA, Odemir Coelho. **Rural settlements in Brazil: Agrarian policies and their implications.** Research, Society and Development, vol. 13, no. 3, p. e10413345339-e10413345339, 2024.

EMBRAPA TERRITORIAL. **Analyses of the Rural Environmental Registry. Brasília,** 2021. Available at: https://www.embrapa.br/en/car-2021/resultados. Accessed on: October 25, 2025.

FREITAS, Bruna Fagundes et al. **The use of operators as a search strategy in scientific literature reviews.** Brazilian Journal of Implantology and Health Sciences, v. 5, n. 3, p. 652-664, 2023.

Year V, v.2 2025 | Submission: November 13, 2025 | Accepted: November 15, 2025 | Publication: November 17, 2025

FUNDAÇÃO GETULIO VARGAS (FGV). **Diagnosis of the carbon market in Brazil: main topics for market regulation.** Rio de Janeiro: FGV, 2024. Available at: https://fgvenergia.fgv.br/publicacoes. Accessed on: November 7, 2025.

GOMES, Dérick Lima; BRITO, Arthur Erik Monteiro Costa de; PORRO, Noemi Sakiara **Miyasaka. Environmentalism and in situ deterritorialization in settlements in the Amazon.** Estudos Sociedade e Agricultura, 2018.

National Institute for Colonization and Agrarian Reform (INCRA). **The INCRA.** Brasilia: INCRA, January 28, 2020 (updated April 15, 2025). Available at: https://www.gov.br/incra/pt-br/acesso-a-informacao/institucional/o-incra. Accessed on: August 30, 2025.

KRUSE, BC. **Pungent considerations on the carbon credit market. Social Perspectives,** v. 9, n. 01, p. 14-39, Oct. 3, 2023.

LUZ, LFP da; ARRUDA, AFS de; LUZ, VFP da. **CARBON CREDITS AND REGISTRATION SERVICES: THE ROLE OF LEGAL SECURITY IN SUSTAINABILITY.** Revista Contemporânea, *[S. l.],* v. 5, n. 4, p. e7863, 2025. DOI: 10.56083/RCV5N4-026. Available at: https://ojs.revistacontemporanea.com/ojs/index.php/home/article/view/7863. Accessed on: August 20, 2025.

LEITÃO, Carla. **The interview as an instrument of scientific research: planning, execution and analysis. Scientific research methodology in informatics in Education: a qualitative research approach,** v. 3, 2021.

MENEGUIN, Fernando. What is the carbon market and how does it operate in Brazil? **Brazil Economy and Government,** v. 28, 2012.

MULLER, Gerhard Guttilla. **Carbon credits: legal environment and current challenges.** 2023.

MUNHOZ, Leonardo. **Environmental regulation and expectations for 2025.** AgroANALYSIS, v. 45, n. 2, p. 23-26, 2025.

OLIVEIRA, Barreto; STAKOVIAK JÚNIOR, Paulo Beli Moura. **The carbon market in the context of the Paris Agreement: challenges and perspectives for the regulation of the sector in Brazil.** Singular. Social Sciences and Humanities, Palmas, v. 1, n. 6, p. 1-20, June 2024. DOI: 10.33911/singularsh.v1i6.194. Available at https://ulbra-to.br/singular/index.php/SingularSH/article/view/194 . Accessed on: October 15, 2025.

PROLO, Caroline Dihl et al. **Explaining carbon markets in the era of the Paris Agreement.** Rio de Janeiro: Climate and Society Institute, 2021.

REISCH, Renzo Dalle Nogare. **The Brazilian Potential to Generate Carbon Credits Through Forest Conservation, Reforestation and Sustainable Agricultural Production.** HUMBOLDT, Rio de Janeiro, v. 1, n. 3, 2022.

Year V, v.2 2025 | Submission: November 13, 2025 | Accepted: November 15, 2025 | Publication: November 17, 2025
Available at: https://www.e-publicacoes.uerj.br/humboldt/article/view/61662. Accessed on: August 21, 2025.

RODRIGUES, Albert Silva. **The Brazilian emissions reduction market: the eligibility of the legal reserve surplus as an activity generating carbon credits.** 2023. 88 p.
Dissertation (Master's thesis) - Catholic University of Santos, Graduate Program in Law, 2023.

SANTANA, Isaías da Silva Moreira de. **The carbon market under the auspices of the Paris Agreement: the challenges of its transcription into Brazilian law.** Advisor: Dr. Jahyr Philippe Bichara. 2025. 151 p. Dissertation (Master's in Law) – Center for Applied Social Sciences, Federal University of Rio Grande do Norte, Natal, 2025.

SANTOS, D.; SALOMÃO, R.; VERÍSSIMO, A. **Territories and Paths of Environmental Crime in the Brazilian Amazon.** Belém: Imazon, 2021.

SEQUEIRA, Fernanda Jorge (coord.). **Primer on the carbon market.** Belém, 2024.
Available at: https://www.pge.pa.gov.br/publicacoes/manuais Accessed on: September 9, 2025.

TOMAS, WM et al. **Challenges in the conservation and management of legal reserve areas in Brazilian grassland and savanna ecosystems in the face of global climate change.** Pesquisa Agropecuária Brasileira, v. 59, e03491, 2024. Available at: https://doi.org/10.1590/S1678-3921.pab2024.v59.03491. Accessed on: June 5, 2025.

VARGAS, Daniel Barcelos; DELAZERI, Linda Márcia Mendes; FERREIRA, Vinícius Hector Pires.
The advancement of the voluntary carbon market in Brazil: structural, technical and scientific challenges.
Getúlio Vargas Foundation, Bioeconomy Observatory, 2022.

VIEIRA, ACP et al. **The regulated carbon market in Brazil. Estudos Avançados,** v. 39, n. 114, p. e39114141, 2025.

WMO. **WMO Global Annual to Decadal Climate Update (2025–2029).** World Meteorological Organization,.2025.Disponível.em:>https://wmo.int/publication-series/wmo-global-annual-decadal-climate-update-2025-2029 <. Accessed on: May 5, 2025.