REGULATORY BARRIERS FOR THE IMPLEMENTATION OF BRAZILIAN CLIMATE POLICIES IN THE AFOLU SECTOR:

FOREST CODE, ABC PLAN, AND RENOVABIO

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LIST OF ABBREVIATIONS

ABC - Low Carbon Agriculture
AFS - Agroforestry Systems
AFOLU - Agriculture, Forestry, and Other Land Uses sector
ANEEL - National Electric Energy Agency
ANP - Agency of Petroleum, Natural Gas and Biofuels
PPA - Permanent Preservation Areas
BB - Banco do Brasil (BB)
BNDES - National Bank for Economic and Social Development
BNF - Biological Fixation of Nitrogen
BRICS - Brazil, Russia, India, China, and South Africa
CAR - Rural Environmental Registry
CBIO - Decabonization Credit
CEPEA - Center for Advanced Studies on Applied Economics
CIM - Inter-Ministerial Committee on Climate Change
CIMV - Inter-ministerial Committee on Climate Change and Green Growth
CNA - Brazilian Agriculture and Livestock Confederation
CNMA - National Conference on the Environment
CNPE - National Council for Energy Policy
COP – Conference of Parties
CRA - Environmental Reserve Quotas
CRFB - Constitution of the Federative Republic of Brazil
DPS – Direct Planting System
EEP - National Energy Efficiency Program
EFD - Federal Development Strategy for Brazil
EMBRAPA - Brazilian Agricultural Research Corporation
EPE - Energy Research Office
FBMC - Brazilian Forum on Climate Change
FEPLANA - Federation of Cane Growers Brazil
GHG - Greenhouse Gases

GEX - Executive Group on Climate Change
HVO - Green Diesel
IBP - Brazilian Petroleum and Gas Institute
ICL - Integrated Crop-Forest (ICF
ICLFS - Integrated Crop-Livestock-Forestry Systems
ICMS - Brazilian State Value-Added Tax
INCRA - National Institute for Colonization and Agrarian Reform
INDC - Intended Nationally Determined Contributions
IPCC - Intergovernmental Panel on Climate Change
IPEA - Institute of Applied Economic Research
ITR - Rural Land Taxation
LULUCF - Land Use, Land-Use Change, and Forestry
MAPA - Ministry of Agriculture, Livestock and Food Supply
MBRE - Brazilian Carbon Market
MMA - Ministry of the Environment
MME - Ministry of Mines and Energy
MP - Public Prosecutor's Office
NAMA - Nationally Appropriate Mitigation Actions
NDC - Nationally Determined Contribution
NMC – National Plan for Climate Change
PNMC - Brazilian National Policy on Climate Change
PPCDAm - Action Plan for the Prevention and Control of Deforestation in the Legal Amazon
PRA - Environmental Regularization Program
PRONAF - National Program for Strengthening Family Farming
PRONAMP - National Support Program for Medium Rural Producers
REDD+ - Reducing Emissions from Deforestation in Developing Countries
LR – Legal Reserves
RDP - Restoration of Degraded Pastures
SEMA - Secretariat for the Environment
SINIMA - Brazilian National Environment Information System
SISNAMA - National Environmental System
SNA -National Society of Farmers

UNFCCC - United Nations Framework Convention on Climate Change
UNICA - Sugarcane Industry Association

SUMÁRIO

1 PRESENTATION OF THE TOPIC AND METHODOLOGICAL DESCRIPTION

Brazil occupies a prominent place in global agricultural[1] production. Like the United States, Russia, China, and India, Brazil has a population of over 80 million people, an agricultural area larger than 30 million hectares, and a GDP that exceeds 1 trillion dollars (BARROS, 2019, p. 47). Despite the adverse economic effects resulting from the COVID-19 pandemic, the Brazilian agricultural GPD grew by 11.16% in the first quarter of 2021 (CNA; CEPEA, 2021)[2].

The role of the State in intervening in the agricultural sector is manifested by various instruments. Bacha (2018, p. 43) classifies these instruments into generic (or macroeconomic) intervention measures, which impact the entire national economy, and policies specifically targeting the agricultural sector. The first category includes fiscal, monetary, exchange rate, and income policies, while a combination of these instruments also produces the trade policy, which deals with the country's international transactions.

Other combinations operate in specific sectors, such as agriculture. These concern policies on rural credit, minimum prices, rural insurance, agricultural research, and extension systems, in addition to those for specific agricultural products and inputs, such as sugarcane, coffee, etc. Another important policy for

[1] The concept of agriculture adopted is the one used by Bacha (2018, p. 14) and by the Center for Advanced Studies in Applied Economics in partnership with the Brazilian Agriculture and Livestock Confederation (CEPEA, CNA, 2022), which refers to the primary production of plant (agricultural sector) and animal (livestock sector) products. Therefore, it is a more restricted concept than agribusiness, which includes the agribusiness inputs sector, agro-industry, and agricultural services.

[2] This growth trend, however, was interrupted, as shown by data for 2022. According to the same study center (CNA; CEPEA, 2022), the agriculture GDP dropped by 8.92% in the first semester of 2022, mainly due to rising costs in the agricultural sector and accommodation of prices in the livestock sector.

the agricultural sector deals with the use of forest resources. It refers to land use and native vegetation, especially deforestation control and reforestation tax credits (BACHA, 2018, p. 43 and 155).

As the study developed by Embrapa (2018, p. 85-86) explains, understanding the relationship between agriculture and climate change involves the perception of an active and a passive element. On the one hand, the agricultural sector plays a relevant role in gas emissions responsible for global warming but is also affected by climate change.

Brazil's Fourth National Communication to the United Nations Framework Convention on Climate Change (BRAZIL, 2021) reported that the agricultural sector accounted for 33.2% of Brazil's total greenhouse gas emissions in 2016. Furthermore, more than half of the national emissions in the Land Use, Land-Use Change, and Forestry (LULUCF) sector, which represented 27.1% of the total, came from the Grassland and Grassland subsectors (43.6%) and Agriculture (9.1%) (BRAZIL, 2021).

The same document also discusses vulnerabilities related to the effects of climate change and agricultural production. When specifically addressing food security, it notes that a higher frequency of extreme weather events will imply increased losses and raised costs in the production chain. Consequently, consumer prices are likely to rise while the producers' profits are expected to fall (BRASIL, 2021).

By reviewing guidelines on national inventory reporting, the Intergovernmental Panel on Climate Change (IPCC) considered the correlation between land use effects on climate change in the agricultural and LULUCF sectors. Hence, IPCC recommended that these sectors be integrated into the Agriculture, Forestry, and Other Land Uses sector (AFOLU) (IPCC, 2006).

According to the Fourth National Communication of Brazil (BRASIL, 2021), the agriculture and the LULUCF sectors were responsible for 60.3% of greenhouse gas emissions in 2016. Given the prevalence of AFOLU in the Brazilian gas emissions profile, this study's objective is to analyze the intersection and alignment of

Brazilian climate policies in the sector and the measures adopted under the Paris Agreement.

The public policies concerning the agricultural sector referred to in the Intended Nationally Determined Contribution of Brazil (INDC), presented within the scope of the Paris Agreement in 2015 (BRASIL, 2015), were adopted as this study's thematic focus. Thus, the following were selected: (i) Native Vegetation Protection Law No. 12,651, of May 25th, 2012; (ii) the agricultural portion of the National Policy on Climate Change, materialized in the Sectorial Mitigation and Adaptation Plans for Climate Change, aiming at the Consolidation of a Low Carbon Economy in Agriculture - PLAN ABC; and (iii) National Policy on Biofuels, known as RENOVABIO.

As for the Native Vegetation Protection Law, note that the legislation became nationally known as the "Forest Code," even though it did not follow the rite for draft code provided for in the National Congress' internal regulation. In fact, this expression is adopted in the INDC to refer to Law No. 12,651/2012. For this reason, the expression "Forest Code" is also used here to refer to the national regulation concerning the protection of native vegetation.

Note that the time frame of this study's object is limited to the analysis of the period between the signing of the Paris Agreement in 2015, going through its incorporation into domestic law, via Decree No. 9,073, from June 5th, 2017 (BRASIL, 2017), and submission of the updated Brazilian nationally determined contribution, which took place on December 9th, 2020.

It is, therefore, an investigation that covers the first five years of the international governance regime inaugurated by the Paris Agreement. However, this time frame does not disregard the reconstruction of a legal and institutional context that preceded it, which enables an understanding of the continuity, discontinuity, and innovation processes provided by the above Agreement.

Therefore, the study on the ABC PLAN and Forest Code, legal frameworks prior to the Paris Agreement, relies on a historical description, which will allow verifying whether the new

international regulation implied any changes in internal policies. Thus, we expect to identify the challenges and efforts made by the government in the first years of the Paris Agreement implementation.

Methodologically, this investigation consists of a multiple-case study. There are several ways to conduct research on an academically relevant topic: experiments, surveys, historical studies, or case studies. All these approaches represent different strategies to produce knowledge.

When specifically addressing case studies, Yin (2001, p. 35) describes them as a way to "investigate an empirical topic by following a set of desired procedures." In this sense, it is a comprehensive approach that allows the use of various data collection techniques in order to understand the "how" or "why" of contemporary phenomena, the variables of which (effective behaviors) cannot be controlled.

Therefore, case studies are conducive to evaluating real-world phenomena, whether to describe a particular intervention or explain causal links (YIN, 2001). Specifically in the field of Law, Machado (2017, p. 357) understands a case as "an intellectual construction that seeks to offer a representation of a legal phenomenon, in a specific context, based on a wide range of data and information".

This study aims to assess the Paris Agreement implementation process and its impacts on Brazilian climate policies concerning the AFOLU sector. Therefore, a case study has interesting advantages for investigating this study's topic. First, the phenomenon addressed here is contemporary to the study, starting in 2015 after the Paris Agreement was concluded. Second, it is impossible to control the variables or the behavior of those affected since their decisions are firmly anchored in real-world decision-making conditions (context).

Yin (2001) assesses two options when structuring a case study. The first deals with the number of cases to be analyzed, single or multiple cases, and the second concerns the number of units of

analysis within each case, which may result in a holistic (single unit) or embedded case study (with more than one sub-unit of analysis).

A single case study is suitable when a phenomenon is considered decisive to justify or reject a given theory. In turn, when a study object involves the analysis of independent phenomena within the same context, a multiple-case study is considered more appropriate (YIN, 2001).

Therefore, the implementation of the commitments signed under the Paris Agreement imported a scope that surpassed the boundaries of a single case, as it unfolded in the analysis of three national public policies (mentioned above) involving the AFOLU sector. Therefore, a multiple-case study is proposed to delve into each one of them.

The legal framework and implementation challenges were addressed in each of these initiatives to achieve the objectives proposed here; together, these initiatives represent a relevant part of the commitments assumed by Brazil under the Paris Agreement. Units of analysis were developed using multi-methods, maintaining a common structure for each case study, further elaborated in their respective chapters.

Based on the content analysis (BARDIN, 1977) of the commitments assumed internationally, each case study presents a systematic literature review (ROTHER, 2007) on their respective subjects in addition to a survey of the regulatory framework, which is relevant to the public policies addressed here. Content analysis is a traditional methodology in the study of Law, especially when considering that legislation, understood as an official document, represents the primary source of legal norms.

In this sense, the literature (CELLARD, 2012, p. 295-296) reports that one of the qualities of documentary research is that information mainly flows directly from the object to the researcher, despite natural hermeneutical conditions. Nevertheless, this previous stage allows an approximation to the topic, which is

helpful in the following stages of research, with a lower degree of interference (reaction) in the object, as it occurs with interviews.

In turn, a systematic literature review differs from a narrative review by minimizing biases. While in the second, the texts are selected based on the pertinence and relevance attributed by researchers, the first makes explicit and is guided by objective, inclusion, and exclusion criteria (MOHER; STEWAD; SHEKELLE, 2015).

Hence, it was possible to infer the stage of development of academic production based on objective and measurable criteria. The three case studies have in common the fact that the searches were performed in the CAPES Periodicals Portal, which includes all journals qualified by the Law field; the keywords differ for each situation.

Furthermore, an analysis was conducted on the websites that dealt with the public policies selected. The objective was to identify implementation issues, which, although relevant, were not covered in the specialized literature because of their contemporaneity; the *ubersuggest* search tool was used.

Finally, based on the previous stages, we developed the script for the qualitative semi-structured interviews held with agents of the sectors affected by State interventions to analyze each of the selected policies. The development of this instrument considered the theoretical guidelines proposed for qualitative interviews in Law proposed by Ribeiro and Vilarouca (2019) and Xavier (2017).

According to Ribeiro and Vilarouca (2019), interviews are a social research technique, the object of which is the interaction between two people, and the objective is to gather information concerning the matters a researcher wants to investigate. There are many ways to conduct an interview; hence, choosing one model or another depends on the research problem guiding the investigation (XAVIER, 2017).

The interviews are qualitative, i.e., the focus is on analyzing nuances of perceptions and organizational practices, reaching a degree of subjective depth not found in quantitative research (RIBEIRO; VILAROUCA, 2019). Ribeiro and Vilarouca (2019)

discuss three types within the universe of qualitative interviews. First, in semi-structured interviews, researchers use a script that guides the conversation according to topics of interest. Even though a script is used in open interviews, it is very flexible, merely introducing the topic and allowing interviewees to explore the subject freely. Finally, the interest in life history interviews is almost exclusively in the interviewees, the very object of the investigation. Hence, the three categories listed by Ribeiro and Vilarouca (2019) concern to levels at which questions are structured. Finally, the study project was not submitted to the Institutional Review Board because the interviews were solely intended to "deepen situations that emerge spontaneously and contingently in professional practice" under the terms of CNS Resolution No. 510, from April 7th, 2016. Additionally, the information collected from the interviews is presented without personally identifying any participant.

This study is divided into six sections, including the introduction and conclusion. An in-depth study of the thematic focus guiding this study is presented in the second section, where the development of the climate regime at the international and national levels, as a result of the signing and internalization of the Paris Agreement, is described based on the National Policy on Climate Change (Law No. 12,187/2009).

The third, fourth, and fifth sections discuss each public policy selected (Forest Code, PLAN ABC, and RENOVABIO, respectively). The primary public policy instruments legally foreseen are presented in each of them, in addition to criticisms published in specialized literature and relevant websites regarding their implementations and contributions that emerged from the interviews with the agents affected by state interventions.

Finally, the last section presents the conclusions, including an analysis of the aspects that may be discussed or addressed in more detail in future studies.

2 SURVEY OF THE LEGAL FRAMEWORK AND ANALYSIS OF THE GENERAL REGULATORY ASPECTS OF THE BRAZILIAN CLIMATE POLICY

2.1 DEVELOPMENT OF PARIS PRE-AGREEMENT REGULATORY FRAMEWORK: CLIMATE POLICY IN BRAZIL

2.1.1 National Climate Change Plan

Institutionally, a relevant effort to work on the Brazilian climate policy begins with the enactment of Decree No. 6,263 on November 21st, 2007 (BRASIL, 2007)[3]. This decree enabled the creation of the permanent Inter-Ministerial Committee on Climate Change (*CIM* – Acronym in Portuguese), whose first assignment was to "guide the preparation, implementation, monitoring, and evaluation of the National Plan on Climate Change"[4]. The Committee's members were established by article 2nd, which provided for the presence of 17 federal bodies, coordinated by the Civil House of the Presidency of the Republic, in addition to the participation of the Brazilian Forum on Climate Change (*FBMC* – Acronym in Portuguese), as a guest[5].

Subject to the *CIM*'s guidance, the same Decree established the Executive Group on Climate Change (*GEx* – Acronym in Portuguese), coordinated by the Ministry of the Environment (MMA)[6]. *GEx* was responsible for the executive activities of preparing the Brazilian National Policy on Climate Change (*PNMC* – Acronym in Portuguese) and the National Plan for Climate Change (*NMC* – Acronym in Portuguese).

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[3] Decree No. 6,263/2007 is not currently in force; it was revoked by Decree No. 10,223, on February 5th, 2020 (BRASIL, 2020).

[4] See article 1st, Decree No. 6,263/2007.

[5] *Ibid.*, article 2nd, §1st.

[6] *Ibid.*, article 3rd, *caput*.

The *PNMC* proposal prepared by the *GEx* was forwarded to the National Congress and formalized through Law No. 3,535/2008 (BRASIL, 2008). Its role was to guide national and state plans, as well as any other programs and actions directly or indirectly related to climate change (BRASIL, 2008, p. 17). However, the bill was only enacted in December 2009, through Law No. 12,187/2009 (BRASIL, 2009).

Meanwhile, the federal government published the National Plan on Climate Change in December 2008. Several public consultations were conducted during its development to promote participation and transparency, which was determined by article 6th, Decree No. 6,263/2007. Among the measures adopted, the III National Conference on the Environment (III CNMA – Acronym in Portuguese) and the "Sectoral Dialogues," promoted by the Brazilian Forum on Climate Change, stand out.

Deliberations in the III CNMA were divided into four thematic axes: Mitigation, Adaptation, Research and Technological Development, and Environmental Education and Citizenship (Training and Dissemination), subdivided into first and second. The mitigation axis addressed forests, agriculture, energy, waste, buildings, industry, and transportation. As for adaptation, there was a division into the fields of health, water resources, coastal and marine zones, agriculture, human settlements, and natural ecosystems (BRASIL, 2008, p. 18).

In turn, the Brazilian Forum on Climate Change was responsible for the so-called "Sectoral Dialogues", which consisted of meetings attended by representatives from the first, second, and third sectors. The objective was to map actions already implemented and actions needed for future implementation (BRASIL, 2008, p. 19).

Decree No. 3,515 had already established the Brazilian Forum on Climate Change on June 20th, 2000, to sensitize and mobilize society and support the discussion on actions needed to fight global climate change (BRASIL, 2000). However, over time, the rules

changed[7], and the objectives were updated according to the development of national and international commitments.

The composition of the *FBMC*, established by Decree No. 9082 of June 26th, 2017, provides for the participation of State Ministers, representatives of federal agencies and departments, in addition to civil society representatives. It also determines the equal representation of the public sector and civil society (BRASIL, 2017).

A set of propositions was collected from the sectors consulted through "Sectoral Dialogues." These propositions influenced the development of the *NMC* PLAN as they were systematized and sent to the *GEx* (BRASIL, 2008, p. 19).

Regarding the content of the NMC Plan, even though Decree No. 6,263/2007 addresses all the themes deliberated in the III CNMA, it emphasizes mitigation and adaptation[8] actions. Regarding its structure, the same regulation[9] provides for five axes, for which economic and legal instruments are foreseen. They are (i) mitigation, (ii) vulnerability, (iii) impact and adaptation, (iv) research and development, and (v) training and dissemination (BRASIL, 2008, p. 14). Note that the last two structuring axes (training and dissemination and research and development) are instrumental for the first two (mitigation and adaptation).

The annex of Decree No. 6,263/2007 establishes the entries and expressions of the United Nations Framework Convention on Climate Change (UNFCCC) and the Intergovernmental Panel on Climate Change (IPCC). It contains the concepts of mitigation and adaptation.

The annex defines mitigation as "human interventions that reduce the sources or enhance greenhouse gas sinks" (BRASIL, 2008). However, this definition is less comprehensive than the one developed by the *GEx* in the context of Law No. 12,187/2009

[7] Repealed by Decree from August 28th, 2000, and later by Decree No. 9082 on June 26th, 2017.

[8] *Ibid.*, article 5th, *caput*.

[9] *Ibid.*, art. 5th, single paragraph.

(BRASIL, 2009), which is defined by its article 2nd, item VII, as "technological changes and replacements that reduce the use of resources and emissions per unit of production, and the implementation of measures to reduce greenhouse gas emissions and increase the number of greenhouse gas sinks."

The conceptualization of mitigation requires knowledge about what greenhouse gas sinks are. Thus, article 2nd, item IX of Law No. 12,187/2009 defines it as a "process, activity, or mechanism that removes greenhouse gases, aerosol, or precursor of greenhouse gas from the atmosphere" (BRASIL, 2009).

In turn, adaptation is defined in the annex to Decree No. 6,263/2007 as "initiatives and measures to reduce the vulnerability of natural and human systems to the current and expected effects of climate change" (BRASIL, 2008). In this case, the definition is identical to that of the National Policy on Climate Change.

Vulnerability is linked to the concept of adaptation, which is understood as "the degree of susceptibility or inability of a system to respond to the climate change adverse effects, including climate variability and extreme weather events," being "[...] a matter of the nature, magnitude, and rhythm of climate changes and the variation to which a system is exposed, its sensitivity and ability to adapt" (BRASIL, 2007). It does not differ, in essence, from the definition conveyed in article 2nd, item X of the *PNMC* (BRAZIL, 2009)[10].

When the *NMC* Plan was released in December 2008, it set the objective of "encouraging Brazil's actions to collaborate to the global effort to fight the problem [of global climate change] and create the internal conditions to face its consequences" (BRASIL, 2008, p. 7). It aligns with the strategies to mitigate greenhouse gas emissions and the measures to adapt to the global warming consequences. A periodic reassessment of the Plan was also

[10] Pursuant to article 2nd, item X Law No. 12,187/2009, "the degree of susceptibility or inability of a system, due to its sensitivity, adaptability, and the nature, magnitude, and rate and variation of the climate change to which one is exposed, to deal with the adverse effects of climate change, including climate variability and extreme weather events."

foreseen to keep it updated with and adequate to the objectives proposed.

In addition to the general objective, the *NMC* Plan establishes some specific objectives, as presented below:

a. To foster efficiency gains in the performance of economic sectors in a constant search for achieving the best practices

This goal is linked to national efforts to mitigate gas emissions. In order to implement the principle of sustainable development, the *NMC* Plan provides that government actions related to the productive sector would seek to "promote the most efficient use of natural, scientific, technological, and human resources" (BRASIL, 2008, p. 9). Thus, government actions were supposed to promote the performance of the economy to indirectly "reduce the carbon content of the Brazilian gross domestic product, increase the competitiveness of Brazilian products in the international market, promote income growth, and generate economic surpluses to ensure higher welfare levels" (BRASIL, 2008, p. 9).

It also mentions the need for a National Energy Efficiency Program (EEP) to generate the immediate and mediate effects previously mentioned in the energy sector. The Plan estimated that by 2030, this EEP would decrease by 10% electricity consumption (BRASIL, 2008, p. 9).

b. Seek to maintain a high share of renewable energy in the electricity matrix, preserving the prominent position Brazil has always held in the international context

The Plan recognizes that Brazil has a mostly renewable energy matrix, with a predominance of hydroelectric plants. However, it establishes the need for various energy sources, such as the case of co-generation with sugarcane bagasse and other forms of biomass, wind, and solar power. Furthermore, it established the goal for this

source of energy to be 11.4% of the total national electricity supply by 2030 (BRASIL, 2008, p. 10).

In addition to the need to vary the energy matrix, there is a need to decrease electricity waste with non-technical losses, such as errors in reading, billing, and measuring. These losses are associated with the concessionaires' management and the socioeconomic characteristics in the areas covered by these companies. Such losses differ from technical losses arising from the natural dissipation of energy (ANEEL, 2021, p. 2).

Thus, the *NMC* Plan dictates a more varied energy mix and decreased non-technical losses and also requires the government "to increasingly introduce the socio-environmental variable, i.e., the one referring to climate change, in the process of planning the expansion of the electricity supply to enable an increased share of renewable sources" (BRASIL, 2008, p. 10). This goal is also related to mitigating the adverse effects of climate change.

c. Foster a sustainable increase of biofuels share in the Brazilian transportation matrix and promote the structuring of an international market for sustainable biofuels

This objective, related to mitigation, would be fulfilled in the national context by increasing the share of biofuels. The role of sugarcane-based fuels stands out, but it also includes an increase in the mandatory percentage of biodiesel in diesel. In the international context, the Plan expects Brazil to cooperate with countries with agricultural potential and capable of planting sugarcane to consequently expand ethanol supply and enable the sustainable expansion of demand (BRASIL, 2008, p. 10).

d. Seek a sustained decrease in deforestation rates, considering its four-year average, in all Brazilian biomes until zero illegal deforestation is reached

Decreased deforestation rates, which also have mitigating purposes, are expected to occur in four-year periods. Thus, the Plan established the objective "of decrease deforestation between 2006-2009 by 40% considering the average of the ten-year reference period reported in the Amazon Fund (1996-2005), and by another 30% in each of the following two four-year periods, compared to the previous four-year periods" (BRASIL, 2008, p. 11).

The previous four years are the basis for the subsequent ones; thus, the parameter is dynamic rather than fixed. Both international and national resources would be used in this task, including resources raised by the Amazon Fund (BRASIL, 2008, p. 11).

Considering the fruitful results of the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm), similar programs are foreseen for other Brazilian biomes. Furthermore, the creation of Satellite Monitoring of Brazilian Biomes is also expected to supervise deforestation areas that cannot be monitored without modern technologies.

e. Eliminate the net loss of Brazil's forest areas by 2015

The National Plan on Climate Change defines vegetation cover as the "amount of the areas intended for conservation and those suitable for afforestation and reforestation; the latter two to be implemented where environmental or economic returns accruing from forest restoration exceed the gains obtained with crops and herds" (BRASIL, 2008, p. 13).

The practical utility of both types of planted forests is acknowledged: forests with economic purposes (or homogeneous) or aimed to restore ecosystems to face climate change. However, regardless of the purpose, all forests can remove greenhouse gases from the atmosphere; thus, they are GHG sinks or reservoirs.

Hence, the mitigating purposes of this objective are evident (BRASIL, 2008, p. 12).

Therefore, the Plan established the goal of doubling the area of forest covers in Brazil, i.e., reaching 11 million hectares (ha) by 2020, with two million concerning native species. The priority would be the economic-environmental recovery of degraded pasture lands (BRASIL, 2008, p. 12).

f. Strengthen intersectoral actions intended to reduce the vulnerabilities of populations

Unlike the objectives analyzed thus far, this objective is related to adaptation. The *NMC* Plan recognizes the need for interdisciplinary actions to tackle global warming. It also acknowledges that the heterogeneity of the Brazilian population represents a challenge to coordinate responses to face the consequences of climate change.

These consequences are related to the climate change adverse effects concept, defined by Law No. 12,187/2009 in article 2nd, item II. According to the legal provision, such consequences concern

> changes in the physical environment or biota resulting from climate change, having significant deleterious effects on the composition, resilience, or productivity of natural and managed ecosystems, the functioning of socioeconomic systems, or on human health and well-being (BRASIL, 2009).

Therefore, it implies the need to identify the most vulnerable populations and promote their resilience (thus, decreasing their vulnerability) to the adverse effects of climate change. The term resilience is defined by the National Plan on Climate Change as a "system's ability to absorb impacts while preserving the same basic structure and the same means of functioning." It also provides the synonym of resilience as "self-organization ability" (BRASIL, 2008, p. 87).

This is in line with the doctrinal definition supported by Holling (1973, p. 14), who conceptualizes resilience as "a measure of the persistence of systems and of their ability to absorb change and disturbance and maintain the same relationships between populations or state variables." State variables describe the mathematical state of a dynamical system.

Anyhow, note that the purpose is to decrease the vulnerability of populations, which is inversely proportional to resilience. Thus, there is a need to map populations to identify vulnerabilities to the adverse effects of climate change.

g. Identify the environmental impacts resulting from climate change and encourage the development of scientific research to devise a strategy that minimizes the country's socioeconomic costs of adaptation

Once again, this goal concerns adaptation, though its description is rather brief. The Plan advises, "increasing the production of scientific knowledge regarding all aspects interrelated with the problem to promote a process that minimizes the costs for the country to adapt to the new climatic conditions." The problem refers to the environmental, social, and economic impacts at the local and national levels that may arise from climate change throughout the century (BRASIL, 2008, p. 13).

2.1.2 National Policy on Climate Change

Law No. 12,187, of December 29th, 2009, which establishes the National Policy on Climate Change, was first regulated by Decree No. 7,390 on December 9th, 2010 (BRASIL, 2010), later revoked by Decree No. 9,578, on November 22nd, 2018 (BRAZIL, 2018). The regulation, however, only consolidates the Policy, unifying, in a single diploma, the *PNMC* and the National Fund for Climate Change (*FNMC* – Acronym in Portuguese) (BRASIL, 2009).

The regulation's structure is typical of laws that establish public policies, with principles, objectives, guidelines, and

institutional instruments. The principles include precaution, prevention, citizen participation, sustainable development, and shared, though differentiated, responsibilities, the latter at an international level[11].

The principles guide the interpretation and application of the law. For example, the precautionary principle concerns the need for adopting measures even if lacking scientific certainty regarding climate change, its degree, or the aspects of its impacts on Brazil. Meanwhile, the principle of citizen participation indicates the need for sectors of society to become involved with climate governance bodies and specific policy decision-making.

The policy's objectives are listed in Article 4th and consist of promoting socio-economic development that is compatible with environmental protection; decreasing anthropogenic greenhouse gas emissions; enhancing anthropic removals by greenhouse gas sinks; implementing measures to promote climate change adaptation by the three spheres of the Federation (with the participation of sectors of society, especially those most vulnerable to adverse effects); preserving and conserving environmental resources; consolidating and expanding legally protected areas, and encouraging the reforestation and restoration of degraded land; and, finally, promoting the Brazilian carbon market (MBRE).

The mitigation and adaptation goals stand out. However, sustainable development is also addressed and is understood as a "*condition to deal with climate change and reconcile the need to meet the common and particular needs of populations and communities"* (BRASIL, 2009).

Incentives to MBRE are also emphasized, and carbon markets are typical instruments of climate policies. However, the lawmakers opted to discuss it as a goal. Despite debates and bills, this market is yet to be regulated in Brazil[12].

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[11] See article 3rd Law No. 12,187/2019.

[12] Some concepts composing the MBRE are explained in Decree No. 11,075 of May 19, 2022, but supplementary regulation is still pending (BRASIL, 2022).

The *PNMC* guidelines are defined in article 5th, among which are the commitments assumed by Brazil in documents on climate change and the encouragement to maintain and promote "practices, activities, and technologies to promote low greenhouse gas emissions" (BRASIL, 2009).

The *PNMC* establishes in article 6th a long list of instruments. Some predate the Policy itself, such as the National Plan on Climate Change; the Action Plan for the Prevention and Control of Deforestation in biomes; Brazil's National Communication to the United Nations Framework Convention on Climate Change; and the National Fund on Climate Change. It also refers to tax and fiscal policies; lines of credit, specific financing, and even environmental law instruments, such as standard instruments and assessment of environmental impacts.

The main governance structure of the policy established by the *PNMC* is referred to in article 7th as "institutional instruments." It includes already operating bodies, such as the Inter-ministerial Committee on Climate Change and the Inter-ministerial Committee on Global Climate Change.

Finally, article 12th establishes Brazil's voluntary commitment to decrease 36.1% to 39.9% of projected greenhouse gas emissions by 2020. This was the commitment assumed by Brazil at the Conference in Copenhagen in 2009.

2.2 CHANGES IN THE GLOBAL GOVERNANCE STRUCTURE ON CLIMATE CHANGE

After analyzing the context of climate legislation at the national level, through the National Plan on Climate Change and the National Policy on Climate Change, the international treatment of climate policies will be presented considering relevant documents, such as the United Nations Framework Convention on Climate Change, the Kyoto Protocol, and the Paris Agreement.

Beginning in the 1970s, a series of international conferences raised the issue of environmental protection in the global public

debate. In this sense, the Stockholm Conference (1972), the Vienna Convention for the Protection of the Ozone Layer (1985), and the UN Conference on Environment and Development (1992) stand out.

The United Nations Framework Convention on Climate Change (UNFCCC), signed in 1992, was the first international document especially addressing climate change. Faced with uncertainties about how to deal with climate change, the option adopted was establishing principles and institutions that would guide discussions on the subject (BIATO, 2005).

The UNFCCC's primary objective was to stabilize the concentration of greenhouse gases in the atmosphere at levels that would prevent harmful human interference in the climate system, as provided for in the treaty's article 2nd (BRASIL, 1998). Therefore, the States Parties should adopt measures, programs, or policies to mitigate emissions based on the differences between industrialized and non-industrialized countries, adopting the precautionary principle without neglecting the peculiarities of developing countries (MAYER, 2018).

In this sense, no mandatory GHG reduction targets were foreseen. Determining reduction targets per country was left to the Conference of Parties (COP), the highest decision-making body within the governance structure established by the UNFCCC (SANDS, 1992). The Kyoto Protocol and the Paris Agreement resulted from discussions in this instance.

The Kyoto Protocol is an international treaty that began to be discussed in 1988 in Toronto, Canada, and was signed in 1997 in Kyoto, Japan. Its approach considered that countries with a history of high GHG emissions should make more substantial mitigation efforts than others. In addition, the measure reinforces the principle of common but differentiated responsibilities provided for by the UNFCCC.

Unlike the Framework Convention, the Protocol provided concrete mitigation targets and rules. It established a reduction of GHG emissions by at least 5% compared to 1990 levels between 2008 and 2012. However, individual targets considered the

peculiarities of each State-Part; e.g., an 8% reduction was foreseen for the European Union (BRASIL, 2005).

The Kyoto Protocol took seven years and ten months to enter into force, which occurred in February 2005. For its validity, the treaty required the adherence of at least 55 Parties, whose sum of their respective carbon dioxide emissions corresponded to 55% of the global emissions calculated for 1990 (BRASIL, 2005). Even though the United States signed the treaty, it never ratified it, meaning that the leading emitter of GHG has not legally submitted to the international mitigation commitment (LERNER; LERNER, 2008).

Viola (2002, p. 30) notes that the climate change regime depends on countries that lead the process. Therefore, he considers that the presence of the United States, European Union, or Japan was essential for the governance under construction. He also points out the importance of countries like China, India, Russia, Canada, Indonesia, and Brazil, whose global carbon emissions in 1999 were significant. In that year, emissions from the abovementioned countries reached almost a quarter of the total.

Over time, in addition to the difficulty of implementing the Kyoto Protocol, developing countries (especially the BRICS) became significant pollutants of greenhouse gases. Thus, the Protocol's effectiveness was also compromised by increased industrialization in countries that were not previously subject to specific mitigation targets (SOUZA; CORAZZA, 2017, p. 73-74).

The Paris Agreement was signed and approved under the UNFCCC on December 12th, 2015. It established the new international climate legal regime for the post-2020 period. However, its validity depended on the adherence of at least 55 Parties, representing 55% of the global GHG emissions, which occurred on November 4th, 2016, after the signature of 100 out of 195 countries that accepted the global pact in December 2015 (PLANELLES, 2016).

Its approval by the Brazilian Congress occurred through Legislative Decree No. 140 of August 16th, 2016 (BRASIL, 2016). The ratification was deposited with the Secretary-General of the United

Nations on November 4th, 2016, and finally enacted Federal Decree No. 9073 on June 5th, 2017 (BRASIL, 2017).

The primary objectives of the Paris Agreement are described in items "a," "b," and "c" of article 2nd. They deal, respectively, with targets concerning increasing global average temperature, promoting resilience, and adapting financial flows, as transcribed below:

> Article 2nd [...]
> (a) Keep global average temperature rise well below 2°C considering pre-industrial levels, and endeavor efforts to limit such temperature rise to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce risks and the impacts of climate change;
> (b) Increase adaptive capacity to the negative impacts of climate change and promote climate change resilience, with a development that involves low greenhouse gas emissions in a way to not threaten food production; and
> (c) Make financial flows compatible with a trajectory towards a low greenhouse gas emissions development, resilient to climate change (BRASIL, 2017).

Fundamentally, the treaty aims to limit global warming to levels below 2°C, preferably below 1.5°C compared to pre-industrial levels. This target is linked to the responsibility assigned to all States Parties to "prepare, communicate, and maintain successive nationally determined contributions intended to achieve"[13] (BRASIL, 2017). The contributions, called NDCs, must be progressively updated every five years and be as ambitious as possible (BRASIL, 2017).

The Agreement also aims to promote adaptability and resilience to the climate change adverse impacts on decreasing vulnerability to extreme weather events, detailed in articles 7th and 8th. The provision of this objective in article 2nd gives it prominence and importance similar to the mitigation matter.

The third fundamental objective is to encourage financial support from developed countries to expand actions that support

[13] See article 4th, 2nd annex of Decree No. 9,073/2017.

the fulfillment of the Agreement's goals by other developing countries. The subject, further elaborated in the treaty's articles 9th and 11th, takes into account the priorities and particularities of each country, especially those most vulnerable to the adverse effects of climate change (BRASIL, 2017).

The Agreement provides for the promotion of technological development, technology transfer, and capacity building for adapting to climate change. It also encourages cooperation between civil society, the private sector, financial institutions, cities, traditional communities, and indigenous peoples to expand and strengthen actions to mitigate global warming (BRASIL, 2017).

In order to assess the collective implementation of these objectives, the treaty institutes the so-called "global stocktake,"[14] a strengthened transparency structure intended to clarify the actions taken and the support provided and received by the different Parties in the context of fighting climate change. Additionally, it encourages internal actions of environmental education and access to information[15] (BRASIL, 2017).

In terms of implementation control, the Paris Agreement regulates a mechanism for assessing compliance with the responsibilities assumed. Thus, a non-adversarial and non-punitive experts committee is expected to facilitate and promote compliance with the Agreement[16].

Countries may, upon signature, participate in the Conference of Parties as observers; a prerogative extended to the United Nations, its specialized bodies, the International Atomic Energy Agency, and these organizations' member states[17]. First, however, they must wait for the completion of the process of joining the Agreement to be able to deliberate as a Party[18] (BRASIL, 2017).

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[14] *Ibid.*, article 14th.
[15] *Ibid.*, article 13th.
[16] *Ibid.*, article 15th.
[17] *Ibid.*, article 16th, 8.
[18] *Ibid.*, article 16th, 2.

Each State Party is entitled to one vote. Regional organizations of economic integration vote with a number equal to their member states participating in the Agreement. A Party may terminate the Agreement after three years from its entry. Furthermore, denunciation of the Framework Convention implies denunciation of the Agreement (BRASIL, 2017).

Although the Paris Agreement has a well-defined objective of fighting climate change, it also establishes dynamics related to social issues and sustainable development, which is inferred from the wording of the *caput* of article 2nd. According to the device, the agreement aims to "*strengthen the global response to the threat of climate change in the context of sustainable development and efforts to eradicate poverty*" (BRASIL, 2017).

The pillars that ensured the acceptability and effectiveness of the Paris Agreement are identified from the discussion presented here: i. ambition in global efforts to reduce greenhouse gas emissions; ii. Common but differentiated responsibilities[19]; iii. provision and mobilization to support efforts to fight climate change[20] (RAJAMANI; GUÉRIN, 2017, p. 74-90).

The Paris Agreement is considered a milestone in the multilateral process of climate change, as all significant emitters of greenhouse gases share a joint commitment to undertake ambitious efforts to combat climate change and adapt to its effects (UNFCCC, 2021). Therefore, it is necessary to analyze the role of NDCs and the parameters for their development to address the specific goal of each State Party.

[19] *Ibid.*, article 2nd, 2.

[20] *Ibid.*, article 9th, 4.

2.2.1 Parameters for preparing Brazil's Nationally Determined Contributions and the Intended Nationally Determined Contributions for 2016

Upon signing the Paris Agreement of 2015, Brazil committed to preparing and submitting its National Determined Contributions to the UNFCCC Secretariat. Based on this commitment, the international legal regime on climate change starts to be structured in a bottom-up model (JACQUET; JAMIESON, 2016, p. 643-644). In this arrangement, NDCs are considered voluntary commitments by the signatories of the Paris Agreement intended to achieve the common objectives set out in the body of the treaty (FLAKNER, 2016, p. 1114-1116).

One of the challenges imposed is to orchestrate NDCs in such a way that, on the one hand, they lead to symmetric obligations among the signatories, at the same time in which the particularities of each member state are acknowledged. However, on the other hand, there is a fear that the greater degree of freedom given to the signatories will harm the comparability of the commitments assumed by the group (MORGAN; WASKOW, 2014, p. 18-19).

Articles 3rd and 4th of the Agreement regulate some parameters for the preparation of NDCs, considering that they must convey "ambitious efforts," "to achieve the objective," and represent "progression over time." Furthermore, in the relationship between the signatories, the treaty considers that the goals must take into account "their common but differentiated responsibilities and respective capabilities, in light of distinct national circumstances" (BRASIL, 2017).

The idea of "common but differentiated responsibilities" is a principle that dates back to the UNFCCC and has traditionally been used to distinguish the degree of historical responsibility for greenhouse gas emissions between developed and developing countries. Thus, it ended up being used by non-industrialized or late-industrializing countries to justify their inactivity in the commitments assumed (WINKLER; RAJAMANI, 2014, p. 118).

In the new context adopted by the Paris Agreement, such a conception is counterbalanced by evaluating commitments "in the light of distinct national circumstances," adding a qualitative criterion to the historic quantitative criterion. Hence, the perception of the ability of each Nation State to adopt climate action measures becomes relevant.

The example presented by Fleurbay *et al*. (2014, p. 4) illustrates the matter. They explain that two countries may emit similar amounts of greenhouse gases while having substantially different emission profiles. Such is the case of "survival emissions," "development emissions," and "luxury emissions."

In addition to analyzing the "essentiality" of emissions, other criteria can be considered when talking about capability. For example, differences in economic development and vulnerability to the effects of climate change or the relative cost of changes in a country's development can also be considered relevant.

In the Brazilian case, the first NDC was presented on September 20th, 2016, even before the Paris Agreement entered into force. Thus, in that context, only intentions were discussed, which is why the first document submitted was called the Intended Nationally Determined Contributions - INDC.

The Brazilian INDC comprises a series of targets and commitments that the State proposes to adopt to achieve the reduction, mitigation, and adaptation goals. Its structure is divided into two parts. The first establishes mitigation targets, adaptation commitments, and means of implementation. The second part, called "additional information about the INDC for clarification purposes only," presents context data on the country's economic and social development, clarifies methodological aspects, and assesses the commitments concerning equity and ambition (BRASIL, 2015).

Brazil's mitigation goal was to reduce 37% of GHG emissions by 2025, considering 2005 levels; thus, an absolute objective was assumed considering a base year. Additionally, it proposed an indicative target of decreasing 43% of GHG emissions by 2030. Regarding adaptation,

the preparation of the National Adaptation Plan, the National Water Security Plan, and the Plan for Protected Areas was mentioned to improve the resilience of ecosystems and communities vulnerable to the effects of climate change (BRASIL, 2015).

Regarding the means of implementation, the importance of international support, investment flows, and technology transfer is mentioned. Nonetheless, the targets proposed were not conditioned to these flows and transfers. Furthermore, there is a commitment to strengthening cooperation with other developing countries, such as "south-south initiatives."

Additional information conveys the country's understanding of climate geopolitics and spells out measures in specific sectors of the economy. As for the first point, there are two topics in the document: "Historical Responsibilities and Equity" and "Equity and Ambition".

By addressing historical responsibilities, the Brazilian NDC reinforces the traditional understanding of the principle of "common but differentiated responsibilities." Thus, the matter of historical debt to the climate arising from developed countries in their processes of the industrial revolution is emphasized, arguing that, even so, Brazil would be adopting equivalent commitments.

The topic "Equity and Ambition" discusses the country's social conditions, though it is a short passage. According to the document, "Brazil is a developing country with several challenges concerning eradicating poverty, education, public health, employment, housing, infrastructure, and energy access" (BRAZIL, 2015).

Regarding sectoral goals, the areas of energy and bioenergy, land use change, agriculture, industry, and transportation are mentioned, which is the thematic focus guiding this study.

2.2.2 Emissions by Sector determined in the Brazilian INDC and "Agriculture, Forestry and Other Land Uses," thematic focus of the intersection between agriculture and bioenergy policies and their impact on climate change

The parameters established in 1996, which divided the agriculture sector from that concerning land use and land use change and forestry, are revised in the fourth volume of the "IPCC Guidelines for National Greenhouse Gas Inventories – 2006" (IPCCC, 2006). This document proposes uniting the sectors according to Agriculture, Forestry and Other Land Use (AFOLU).

The change in methodology seeks to recognize that carbon inventories and the GHG emission and removal processes are related to all types of soil, regardless of whether lands are aimed at agriculture. For this reason, the AFOLU sector seeks to determine all greenhouse gas emissions resulting from lands where human interventions and activities are implemented to perform productive, ecological, or social functions. This part gravitates around "managed lands" (IPCC, 2006, 1.4-1.5).

Therefore, the objective is to group certain activities in the GHGs inventory so that the States can monitor emissions better, mainly to supervise higher emission levels of concern. For example, the AFOLU sector includes cellular respiration, photosynthesis, and fermentation emissions. Additionally, it includes the management of agricultural fertilizers, deforestation, livestock farming (especially cattle), and burnings, among other activities affecting plantations, forestry, and other land uses that result in the release of methane (CH4), nitrous oxide (N2O), carbon monoxide or dioxide (CO and CO2), etc.

One of the AFOLU sector's peculiarities is that it works, at the same time, as a GHG source and sink. Planted activities are covered in the sector, whose energy source (photosynthesis) sequesters greenhouse gases and emits oxygen, which is essential for human and animal vital activities (STEVENS et al., 2016, p. 34).

In the AFOLU sector, the release of carbon dioxide is directly linked to altered soil carbon, especially biomass burning (UFMG, 2017). Burning is one of the leading anthropic causes of carbon dioxide emissions. It has been increasingly used to clean land available for agriculture or pasture. By destroying forests, burning destroys not only a source that sequesters gases that harm the atmosphere but also destroys organisms that release oxygen gas on Earth, an essential gas for animal cell activities, especially human activities.

There is also methane gas (CH4), which is considered the second most important gas among GHG emissions. Agriculture accounts for 52% of its release into the Earth's atmosphere, with rice cultivation being one of the primary emitters due to flooded rice systems (TORDIN, 2021).

According to a survey conducted by the Brazilian Agricultural Research Corporation (EMBRAPA), flooded rice roots facilitate the entry of atmospheric oxygen and the exit of methane gas formed in the anaerobic respiration of the flooded soil caused by long-term floods. Thus, the inadequate cultivation of rice, without proper flooding support, becomes an important source of methane emission, heavily contributing to global warming (TORDIN, 2021).

Another important source of methane release is cattle farming. Enteric fermentation from ruminant cattle releases methane gas, which is removed from the animals' bodies through the eructation, waste release, and cellular respiration processes. Despite innovations in the raise of these animals, such as diet changes and other kinds of change, the release of methane in cattle raising is evident and must be controlled by mitigation strategies, either through the improvement of pastures or the cattle genetics (MOMBACH et al., 2016, p. 197).

Nitrous oxide also stems from some activities covered by the AFOLU sector. For example, excessive soil nitrogen fertilization is a relevant cause of methane gas emissions in agriculture. According to a study performed by EMBRAPA, plantations usually absorb 50% of all nitrogen fertilizers, while the remaining is

dissolved in the soil or released into the atmosphere, further compounding the greenhouse effect (FERREIRA, 2015).

According to the IPCC Sixth Assessment Report, the AFOLU sector accounted for 22% of all net greenhouse gas emissions on the planet in 2019 (IPCC, 2022). In the Brazilian case, the Center for Integrated Studies on the Environment and Climate Change (2018, p. 37) reports that, in 2010, agriculture represented 35% of national emissions, while land use change corresponded to 26%, also noting a high emission context between 2010 and 2015, followed by a drop between 2015 and 2020.

The Brazilian Federal Government still separates estimates concerning the agricultural sector from that concerning land use change, the emissions of which were calculated to be 38% and 28.5% of total emissions in 2020 (BRASIL, 2022). Thus, the activities encompassed by the AFOLU concept have a relevant participation in the Brazilian emissions profile.

Regarding the performance of UNFCCC States Parties in the AFOLU sector, the IPCC is highly confident of the need to overcome institutional and public policy challenges. According to the institution,

> Realizing AFOLU's mitigation potential implies overcoming institutional, economic, and political constraints and managing potential trade-offs (high confidence). [...] Barriers to implementing AFOLU mitigation include a "lack of institutional and financial support, uncertainty over long-term additionality and compensations, weak governance, fragmented land ownership, low profitability, and a lack of access to alternative income sources, and the risk of backsliding (IPCC, 2022, p. 37).

In this sense, Brazil and other countries should observe the strategies for properly reducing emissions, either by implementing stricter policies on deforestation and recovery of deforested biomes or by encouraging new techniques and more sustainable technologies that cause fewer impacts, decreasing the number of emissions.

The Brazilian INDC mentions targets per sector to mitigate GHG emissions from energy and bioenergy, land use change, agriculture, industry, and transportation. The concept of AFOLU employed by the IPCC proves helpful in determining a thematic focus that encompasses this study's objectives.

Regarding bioenergy, the document notes that Brazil has one of the oldest biofuel programs in the world. The share of these fuels in the Brazilian matrix is expected to increase to approximately 18% by 2030. The objective is to expand the production and consumption of biofuels, promoting the development of second-generation renewable fuels.

Regarding land use change, the text establishes measures to fight deforestation and promote reforestation. Thus, it indicates an intention to strengthen the implementation of the Forest Code at the federal, state, and municipal levels; adopt measures to end illegal deforestation in the Amazon by 2030 and compensate legally suppressed emissions; restore 12 million hectares of forests by 2030; and strengthen the sustainable management of forests (BRASIL, 2015).

Specifically regarding agriculture, the document indicates that the Low Carbon Agriculture Program (ABC Program) is the primary measure to promote the agricultural sector's development. It also mentions the recovery of 15 million hectares of degraded pastures and the adoption of integrated crop-livestock-forestry systems on 5 million hectares by 2030 (BRASIL, 2015).

These three sectoral goals mentioned in the INDC are part of the AFOLU concept. There is a relationship between the concept of "managed lands" (which guides AFOLU) and agriculture in the profile of GHG emissions in Brazil, either through deforestation to change land use or through the productive management of land to produce food or bioenergy.

Henceforth, we observe that the international climate governance regime inaugurated with the Paris Agreement requires Brazil to primarily understand how the new commitments and the implementation of the new framework to fight climate change

affect the Brazilian measures, which had been implemented in the pre-Paris Agreement for the AFOLU sector.

2.2.3 Public climate policies: discussions regarding the AFOLU sector concerning internal policies to fight climate change before and after the Paris Agreement

The term "public policies" refers to a set of government action programs to coordinate the means and achieve socially and politically precise objectives. Programs and policies are not to be confused because the first concerns administrative actions intended to achieve a given end. Policies are related to the political means to find a method to put thoughts into practice and achieve the expected result. In this sense, public policies may be composed or originate from government implementation programs (NUSDEO, 2018, p.92 and 93).

Public policies are considered the border between Law and politics. They implement government actions through government programs and the like and effectively institutionalize them without harming the future exchange of mandates. This is the institutional arrangement to which public policies are linked, even if indirectly, to achieve the purpose for which they were conceived (NUSDEO, 2018, p. 94).

The Constitution of the Federative Republic of Brazil - 1988 (CRFB/1998) establishes in its initial articles some resources of indisputable importance for society, such as education, health, and housing, among other fundamental rights. Hence, public policies must act through various means, either by implementing programs (e.g., federal housing programs) or creating laws, decrees, and the like to regularize and implement propositions to achieve such purposes.

In this context, public policies addressing environmental conservation gain relevance. Public policies legally enable to supervise and promote a decrease of harmful practices that threaten nature, such as GHG emissions and deforestation, among others.

There are three temporal phases within the scope of environmental public policies. The first comprises between the end of the 19th century and World War II, in which government measures assume more individualistic aspects in the struggle to reduce polluting activities. The second involves the actions performed between 1945 and 1970 when supervision and other actions concerning polluting activities became a State responsibility. Finally, the third and current phase refers to the actions implemented from the 1970s onwards, characterized by using instruments to safeguard the quality of natural resources (NUSDEO, 2018, p. 96).

Concerning the climate, the National Policy on Climate Change stands out as a set of government actions that structured, starting in 2009, the means and ends to fight global warming. Among others, its objectives involve reconciling "[...] economic and social development with the climate system protection"[21]; strengthening "[...] anthropic removals through greenhouse gas sinks"[22]; promoting the "[...] preservation [...] conservation and [...] recovery of environmental resources, especially vast natural biomes considered National Heritage"[23] and, finally, moving towards "[...] the consolidation and [...] expansion of legally protected areas and promoting reforestation and restoration of vegetation cover in degraded areas"[24].

These objectives align with the 2012 Forestry Code, as it establishes protected areas with specific rules on their preservation and potential uses. Thus, a series of legal instruments had already been established before the Paris Agreement.

It is for no other reason that the Brazilian INDC once again mentions the Forest Code, seeking to strengthen it and other

[21] See Law No. 12,187/2009, article 4th, I.
[22] *Ibid.*, article 4th, IV.
[23] *Ibid.*, article 4th, VI.
[24] *Ibid.*, art. 4º, VII.

measures to fight illegal deforestation, as potential means to tackle climate change (BRASIL, 2015).

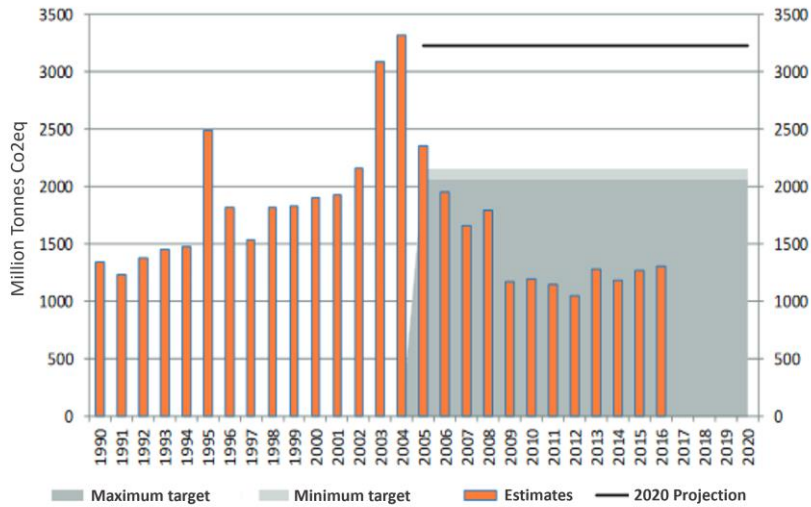
As this is the first NDC presented, identifying potential aspects to be improved and gradually implemented is expected. However, two discrepancies concerning the domestically adopted policies should be highlighted.

The portion in the Brazilian INDC addressing additional information indicates that the GHG emissions in 2005 would have been 2.1 GtCO2e (GWP-100; IPCC AR5). Thus, the emissions ceiling for 2025 would be 1.3 GtCo2eq (IPEA, 2019, p. 39). These data are consistent with the second national communication on emission inventories submitted to the UNFCCC in 2010 (BRASIL, 2010, p. 16).

However, in 2018, three years after the INDC was submitted, the Federal Government enacted a new decree updating the country's voluntary goal adopted in 2009 via the *PNMC*. Article 12th aimed to reduce the 2020 projected emissions between 36.1% and 38.9% (BRASIL, 2009).

Decree No. 9,578/2018 projected the GHG emissions for 2020 to be 3,236 GtCo2eq. However, since the *PNMC* adopts a relative target, the practical result was establishing a 2.0 GtCo2eq goal for 2020, i.e., a less ambitious target than the one submitted under the Paris Agreement three years earlier (which would be 1.3 GtCo2eq). Graph 1 presents the application of the relative emissions target, compared to the target projected to 2020, according to the decree issued in 2018.

Graph 1 – Estimates of Brazil's emissions, with Co2eq (GWP 100 years. IPCC SAR, 1995), from 1990 to 2016, with emission ceilings according to the commitment to decrease the value projected for 2020.



Source: Chart reproduced from the report by the Brazilian Ministry of Science, Technology, Innovations and Communications (BRASIL, 2019, p. 9).

Another matter involves the efforts mentioned in the INDC to ensure that the share of biofuels in the Brazilian energy matrix reaches 18% by 2030. There were fragmented measures to encourage and promote biofuels; however, these measures were only partially unified with the National Biofuels Policy, enacted in 2017.

Nonetheless, sugarcane-based fuels had already jumped from 15.4% to 17.4% of the Brazilian energy matrix between 2012 and 2017 (MORAIS, 2019, p. 10). Therefore, even though the above commitment is mentioned only in the additional information, it represents a target that has been practically fulfilled (IPEA, 2019, p. 24). For this reason, domestic policies on bioenergy gain certain autonomy in setting targets, as there is no international commitment parameter.

The year 2020 was the last year for *PNMC* to establish voluntary goals. However, the commitments established in the INDC defined deadlines for 2025 and 2030. Therefore, a necessary

measure is to update the internal regulatory framework to the new international commitments.

There was some effort to update the Brazilian legal framework, which was countered with deregulation and deinstitutionalization measures of climate policy. A broad proposal to integrate the *PNMC* and the Paris Agreement is Bill No. 6,539/2019, on the initiative of the Environment Commission and already approved by the Federal Senate. It would establish a general norm for restructuring the *PNMC*, while the commitments to the Paris Agreement would be introduced internally, also establishing responsibilities and competencies.

One of the qualities of the original text under debate is the definition of the NDC, understanding it as "a Brazilian commitment within the scope of the Paris Agreement, which includes absolute targets for reducing GHG emissions, mitigation and adaptation measures, and means of implementation." Furthermore, it proposes that the Inter-ministerial Committee on Climate Change be the highest coordinator for implementing the *PNMC* (BRASIL, 2019).

Additionally, in 2021, Bill No. 1539/2021, authored by Senator Kátia Abreu (BRASIL, 2021), proposed changes to the *PNMC* to align it with the concepts and commitments established in the Paris Agreement.

A third initiative took place during the meeting of the Conference of the Parties to the Paris Agreement in Glasgow. In November of the same year, the federal government issued Resolution 05 on October 20th, 2021, approving the public consultation of the PL draft that proposes the revocation of the *PNMC*, establishing a new treatment for the Climate Change Policy (BRASIL, 2021). However, this action was criticized in the media given a lack of coordination between the actions of the Legislative and Executive Powers, the setbacks concerning the participation of civil society and other federative entities in the Inter-ministerial Committee proposed, and the withdrawal of the

objective of expanding protected areas, among other aspects. (POLÍTICA POR INTEIRO, 2022).

Although a broad reform of the internal policy on climate change has yet to be approved, there is a fragmented and one-off introduction of the Paris Agreement in public policies on climate and the development of infra-legal norms.

An example is the introduction of this topic in the Federal Development Strategy for Brazil – 2020 to 2031 (EFD 2020-2031), established by Decree No. 10,531/2020 (BRASIL, 2020). The EFD 2020-2031 has an environmental axis and considers it a challenge (4.3.2) "to implement policies, actions, and measures to fight climate change and its effects, fostering a resilient low-carbon economy" (BRASIL, 2020). Thus, it provides that actions and measures to fight climate change, regulating a series of guidelines, must align with Brazil's NDC submitted to the Paris Agreement.

In this same vein, collegiate bodies established within the *PNMC*, or with responsibilities related to its scope were subject to changes. Also surrounded by much criticism, the government initiating its term issued Decree No. 9,759 on April 11th, 2019, determining the extinction of many collegiate bodies on climate (BRASIL, 2019).

The Decree preserved the councils that were created, composed, and with responsibilities established by law. On the other hand, it extinguished those whose creation was referred to by law but were established in later or earlier decrees, such as was the case of collegiate bodies referred to in the National Environmental Policy.

The matter went to the courts, and the Supreme Court judged it according to the Direct Action of Unconstitutionality No. 6,121/2020. When assessing the request for precautionary measures, the Court determined the maintenance of these councils referred to by law, as was the case of the *CIM* (BRASIL, 2019). However, later decrees changed how it was composed and its responsibilities.

The changes caused by Decree No. 10,145 of November 28th, 2019, on CIM's responsibilities and how it was composed (BRASIL,

2019) were criticized because it reduced the number of members and opportunities for social participation (TALANOA, 2020). On October 25th, 2021, Decree No. 10,845 transformed the *CIM* into Inter-ministerial Committee on Climate Change and Green Growth (CIMV), adding responsibilities related to the National Program for Green Growth, instituted by Decree No. 10,846 of October 25th, 2021 (BRASIL, 2021).

In 2017, Decree No. 9,082 of June 26th promoted changes in the Brazilian Forum on Climate Change (BRASIL, 2017). In turn, Decree No. 10,144 of November 28th, 2019, changed the responsibilities of the National Commission for Reducing Emissions from Deforestation and Forest Degradation, Forest Carbon Stock Conservation, Sustainable Forest Management, and Increase of Forest Carbon Stock, which specifically deal with REDD+ measures (BRASIL, 2019).

Although this study's scope is limited to the first years of the Paris Agreement and iNDC presented by Brazil, we should note that an updated version of the national commitments was submitted on December 9th, 2020 (BRAZIL, 2020).

In summary, the general commitments that had already been presented were confirmed, highlighting Brazil's intention to achieve climate neutrality in 2060 (BRAZIL, 2020). However, opinions and editorials published in the media and general information indicate a tone of pessimism concerning the new NDC, showing flaws in the way the commitment is presented and the possibility of gaps, which may represent decreased ambition in emissions mitigation targets (CLIMAINFO, 2020; ROMEIRO; GENIN; FELIN, 2021; CHIARETTI, 2021).

3 CASE STUDY No. 1 – FOREST CODE

The analysis of the implementation process of the Brazilian INDC begins with a case study on the Law for the Protection of Native Vegetation (Law No. 12,651/2012), herein referred to as the Forest Code[25], the object of which is the establishment of rules concerning the preservation, conservation, and restoration of protected areas.

The Forest Code was enacted in 2012, prior to the proposal of the INDC in 2015. Nevertheless, the objectives pursued by the regulation were incorporated into the commitment to the Paris Agreement, mainly considering the characteristic of native vegetation, which serve as carbon stock, and the fact that the Forest Code provides for the restoration of degraded land as part of its policy for the regularization of urban and rural properties.

Furthermore, one must acknowledge that the land-use change sector (LULUCF) presents high rates of environmental degradation recrudescence. For example, data from the federal government indicate an increase of 56.8% in net greenhouse gas emissions in the sector between 2016 and 2020 (BRASIL, 2022, p. 8).

Many controversies permeated the legislative process and the enactment of the Forest Code. The lessening of environmental protection standards was the main aspect criticized by environmental sectors, culminating in a long judicialization process, delaying its implementation. Additionally, the very complexity of the legislation affects its implementation, such as the need for private agents to coordinate with the public sector at the state level.

[25] As mentioned in the first chapter, the Law for the Protection of Native Vegetation became nationally known as the "Forest Code." However, it did not follow the rite for a code project provided for in the internal regulations of the chambers of the National Congress. The "Forest Code" expression is used in the INDC to refer to Law No. 12,651/2012 and will also be used here.

Such complexity aligns with the methodological approach addressed here. As Martins (2008, p. 9) notes, applied social sciences often investigate objects, the events and variables of which are outside the researchers' control, which is why a quantitative approach would not fully apprehend reality.

Thus, a case study allows using a wide range of data collection techniques to record and evaluate the context under analysis. In this study, we used content analysis to treat the related legislation, a systematic bibliographical review, content analysis to analyze the webpages of representatives of the sectors impacted by the regulation, and, finally, interviews were held with policy participants.

Each data collection set was placed in a subsection of this chapter according to the order mentioned above. However, the objective of understanding criticisms toward the Forest Code and the challenges for implementing the regularization program it establishes determined how data are presented.

3.1 REGULATORY SURVEY AND CONTENT ANALYSIS OF THE RELATED LEGISLATION

One of the strategies provided for by both international and national standards to fight climate change is the preservation and strengthening of greenhouse gas sinks and reservoirs (BRASIL, 2017). In this context, the Forest Code converges with this objective as it provides for the uses, preservation, and conservation of protected native vegetation (BRASIL, 2012).

Some instruments concerning protected land areas are assessed in this chapter, such as the Permanent Preservation Areas (PPA), Legal Reserves (LR), the Rural Environmental Registry (CAR, in Portuguese), and the Environmental Regularization Program (PRA, in Portuguese).

Each of these instruments is presented below, enabling us to understand part of the strategies designed to achieve the climate

targets established by Brazil in its INDC regarding the implementation of the Forest Code.

3.1.1 Forest Code Trajectory

The Forest Code provides for two categories of protected areas: Permanent Preservation Areas (PPA) and Legal Reserve areas (LR). Additionally, it provides for forest exploration, the supply of forest raw materials, the control of the forest products' origin, and the control and prevention of forest fires in the Brazilian territory (BRASIL, 2012).

The doctrine recognizes the law as the "new Forest Code," as it replaced previous forestry laws. It expressly revoked Law No. 4,771 from September 15th, 1965 (BRASIL, 1965, p. web), which, in turn, had revoked Decree No. 23,793 from January 23rd, 1934 (BRASIL, 1934).

The legislative process of the Forest Code (Law Project No. 1,876/99) lasted more than 12 years. It was the object of heated discussions in the National Congress, and it still underwent supervening changes after its enactment by Provisional Measure No. 571/2012 (BRASIL, 2012) and Federal Law No. 12,727/2012.

Furthermore, the constitutionality of the norm was questioned by at least five lawsuits presented to the Federal Supreme Court. As a result, the actions[26] were considered partially valid in February 2018, leading to the exclusion of unconstitutional sections (BRASIL, 2021). However, the rulings were published only 18 (eighteen) months later, preventing the decision's legal effects (BRASIL, 2021).

[26] It concerns the joint judgment of the Direct Actions of Unconstitutionality No. 4901, 4902, 4903, and 4937, and the Declaratory Action of Constitutionality No. 42.

3.1.2 Permanent Preservation Areas - PPA

Chapter II of the Forest Code deals with Permanent Preservation Areas (PPA), intended to preserve native vegetation in relevant areas to protect watercourses and geological stability, among others. For example, "the marginal strips of any perennial and intermittent natural watercourse, excluding the ephemeral ones," are protected in rural and urban areas (BRASIL, 2012).

Buffer strips have different lengths, starting from the edge of the regular bed gutter. The width of protection strips ranges between 30 and 500 meters, depending on the watercourse width[27]. In the same sense, areas around natural lakes and ponds, between 30 and 100 meters wide, are also protected[28].

Socioeconomic issues were considered when determining obligations to preserve and protect native vegetation in PPA. Hence, in areas where native vegetation had already been suppressed, the Code authorized small properties or those owned by rural families to make agricultural use of the floodplains and implement aquaculture activities around rivers, lakes, and natural ponds[29].

In addition to protecting water resources, the Code also establishes that PPA are strategic regions for geological stability. It is the case of slopes with a declivity greater than 45º, restingas, mangroves, and the edges of plateaus[30].

The Forest Code also authorizes the Chief Executive to create PPA in addition to those areas pre-established by lawmakers[31]. To this end, native vegetation must fulfill functions of social interest, such as, for example, "containing soil erosion and mitigating the risk of floods and landslides and rockslides"[32].

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[27] See Art. 4th, I of Law No. 12,651/2012.
[28] See Art. 4th, II of Law No. 12,651/2012.
[29] See Art. 4th, §5th and §6th of Law No. 12,651/2012.
[30] See Art. 4th, V, VI, VII, VIII of Law No. 12,651/2012.
[31] See Art. 6th, *caput* of Law No. 12,651/2012.
[32] See Art. 6th, I, of Law No. 12,651/2012.

3.1.3 Legal Reserves - LR

Chapter IV of the Forest Code is dedicated to Legal Reserve areas (LR). It concerns a minimum percentage of protected native vegetation in rural properties. As a rule, the law establishes that 20% of a property is an LR area. However, in properties located in the Legal Amazon, this percentage increases to 35% in Cerrado regions and 80% in forest areas[33].

The definition of an LR area is not at the owners' sole discretion. Its location must consider the importance of preserving biodiversity and the area's environmental fragility, taking into account the hydrographic basin plan, the Ecological-Economic Zoning, and the possibility of creating ecological corridors[34]. Additionally, its location must be approved by the competent state agency[35].

As a rule, LR and PPA are independent, which prevents a PPA from being considered an LR. However, the Code permits this possibility in already suppressed areas, provided it does not imply new suppressions[36], or situations where the cumulative incidence of rules precludes the productive use of at least 20% of the property in the Legal Amazon[37].

Large percentages of conservation units in the public domain or indigenous lands approved in the states also make the LR regime more flexible in the Legal Amazon. It is the case where more than 50% of a municipality's territory is covered by a conservation unit or indigenous land[38], or 65% of the State's territory. The latter is subject to prior Ecological-Economic Zoning approval[39]. In these situations, the Government can reduce the LR percentage to 50% of the property.

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[33] See Art. 12th of Law No. 12,651/2012.
[34] See Art. 14th of Law No. 12,651/2012.
[35] See Art. 14th, §1st of Law No.12,651/2012.
[36] See Art. 15th of Law No. 12,651/2012.
[37] See Art. 15th, §4th, I of Law No. 12,651/2012.
[38] See Art. 12th, §4th of Law No. 12,651/2012.
[39] See Art.12th, §5th of Law No. 12,651/2012.

The responsibility of preserving an LR rests with the person occupying a property or its owner, regardless of the property title[40]. Likewise, restoration is mandatory in case of illegal suppression of native vegetation.

LR areas may be subject to sustainable management, which consists of "selective logging practices in sustainable management modalities without commercial purposes for consumption on the property and sustainable management for forest exploration with commercial purposes"[41]. The use of an area for commercial purposes depends on prior authorization from the environmental agency[42].

The Forest Code also foresees situations for expanding an urban area. In order to extinguish legal reserve areas, one must register the subdivision of land in the master plan[43]. It also provides for the use of legal reserves as an instrument for establishing urban green areas[44].

3.1.4 Rural Environmental Registry - CAR

The Environmental Rural Registry (CAR in Portuguese) is an information tool established by the Forest Code. It consists of a "national electronic public registry, mandatory for all rural properties, to integrate the environmental information of rural lands" (BRASIL, 2012). CAR integrates the Brazilian National Environment Information System (SINIMA in Portuguese).

The importance of CAR lies in the possibility of the government obtaining information about Brazilian rural properties, identifying areas where law compliance, and achieving the objective of sustainable development require intervention (BRANCALION *et al*., 2016).

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[40] See Art. 17th of Law No. 12,651/2012.
[41] See Art. 20th, caput of Law No. 12,651/2012.
[42] See Art. 23rd of Law No. 12,651/2012.
[43] See Art. 23rd of Law No. 12,651/2012.
[44] See Art. 19th of Law No. 12,651/2012.

Registration is free, self-declaratory, and mandatory. Upon registration, the rural owner or occupant must provide information such as personal identification, proof of ownership or possession, and detailed property identification.

3.1.5 Environmental Regularization Program (PRA)

The Environmental Regularization Program (PRA in Portuguese) was established in the Forest Code as a transitional institute to facilitate the regularization of landowners or land occupants with a history of non-compliance with the legislation protecting native vegetation[45]. Rural lands must be registered in the CAR[46] to join the PRA. When joining the PRA, the owner or occupant signs a commitment term with an extrajudicial enforceable title[47].

The Union generally establishes the norms for the regularization of rural property. However, it is up to the States and the Federal District to complement and adapt them to territorial, climatic, historical, cultural, economic, and social specificities[48].

Once the commitment term is signed, sanctions resulting from infractions committed before July 22nd, 2008, are suspended. This date coincides with the publication of Decree No. 6.514, which regulates the Environmental Crimes Law and provides for infractions and administrative sanctions against the environment.

From a criminal point of view, the adherence of landowners or land occupants to the PRA also suspends punishment due to environmental crimes[49]. Once a property is effectively regulated, the punishability of such crimes is extinguished[50].

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[45] See Art. 59th of Law No. 12,651/2012.
[46] See Art. 59th, §2nd of Law No. 12,651/2012.
[47] See Art. 59th, §3rd of Law No. 12,651/2012.
[48] See Art. 59th, §1st of Law No. 12,651/2012.
[49] See Art. 60th, *caput* of Law No. 12,651/2012.
[50] See Art. 60th, §2nd of Law No. 12,651/2012.

3.1.6 Environmental Conservation Support Program

The Forest Code authorizes the Government to establish a program to support environmental conservation. In the same sense, it encourages good practices and the adoption of technologies to "reconcile agricultural and forestry productivity, reducing environmental impacts, as a way of promoting ecologically sustainable development"[51] (BRASIL, 2012).

One of the authorized lines of action is the institution of payment or incentive in exchange for environmental services; whether the incentive is monetary or not, conservation activities that promote ecosystems and generate environmental services are encouraged. The Code foresees several categories, directly aligned with the objectives of the Brazilian NDC, as eligible to receive support: "sequestration, conservation, maintenance, and increase of the carbon stock, reducing carbon footprint," "climate regulation" and "maintenance of Permanent Preservation Areas, Legal Reserve Areas, and Restricted Use Areas"[52].

The legislation regulates a series of instruments that can be used in the program. These consist of agricultural credit and insurance on advantageous terms, the deduction of PPA and LR from the cost basis to calculate Rural Territorial Taxes, as well as exemptions from other taxes on inputs and equipment[53].

Therefore, there is a set of tools that help rural owners and occupants to comply with the legislation. In addition to the national instruments, the Forest Code expressly makes PPA and LR maintenance activities eligible for payments or environmental incentives, even declaring as "additionality for the purposes of national and international markets of certified reductions in greenhouse gas emissions"[54] (BRASIL, 2012).

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[51] See Art. 41st of Law No. 12,651/2012.
[52] See Art. 41st of Law No. 12,651/2012.
[53] See Art. 41st, I of Law No. 12,651/2012.
[54] See Art. 41st, §4th of Law No. 12,651/2012.

3.1.7 Environmental Reserve Quotas – (ERQ)

Environmental Reserve Quotas (ERQ) were instituted as an economic instrument to facilitate the compliance of rural property owners or occupants with the Forest Code. It is conceptualized as a "nominative title representative of an existing area with native vegetation or in the process of restoration"[55].

For LR purposes, through ERQ, the owner or occupant of a rural property can compensate for irregular suppression of native vegetation that occurred before July 22nd, 2008[56]. Additionally, as the title can be transferred free of charge or for a fee[57], an economic incentive is provided to owners with a surplus of LR, who earn a new source of income with the conservation and maintenance of native vegetation.

One ERQ corresponds to one hectare of primary native vegetation or secondary vegetation, but also areas that are being restored by the reforestation of native species[58]. Eligible areas are those: (i) under conservation easements; (ii) corresponding to surplus and voluntarily instituted LR; (iii) protected as a Private Natural Heritage Reserve; or (iv) located within conservation units in the public domain but not yet expropriated[59].

Owners must request the issuance of ERQ after registering their lands in the CAR upon presenting a report proving control by the competent federal agency of the National Environmental System – SISNAMA, in the form of an act of the Chief Executive[60]. After the ERQ issuance, the Code determines that the issuing body registers the security on commodity exchanges or systems for the

[55] See Art. 44th, caput of Law No. 12,651/2012.
[56] See Art. 46th, caput of Law No. 12,651.
[57] See Art. 48th, caput of Law No. 12,651.
[58] See Art. 46th, caput of Law No. 12,651.
[59] See Art. 44th, caput of Law No. 12,651.
[60] See Art. 44th, §1st of Law No. 12,651.

registration and financial settlement of assets authorized by the Central Bank[61].

3.1.8 Consolidated areas in PPA and LR

One of the Forest Code's controversial points was the amnesty granted to landowners and occupants of rural lands, the native vegetation of which was irregularly suppressed before July 22nd, 2008. The applicable penalties were suspended in these cases, and instruments such as the PRA eased regularization.

The areas deforested up to the referred date are called "consolidated rural areas." The Forest Code defines them as "area[s] of rural property with anthropic occupation existing prior to July 22nd, 2008, with buildings, improvements or crop-livestock-forest activities systems, admitting, in the latter case, the adoption of fallows"[62].

Regarding PPA, the continuity of crop-livestock-forest activities, ecotourism, and rural tourism activities in consolidated areas was authorized[63]. The vegetation restoration criteria in PPA in consolidated areas are based on the size of properties, which came to be called the "staircase" criterion, applicable to the vegetation along water margins, around natural springs, lakes, and ponds, and on footpaths (*veredas*)[64].

The minimum restoration area must comprise a radius of 15 (fifteen) meters in PPA around springs. In the case of footpaths (*veredas*), restoration must cover 30 (thirty) meters among lands with an area of up to 4 (four) fiscal modules and 50 (fifty) meters for properties with larger areas[65].

Meanwhile, the restoration of PPA on the margins of natural watercourses follows the following proportion:

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[61] See Art. 47th, of Law No. 12,651/2012.
[62] See Art. 3rd, IV of Law No. 12,651/2012.
[63] See Art. 61st-A of Law No. 12,651/2012.
[64] See Art. 61st-A, §1st to §7th of Law No. 12,651.
[65] See Art. 61st-A, §7th of Law No. 12,651/2012.

a) 5 (five) meters for lands with an area of up to 1 (one) fiscal module;
b) 8 (eight) meters for lands with an area of 1 (one) to 2 (two) fiscal modules;
c) 15 (fifteen) meters for lands with an area of 2 (two) to 4 (four) fiscal modules;
d) Other lands must restore between 20 (twenty) and 100 (one hundred) meters, as established by the PRA.

Likewise, if the area to be restored belongs to the surroundings of natural lakes and ponds, restoration footages[66] are:

a) 5 (five) meters for lands with an area of up to 1 (one) fiscal module;
b) 8 (eight) meters for lands with an area of 1 (one) to 2 (two) fiscal modules;
c) 15 (fifteen) meters for lands with an area of 2 (two) to 4 (four) fiscal modules;
d) 30 (thirty) meters for lands with an area greater than 4 (four) fiscal modules.

In any case, the classification of lands in one situation or another must be informed to the CAR for monitoring purposes. Additionally, authorization to continue crop-livestock-forest practices, ecotourism, or rural tourism does not exempt owners or occupants from adopting practices to mitigate impacts[67].

Also, for the case of irregular suppression of native vegetation in an LR area, the Forest Code disciplines the consolidated rural area regime if the irregularity occurred before July 22nd, 2008[68], in which case, regularization through restoration, natural regeneration, or compensation is allowed.

Restoration and natural regeneration occur within the property itself, while compensation is possible by acquiring rights over native vegetation in other properties, as it occurs in the case of commercialization of ERQ. Restoration and regeneration differ in that the first requires actively replanting plant species, while the second consists of abstaining from new productive interventions, allowing the environment itself to reestablish vegetation.

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[66] See Art.61st-A, §6th of Law No. 12,651/2012.
[67] See Art. 61st-A, §9th of Law No. 12,651/2012.
[68] See Art. 66th, of Law No. 12,651/2012.

Owners must complete restorations within 20 years, restoring at least 1/10 (one-tenth) every 2 years[69]. During this process, the planting of 50% of exotic species interspersed with native species is allowed[70].

The regularization of an LR area through compensation requires the land to be registered in CAR, which can be performed through one of four alternatives: (i) "acquiring Environmental Reserve Quotas – ERQ"; (ii) "leasing an area under an environmental easement or Legal Reserve"; (iii) "donating to the government an area located inside a Conservation Unit in the public domain"; (iv) "registering another area equivalent to and with an excess of Legal Reserve, in a land owned by the same owner or acquired in a third-party's land, with established native vegetation, undergoing regeneration or restoration, insofar it is located in the same biome" (BRASIL, 2012)[71].

Some requirements are imposed for using areas for compensation; i.e., the Forest Code requires equivalence of extension and biome within the same state. If outside the State, the area must be identified as a priority by the Union or the States[72]. It so happens that after the Federal Supreme Court verified the legislation, it determined that it would not be enough for the compensation to occur among areas in the same biome; hence, "ecological identity" still must be proven (BRASIL, 2018).

One cannot ignore that regularizing legal reserves can lead to expanding greenhouse gas sinks, mainly through restoration and natural regeneration measures. In the case of compensation, at least the maintenance of carbon stocks is ensured; hence, the policy to protect native vegetation convergences with climate change.

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[69] See Art. 66th, §4th of Law No. 12,651/2012.
[70] See Art. 66th, §3rd of Law No. 12,651/2012.
[71] See Art. 66th, §5th of Law No. 12,651/2012.
[72] See Art. 66th, §6th of Law No. 12,651/2012.

3.2 SYSTEMATIZED BIBLIOGRAPHIC ANALYSIS: CRITICISMS FROM THE LITERATURE

This bibliographic review aimed to identify criticisms of the Forest Code implementation process. These criticisms are divided into two categories: one arising from the academic milieu through papers published on the CAPES Periodicals Portal, and the other, from sectors of society affected or involved in its application, which refer to environmentalists and ruralists. Analysis of these two categories is intended to highlight existing counterpoints.

The search mechanism adopted in the bibliographic review was the one available in the CAPES platform[73]. Some attempts were made when establishing and refining the search terms, which proved unsuccessful due to many results. For example, the term "forest code" returned 574 items.

Thus, after the refining process[74], which included group discussions and reading bibliographies addressing the Forest

[73] Available at: <https://www-periodicos-capes-gov-br.ezl.periodicos.capes.gov.br/index.php>.

[74] The term "forest code" was first used, resulting in 574 results. Hence, the filter for only "articles" was used, decreasing the results to 557. The search was further restricted to the period between 2009-2020 (the year of the approval of the National Policy on Climate Change and the end of the ABC Plan, respectively), which reduced the results to 516 articles. Next, the search was restricted to peer-reviewed journals so that a more robust universe of articles would be identified, which resulted in 447 articles. These were categorized according to relevance, prioritizing those related to "law." However, this study's objective did not include carrying out such a broad literature review on the Code. Since CAPES Periodical Portal offers an option to refine the results based on topics, we searched for "forest code." One of the available topics was "law," and it yielded 26 results. We considered it interesting, provided that the filter was efficient. So, we analyzed these articles in detail, attempting to find criticisms of the forest code. However, six articles were discarded as they dealt with forest codes before 2012; focused on a neutral descriptive or historical analysis without critical notes; addressed urban law and judicial activism, or discussed the principles of environmental law. Even though the remaining 20 articles reported criticisms, they were overly broad. The content addressed contemporary slavery, conservation biology, public opinion, and human rights violation, among others, not allowing categorization of

Code, as well as re-reading the legislation itself, terms were identified to reflect the legislation implementation issues for the period between the publication of the National Policy on Climate Change and the final year of the first Nationally Determined Contribution (NDC).

This process resulted in the keywords <"*código florestal*" [forestry code] AND ["*cadastro ambiental rural*" [rural environmental registry] OR "*programa de regularização*" [regularization program] OR "*áreas consolidadas*"] [consolidated areas] AND "*implementação*" [implementation]>, with a timeframe between January 1st, 2009, and December 31st, 2020. Native platform filters were also applied, referring to the nature of the publication ("*artigos*" [articles] and "*periódicos revisados por pares*" [peer-reviewed journals]) and with the relevance preference for "*direito*" [law].

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criticism. Thus, we concluded that the "law" topic filter offered by the Portal did not meet the specificities of this study. As predicted, even after using several of the filters and tools provided by the Portal's advanced search, the number of results was still significant, and the filter was insufficient. Therefore, in order to make the search more effective, in addition to the term "forest code," we added the following expressions ("AND"): ["regulation" OR "right" OR "legislation"], with a timeframe between January 1st, 2009 and December 31st, 2020, i.e., between the year when the PNMC was published and the final year of the first NDC (Nationally Determined Contribution) proposed by Brazil in the Paris Agreement. Additionally, the filters "articles" and "peer-reviewed journals," with the relevance preference for "law," were used. As a result, 272 articles were identified to which the quadrant method was applied. Such a method separates the result into four quadrants with the same number of articles, in this case, 68 articles each. The full texts of the articles in the first quadrant were read, considering these were the most relevant articles. Next, the titles and abstracts of the 136 articles in the second and third quadrants were read, which revealed the full texts that would be read. Finally, the fourth and last quadrant was discarded due to its lesser relevance. This procedure revealed those articles that did not match expectations, as many exclusively analyzed forest codes before the current law of 2012. Hence, even though a timeframe filter was used, it allowed some articles addressing the previous Code to be selected because they were published during the timeframe chosen. The reason is that we determined the period to start three years prior to the publication of the current Code, considering that discussions about it began much earlier. These procedures enabled identifying a feasible and relevant search.

As a result, 17 articles were identified. Two were discarded after in-depth analysis for not bringing criticisms specific to the code. For example, one of the articles was excluded for analyzing the clinic on human rights and environment at a federal university, dealing specifically with teaching, thus escaping the scope of this study (IRIGARAY, 2014). The other article was discarded for addressing agrarian conflicts in general, not specifically the forest code (JACARANDÁ; MATZEMBACHER, 2018). Thus, the sample of this bibliographical review included 15 articles relevant to this study, allowing for the categorization of criticisms.

3.2.1 Categories of criticisms of the Forest Code according to the literature

As previously mentioned, the sample composing this literature review on criticisms of the Forest Code consisted of 15 academic manuscripts. Six categories of criticism were identified, emphasizing the legal dimension of public policy.

The first category is called "Legal framework: concepts and rules' lack of clarity," which deals with existing doubts among ruralists and environmentalists about the meaning of the rules of the Forest Code and their concrete application. Additionally, they deal with the exceptions provided for in the Code, which does not clearly define in which cases they are applicable, which adds complexity and regulatory uncertainty. In this sense, we note the discussion on the application of Art. 68th of the Forest Code, which exempts native vegetation suppressed according to the legislation in force at the time of deforestation from regularization (MACHADO; SALEME, 2017; KLEIN et al., 2015; BALBINO; SOUSA, 2017; TAVARES et al., 2019; CAMPAGNOLO et al., 2017; CANDIOTTO, 2016; PACHECO et al., 2017; NUNES et al., 2018).

The second set of criticisms refers to "failures in implementing the law." Such criticisms gravitate around the need for the concrete application of legal provisions and the government's scope of action and that of private agents. This set includes, for example,

problems involving the need for adequate mapping of lands and protected areas, methodologies for identifying watercourses, lack of data on the history of deforested areas, and the postponement of deadlines for regularization and compliance. (MACHADO; SALEME, 2017; SILVA et al., 2017; TAVARES et al., 2019; CAMPAGNOLO et al., 2017; CANDIOTTO, 2016; ARVOR et al., 2018; NUNES et al., 2018; ALMEIDA; SILVA; SANTOS, 2019.

The third category deals with a "lack of effectiveness of the law's environmental policy instruments," which refers to the supervising activities typical of command and control institutes (such as PPA and Legal Reserves). There are rules seeking to enforce effective compliance with the law; for example, the ban on granting rural credit to properties not registered with CAR. However, its effectiveness depends on an efficient information system available to the financial sector, which is not always the case. Additionally, criticisms concerning the costs of implementing PPA and LR are included (KLEIN et al., 2015; TAVARES et al., 2019; CAMPAGNOLO et al., 2017; PEREIRA et al., 2016; PACHECO et al., 2017; ARVOR et al., 2018; ALMEIDA; SILVA; SANTOS, 2019).

The fourth category, called "failure in legitimating the legal framework: a dialogue with science and other social groups," encompasses questions concerning the participation of society, including disadvantaged individuals and social groups, in decision-making processes, but also the scientific community. The literature shows the negative perceptions of the sectors affected, such as rural producers and other groups that depend on nature, who do not feel represented by the regulation instituted in 2012 or question the fairness of the legislation (KLEIN et al., 2015; CAMPAGNOLO et al., 2017; CANDIOTTO, 2016; PACHECO et al., 2017).

The fifth category, "lack of equity in implementing the legal framework," encompasses aspects concerning the creation of infrastructure and economic support for the production of small farmers to reconcile economic development and environmental preservation (REMPEL et al., 2015; ARVOR et al., 2018).

Finally, the sixth set of criticisms addresses the "throwback on the legal framework" and the softening of the environmental legislation that resulted from the approval of the 2012 Code. It is the case, for example, of dealing with riparian forests, the regulation of which is considered insufficient (MACHADO; SALEME, 2017; KLEIN et al., 2015; WOLLMANN; BASTOS, 2015; CAMPAGNOLO et al., 2017; ARVOR et al., 2018).

3.3 CONTENT ANALYSIS OF THE WEBPAGES OF THE AFFECTED SECTORS

A bibliographic review often does not reach recent phenomena and discussions on public policy implementation, considering the natural pace of evaluation, edition, and publication of academic manuscripts. For this reason, the criticisms and perceptions collected from the websites of the sectors affected by the implementation of the Forest Code were added to this bibliographical review.

The Ubersuggest platform was used for this purpose. It consists of a monitoring tool to measure digital activity in search engines and enables the ranking of websites with the highest user traffic. Hence, 97 websites identified with the keyword "Forest Code" were ranked.

The first 41 sites were analyzed to determine an initial sample covering the environmental and rural sectors. The following exclusion criteria were applied: (1) reproduction of legislation, (2) institutional presentation of policies, and (3) academic papers (considering this material had already been previously analyzed).

Hence, based on this selection, two websites were identified as representatives of the environmentalist and ruralist sectors, respectively, the Environmental Journalism Portal "O Eco" [75] and

[75] Available at: https://oeco.org.br/.

the website of the Sociedade Nacional dos Agricultores (SNA) [National Society of Farmers][76].

The six categories of criticism[77] that emerged from the literature review were the basis for analyzing the content of the selected websites. Note that a seventh category was added and concerns criticisms not identified in the literature or referring to the legislation before the 2012 Forest Code.

Hence, the congruence between the criticisms presented by academic articles and those found on the affected sectors' websites was compared. Additionally, the number of incidents, degree of relevance, and antagonism between the two political strands of the Forest Code were assessed.

3.3.1 O Eco Portal

The Environmental Journalism Portal "O Eco" is a non-profit journalistic vehicle created in 2004. According to information collected by the website, it disseminates information regarding the advancements, setbacks, and challenges of environmental conservation, biodiversity, and environmental policy in Brazil. In this sense, it is suitable to represent the environmental sector in this study.

A search was conducted using the search engine native to the website with the expression "Forest Code," which generated 110 pages of results containing 1,080 news items. Of these, only those that the website classifies in the "analyses" category were selected, i.e., 110 news items, as we verified in a previous reading that this category presented the criticisms targeted by this study.

The following were identified when systematically reading the news mentioned above: 4 news concerning the Code's clarity, 4

[76] Available at: https://www.sna.agr.br/.

[77] They are: (i) Legal Framework: concepts and rules' lack of clarity; (ii) failure in implementing the law; (iii) ineffective environmental policy instruments; (iv) lack of legitimacy of the legal framework: dialogue with science and other social groups; (v) lack of equity in the implementation of the legal framework; (vi) setback of the legal framework.

referring to criticism of its implementation, 2 to criticism of its effectiveness, 5 containing criticism of its legitimacy, 2 criticizing the lack of equity, 18 addressing criticisms to the Code's setback, and 8 were related to other categories. Note that some of the news items listed did not criticize the Code.

By reading the above sample, criticisms of the legal framework's throwback, compared to the 2012 Forest Code, stood out in the portal's content. There were questions about the increase in deforestation and greenhouse gas emissions in the year following the enactment of the legislation and forgiveness granted to past deforestation. The Forest Code was the target of much criticism for the way in which it sought to reconcile the concomitant protection of the interests of rural producers and the environment, which was considered to result in a relaxation of environmental standards.

We also noted that a relevant portion of the sample could not be used because some news was outside this study's timeframe, i.e., referring to the 1965 legislation, which the 2012 Forest Code replaced. For this reason, many of the criticisms identified were classified as "other criticisms not identified in the literature or referring to the legislation prior to the 2012 Forest Code".

3.3.2 *Sociedade Nacional dos Agricultores - SNA* [National Society of Farmers]

The *Sociedade Nacional dos Agricultores* (SNA) [National Society of Farmers] was founded in 1897. According to information on its website, it promotes Brazilian agribusiness by providing educational support in the field and disseminating knowledge about agriculture, animal husbandry, the environment, and others. Hence, with its twofold support for agribusiness and education, it became the ideal portal for carrying out research on criticism of the Forest Code that encompassed the productive sector's perception of the legislation.

Using the expression "Forest Code" in the platform's search engine resulted in 35 pages, totaling 315 news items. Contrary to

the method used in O Eco Portal, this website has no subdivisions. Thus, all the news identified in the search had to be read for systematic analysis and description.

In this sense, the following criticisms were identified: 14 news concerning clarity, 4 referring to the Code's implementation, 2 to its effectiveness, 2 legitimacy, 4 equity, 8 setbacks, and 2 were categorized as not previously identified in the literature or referring to the legislation prior to 2012. However, again, some news items did not present criticism, hence, were outside the scope addressed here.

In this sample, criticisms concerning the Code's setback and the lack of clarity of its concepts and rules stand out. Thus, the ease with which protected areas and legal reserves could be deforested due to the legislation in force became apparent with how the Forest Code attempted to favor environmentalists and ruralists concomitantly. Hence, the resulting uncertainty and relaxation of the legislation are acknowledged, considering, for example, the case of vegetation in sloping areas on private rural properties.

It is essential to mention the emphatic criticisms of the lack of clarity in the Code's concepts and rules. These criticisms indicate that such a lack of clarity cause those affected by the Forest Code to experience legal uncertainty, with an emphasis on the farmers' negative perceptions toward uncertainty, especially concerning protected areas.

Some residual criticisms (not mentioned in the literature and/or related to the previous legislation) concern a lack of consideration of the biome in the legislative enactment and openness to regulating fruit species in a normative coding that should concern forest species.

3.3.3 Comparing criticisms from the sectors affected

Content analysis of the webpages enabled identifying that the highest recurrence of criticism referred to the Code's setback and lack of clarity. Dissatisfaction with its apparent normative

relaxation is notorious between both the representatives of the environmentalists and rural producers. A concrete example of such relaxation is the deforestation increase in the year following the legislation's enactment. Such is a common aspect for both sectors, as they noted the changes and their impacts on Brazilian deforestation.

However, there are disagreements. On O Eco Portal, criticisms concerned with how the legislation was built and applied, considering the softening of environmental standards and the law's more permissive nature, a setback. On the other hand, the terms and expressions used on the SNA webpage are friendlier and less incisive to the 2012 law. In this sense, it would not be a criticism of the legislation *per se* but a note of caution regarding preservation and areas of agribusiness planting.

A more favorable attitude toward the Forest Code is evident in the portal representing the productive sector, especially when compared to O Eco Portal, where more incisive criticisms are expressed. However, both sectors are critical and show concern with the regulatory confusion caused by the changes, which, in the end, harms not only one sector or another but, above all, it harms the objective of preserving native vegetation.

3.4 INTERVIEWS

Without losing sight of the general objective of understanding the alignment between climate policy and the Brazilian climate policies in the AFOLU sector, semi-structured interviews were held with representatives of the sectors affected by the Forest Code to deepen the analysis of the law's implementation. Based on the literature review results and the webpages' content analysis, we organized the criticisms related to the lack of clarity of the Code's norms and rules and the standards regulating it.

The following questions guided the interviews: Are the uncertainties concerning the legal framework obstacles to implementing CAR and PRA? How the most advanced States

managed these uncertainties? And what about those States with specific problems regarding the normative text (areas of the Atlantic forest and Cerrado)? This methodological strategy was intended to collect data to determine to what extent the normative and regulatory confusion – 10 years after the Code was enacted – remains an obstacle to its implementation or if, on the contrary, these uncertainties have been overcome during the law implementation process, especially regarding the regulation and execution of CAR and PRA.

Thus, a qualitative approach was adopted to address the interviewees' subjective and singular analyzes. Additionally, a semi-structured interview containing a set of pre-defined questions was used. The questions can be adapted to each case and, at the same time, serve as a general guideline for the collection of reports (RIBEIRO; VILAROUCA, 2019).

Regarding the type of information one expects to obtain with semi-structured interviews, Xavier (2017) explains that data regarding the interviewees' subjective aspects can be collected, such as their opinions, experiences, or knowledge. In the first case, the participants' perceptions are sought, that is, the subjective aspect *per se*. In the second case, information on the respondents' experiences is expected. It may refer to various circumstances, such as the relevant group to which one belongs, whether it concerns a professional identity, urban tribe, or political positioning.

Likewise, one may seek the interviewees' experiences from participating in a given situation or historical event. Therefore, when interviewees are selected based on their knowledge, the interviews are designed to obtain information about their theoretical or practical knowledge. Hence, relevant people in a given market niche or with relevant expertise in a given theoretical subject can be a source of data for researchers (XAVIER, 2017).

In the case of this study, the interviewees were selected based on their knowledge about the implementation of the new Forest Code in practical contexts in the States of Bahia and Mato Grosso and their experience related to the difficulties and/or successes

obtained in this implementation process. These states were selected based on Chiavari, Lopes, and Araujo (2021), which reported how advanced these States were in implementing the CAR and PRA. Additionally, this selection considered the Atlantic Forest in Bahia and Cerrado in the Mato Grosso region, which would provide an opportunity to identify potential implementation problems peculiar to each of these biomes.

Seven interviews were held between April and October 2022, two with representatives from Bahia and four from Mato Grosso. An additional interviewee, the representative of a national entity, was nominated during the interviews. Two interviewees were linked to the State Public Prosecutor's Office; three belonged to State environmental agencies, and two to entities representing the agricultural sector.

The interviews were conducted online via video call and lasted between 30 and 50 minutes. The content was recorded with the interviewees' consent and later transcribed verbatim. The analysis enabled the grouping of the relevant points of the conversations according to the topics below.

3.4.1 Clarity, complexity, and acceptance: producers' perceptions of the legal discipline concerning the conservation of native vegetation by the 2002 Forest Code

When the interviewees were asked about the producers' perceptions that the rules set out in the Forest Code lacked clarity, two different approaches emerged: lack of clarity is seen either as complexity or resistance to accepting the rules.

The interviewees from the Public Prosecutor's Office considered that the rules are usually explicit to the producers. For example, interviewee A considered that given the duration of the Forest Code, the regulated agents would already be advanced in the learning curve of the new regulation. In the same line, Interviewee B linked the idea of clarity with acceptance; that is, he highlighted that there is still

much resistance to the percentage of 80% required of legal reserve areas in the forest area in the Amazon biome.

In turn, respondents C, D, E, F, and G, the first three being from environmental agencies and the remaining two representatives of the productive sector, linked the idea of clarity to complexity. Interviewee D emphasized four axes: exceptions, different disciplines depending on the biome or timeframe, and the influence of aspects concerning heritage succession[78]. Interviewee E addressed the difficulty of applying the norms in transition areas between biomes. Meanwhile, interviewee F mentioned the several regulations (e.g., environmental, labor, etc.) to which rural producers are subject.

When interview C reacted to the idea of lack of clarity as complexity, he noted, "[...] a medium-sized or a larger property has money to pay a medium-sized consultant, or even a simple technical consultant [...] He can enter the information in the database, even if incorrect and correct it later [...]". Therefore, he highlighted that mainly small producers are impacted, claiming that small producers represent about 75% of producers in the State of Bahia.

3.4.2 Analysis of the CAR as the main obstacle to advancements in the implementation of the 2022 Forest Code and potential causes for delays: fear of accountability, interpretative divergences, and the need to complete the process

The design of the regularization process for Brazilian rural properties considered that the first stage would be rural land

[78] The interviewee referred to the rule in §2 of Art regarding property succession. 68th of the Forest Code, according to which: "§ 2 The owners or occupants of rural properties in the Legal Amazon, and their heirs who have a Legal Reserve index greater than 50% (fifty percent) of forest cover and have not removed vegetation in the percentages provided for by the legislation in force at the time may use the excess area of the Legal Reserve also to constitute an environmental easement, Environmental Reserve Quota - ERQ or other similar instruments provided for in this Law" (BRASIL, 2012).

registration, followed by a regularization stage. When asked about the implementation of these stages, the interviewees agreed that the need to overcome the CAR analysis was the main obstacle to advancing the implementation of the Forest Code.

The interviews indicated that the CAR's declaratory nature, as provided for in the Forest Code, was not sufficient to speed up the process of completing the registration. Even in Mato Grosso, where the analysis process is ahead of the national average, the percentage of registrations analyzed is low. Several elements concerning this aspect were collected from the interviews.

First, a discrepancy was identified in the structure of the environmental agencies between the States of Bahia and Mato Grosso. In the latter, interviewee B mentioned the existence of 50 public servants dedicated only to analyzing registrations in the CAR.

Meanwhile, interviewee C spoke of a shortage of public servants in Bahia, with no staff dedicated to analyzing registrations. Another aspect mentioned was that servants specialized in information technology left to the private sector, where remuneration is supposedly higher. Hence, it would have affected the development of systems necessary for implementing the Forest Code.

However, both states revealed common aspects that would hinder the analysis of registrations. The first concerns the analysts' concern with being personally accountable for validating an incorrect CAR, fearing being accused of fraud. During the interviews, the respondents mentioned that police operations had already taken place in this regard.

The second aspect concerns interpretative divergences in the identification of protected areas and the application of legal concepts. As for the identification of protected areas, a case was reported in the interview with a Mato Grosso environmental agency member concerning the hydrographic map, the previous version of which distorted part of the analysts' assessment. According to the interviewee:

> Our difficulty is that the hydrographic reference base [...] presented some distortions. So, last year, we worked with the productive sector; they even paid for the so-called CAR Map, which refined the hydrographic base with high resolution, with field inspections for us to make more accurate identifications, especially of springs [...]

Regarding legal concepts, interviewee A talks about the absence of technical parameterization standards, which allows each technician to interpret broad concepts differently. Two proposals were identified to try to minimize discrepant interpretations.

In Bahia, interviewee C mentioned that conversation tables were held among civil servants to harmonize their work in the state. Meanwhile, interviewee B in Mato Grosso mentioned the decision to assign the same analyst to analyze both the CAR and PRA of the same rural property precisely to avoid interpretation differences.

The interview with a representative of the productive sector enabled the collection of a case in which legal uncertainty directly affected the producers' efforts to regularize their properties. The following was mentioned in an excerpt from the interview:

> I'll give you an example of a situation that happened in Lucas do Rio Verde [...] what did they do? They took the lead, registered all the areas, and solved the problems of all the producers, the 'Lucas Legal' Municipality became 100% legal. Then they did the following: gathered the producers, the municipality went after an area for them to buy together and compensate for the missing legal reserves inside their properties and bought the area. The producers bought the area. Currently, this area is not accepted by SEMA. Look at the legal uncertainty imposed on businesses! At the time, everything was done together with the Secretariat, in partnership with it; it was a showcase for Mato Grosso. Now, they own an area in a park, which they can't do anything with. I don't know if the problem is with the biome, a different biome or another state, [...] I don't know exactly what the problem is. But today the Secretariat does not accept the area they bought for compensation. So I see that those who wanted to proceed with the process ended up harming themselves.

As previously mentioned, the Municipality of Lucas do Rio Verde, in the state of Mato Grosso, attempted to be a pioneer in the regularization of the Forest Code but, in the end, wasted investments in the regularization process.

Interviewer B also pointed out another factor that may compound the difficulties in completing the CAR analysis, i.e., the need for incentives for producers to continue the regularization process after registration.

Incentives were provided for the producers to initiate the registration process with CAR. Note that this registration is a prerequisite to accessing a credit line in the national financial system. However, the interviews indicated that once the process has started, the producer already has sanctions and commercial restrictions against him/her removed. Therefore, there are no specific incentives to complete the procedure.

Interviewee B reports the following:

> Here [Mato Grosso], for example, a CAR is analyzed eight times on average. So, it seems like it's not supposed to get to an end. Then the producers, too, as the CAR is active in the system; with an active CAR in the system, they get financing, and they manage to show it to trade businesses, the consumer market, they show they are regular, so the situation perpetuates.
>
> [...] So, degraded areas are not actually restored, or a legal reserve compensated, a legal reserve restored, all because of the producers' lack of will, there is a lack of political will for CAR to happen, the public servants' insecurity, and so on.

On the contrary, the same interviewee notes that the completion of CAR implies that deficits in native vegetation must be restored or compensated for, which means disbursing the amounts necessary for regularization. However, it is a non-existing problem when registration is pending analysis.

3.4.2.1 CAR special situations: settlements and areas of quilombos

Outside the general context of producers who own rural land, the interviews identified special situations in which the implementation of CAR gains additional contours of difficulty. These are the cases involving quilombos and agrarian reform settlements.

Three interviewees from Bahia mentioned the difficulty in regularizing settlement areas for agrarian reform. First, he mentioned the additional bureaucracy resulting from the need to deal with the National Institute for Colonization and Agrarian Reform (INCRA), which is responsible for the settlements. Additionally, interviewee B talks about problems arising from the possibility of a collective legal reserve (in a condominium regime) and its respective legal implications.

Interviewee C, from Bahia, also mentioned the difficulty in dealing with collective areas. In this sense, he pointed out the existence of a proposal for associations to register with CAR.

3.4.3 CAR dynamics, the issue of land regularization and the risks of fraud

One of the points identified in the interviews is that the implementation of CAR implies the creation of a dynamic database, that is, a database sensitive to regular real estate operations – such as purchase, sale, and dismemberment –but also new infrastructure projects. In this sense, problems involving the use of the registration for land regularization purposes were identified.

As for the need to be sensitive to social dynamics, respondents C and D report demands regarding the possibility of changing the location of a legal reserve. Interviewee D gave examples of situations in which this would be necessary, such as the need to pass a power transmission line. In turn, interviewee C emphasized the care required for a procedure of this nature, such as ensuring effective environmental gain.

In this sense, interviewee D address the topic as follows:

> [...] the doctrine is not always aligned with the practical applications of things, you know? Another complication concerns what the legal doctrine says, right? It comes with the legal reserve; it is immutable, inseparable, 'once a legal reserve, always a legal reserve', but I think this creates a difficult situation for us because there are many situations in which we should allow a legal reserve to be reallocated or readjusted for current calculations, you know? For current methodologies, right? Because of what was done at the time, right? [...] So, currently, if you want to pass an energy transmission line, for instance, if it is a legal reserve area, in theory, you cannot, right? This will create a very difficult situation, you know? So that would require some flexibility to allow new registrations, as long as the current environmental requirements are met, right? In my view, it should be allowed an adaptation to current legislation.

Regarding land regularization, the points discussed mainly involve aligning the CAR with other land management systems, especially divisions into fiscal modules and the responsibilities of Brazilian real estate registry offices; though, different fiscal modules in the same hydrographic basin were not seen as a problem or point of conflict in Bahia or Mato Grosso.

On the other hand, the CAR's relationship with property records was considered a controversial topic. First, the interviewee, a member of the environmental agency, and the interviewee representing the productive sector, both from Mato Grosso, explain that the registration of environmental reserves is being used in real estate registry offices as proof of the constitution of a protected area.

Interviewee F, a representative of the State productive sector, says that a positioning regarding this matter is that the use of legal reserves registration in property registration should be considered proof of the constitution and exercise of rights following current legislation. He points out, however, that the sector abdicated this positioning, adhering to the thesis that factual proof of conservation of the area should be required.

The interviewee from the environmental agency explains that this use of the real estate registry is not accepted because the

descriptive memorandum does not support it. Additionally, he points out situations where the real estate registry was merely replicated when there was land dismemberment, which would eventually culminate in counting the same legal reserve area twice.

Additionally, the interviews revealed problems arising from using CAR for land regularization because it is prohibited by §2 of Art. 29 of the Forest Code[79]. Interviewee C was emphatic about the harmful effects on small producers if CAR is used as a requirement for property registrations. In his words,

> [...] it is a shame for the nation that public notaries request environmental registration to carry out real estate and land transactions. The forestry code is very clear, as it says that rural property or rural environmental registration does not lend itself to land regularization, so it is an interpretation that we do here; it is of no use at the registry office. In fact, when you declare your legal reserve, (...) I don't need to submit any environmental records to any registry office. And the registry offices are using this to encourage a wave of mandatory environmental registration in the state, which favors only those with money. You got it? It is a window for speculation and land grabbing! (...) Imagine a state with 900,000 family farmers and a considerable part of these farmers - which is much more than half - cannot afford to buy bread at the bakery at the corner (...). This guy cannot do his environmental registration, complete it, and do it well. So, someone else who can do it well, does it in his own name and goes to the registry office and says 'here I have a rural environmental registration, I own it'. So, (...) if this is not challenged […] we anticipate and foresee tragedies. Yes, tragedies and bloodshed. I'm not kidding. We have very serious agrarian conflicts in the interior of Bahia, especially in the Cerrado.

The same problem was identified in interviewee B's speech, a problem he linked to the State Public Prosecutor's Office, including the Judiciary. In his perception,

[79] Segundo o dispositivo, "§ 2º O cadastramento não será considerado título para fins de reconhecimento do direito de propriedade ou posse, tampouco elimina a necessidade de cumprimento do disposto no art. 2º da Lei nº 10.267, de 28 de agosto de 2001" (BRASIL, 2012).

> CAR has been lending itself to land grabbing, the regularization of invasions, and the use of indigenous areas [...] I think it had to be easier, CAR had to be declaratory as provided in the Code, but it is not declaratory at all [...] it goes through such a rigorous evaluation [...] that's why it doesn't advance. At the same time, if you make it too easy, the Judiciary has accepted fraudulent CAR as a principle of proof of domain. So, it is a mess, [...] but we have to fight precisely for the Judiciary to show that CAR is declaratory. It is not a document that lends itself to land regularization. [...] an active CAR is nothing [...] then they go there and give possession to that person who registered in the CAR system.

Another controversial point is the issue of property dismemberment and the existence of contiguous properties with the same owner but with independent registrations. Interviewee D draws attention to §1 of Art. 12th of the Forest Code, which determines the delimitation of legal reserves based on the property area before dismemberment. However, interviewee B talks about attempts at fraud, such as fractioning a property by simulating donations to family members like children, a situation mitigated when the entire content of a property registration is analyzed.

In the case of Bahia, the environmental agency interviewee said that using registrations to delimit an environmental reserve was, in part, a problem with the old system, which organized the registration based on property registration. However, he notes that it has already been pacified in this State that contiguous properties must be analyzed as a single property.

This positioning is reverberated by the interviewee linked to the Public Prosecutor's Office in the same State. He notes that a normative instruction by the Ministry of the Environment would have pacified the issue, bringing the concept of rural property from the Land Statute (Law No. 4,504/1964) to the analysis of legal reserve delimitation.

In turn, the interviews in Mato Grosso generated contradictory results. Interviewee F, a representative of the productive sector, mentioned that the environmental agency would analyze the complete area in the case of contiguous properties. On the other

hand, interviewee E, a member of the environmental agency, reported that the State does not follow the normative instruction of the Ministry of the Environment, using property registration to delimit the legal reserve areas; hence, grouping properties would be optional.

3.4.4 The application of generic concepts: consolidated areas, their application to the Atlantic Forest biome and transition areas, and the fallow issue

From the perspective of legal interpretation, the application of the concept of consolidated areas was the topic most frequently emphasized. Its importance for producers resides in the fact that restoration options are more beneficial once a protected area is considered consolidated.

In this sense, as a rule, the interviewees consider this topic conflictive. Four aspects of legal problems involving the issue were addressed: (i) the elements that configure a consolidated area, (ii) the technical difficulties in transition areas, (iii) the fallow issue, and (iv) the applicability of the institute in the Atlantic Forest biome.

The first issue highlighted is the technical-legal dispute over which practices would be sufficient to consider that an area has consolidated anthropic activity. Interviewee E even indicated that more than 10,000 registrations have problems involving a consolidated area in Mato Grosso.

The interviews showed several forms of soil management, such as fire management, selective exploration, or even clear-cutting, the latter understood as converting land use *per se*. In this sense, interviewee E mentioned that a working group was created in May 2022 to discuss methodological aspects to identify when an area should be considered consolidated.

Within this context, two situations increase the difficulty of conceptualization, which concern transition areas and the fallow technique. First, according to the interviewees, the existence of more than one biome on a property (transition area) makes image

analysis more difficult, as it is not possible to verify which biome would be restored, whether one has already adopted the fallow technique, or if the percentage of the area complies with current legislation. In these situations, excessively technical analysis is required, a pretty challenging situation to explain to a producer.

Specifically, about the fallow technique, the difficulty stems from the legal concept attributed to the practice. The Code foresees fallow to be the cause that configures a consolidated area. However, it understands as "a practice of temporary interruption of activities or agricultural, livestock or forestry uses, for a maximum of 5 (five) years, to enable the recovery of the capacity of use or the soil physical structure" (BRASIL, 2012).

Therefore, the interviews with the Public Prosecutor's Office and Mato Grosso environmental agency members reveal a positioning that after five years without resuming livestock-forest activities, the owner should restore the previously considered consolidated area.

Two excerpts from the interviews with representatives B and E portray these issues, respectively:

> [...] they want to consolidate deforestation that had no activity implemented, the issue of the fallow technique - so, forget everything that was deforested before 2008, regardless of having activity on top of it in 2008, be consolidated -, so they want to extend the native pasture, even if it has not been deforested. However, there were cattle up there; it will consolidate. Anyway, there are many points that the Public Prosecutor's Office and SEMA [Secretariat for the Environment] understand that would not consolidate, and they want to extend this concept. The conditioning of SEMA, of the technicians, is the same as that of the Public Prosecutor's Office, but the interest in change comes from political will and the producers' will. So, we don't have any more discussion, and it will end up flowing into the judiciary.

> This is a topic [consolidated areas] that [...] leads to many conflicts due to how the five-year term was set out in the forest code and the interpretation that extends to that, that after five years, the status of a consolidated area is mischaracterized and how this can be ascertained by satellite image. So, this is usually a very controversial point and the state of Mato Grosso, for having three biomes, [...] has [...] a transition zone that invariably - even the example

> of São Paulo, which has the same problem with the Atlantic Forest and Cerrado - we have a divergence problem [...]. So, there are two points that [...] are difficult to explain to producers. So, these two points cause many divergences when applying the forest code for the state of Mato Grosso and sometimes require a very technical and time-consuming individualized analysis with an on-site inspection [...].

Finally, another legal issue involves the Atlantic Forest biome, which has its own legislation. When developing the preliminary interview script, the articles that identified the potential conflict between the application of the Atlantic Forest Law (Law No. 11,428/2006) and Forest Code were considered, as it is a controversy that is the object of the Direct Action of Unconstitutionality No. 6446/DF at the Federal Supreme Court.

As confirmed by interviewee G, the productive sector understands that the Forest Code must supersede the Atlantic Forest Law to allow the application of the consolidated area institute in the biome. The judicialization of the matter in superior courts turned the topic into a "perennial agenda" in the environmental agency. As noted by interviewee C,

> It is not uncommon to be notified here by the Public Prosecutor's Office to address this issue together with its environmental staff. Bahia has an extensive Atlantic Forest, right? The coast of Bahia is enormous, reaching the bottom of Espírito Santo, it's high mileage, and in this large area, we have encountered many difficulties in managing this matter.

In turn, the interview with the member of the Bahia Public Prosecutor's Office revealed a perception regarding the application of the Atlantic Forest Law that "the situation is the worst possible." The interviewee discussed a change in the understanding of the state environmental agency, which started accepting the application of "consolidated areas" in areas where Atlantic forest vegetation had been suppressed, outside the hypotheses established by the Atlantic Forest Law.

The matter was the object of a Public Civil Action at the state level, in which the order for an injunction was not appreciated,

increasing legal uncertainty of the sub judice situation and similar others. However, from an administrative point of view, the understanding is consolidated as the interviewee from the environmental agency confirmed the applicability of the institute of consolidated areas in the Atlantic Forest biome.

3.4.5 Implementation of rules for the suppression of native vegetation over time – *tempus regit actum* and "acquired right"

One of the complex aspects and disputes over legal interpretations identified in the interviews was the matter of the application of rules for the suppression of native vegetation over time. In this context, the application of Articles 67th and 68th of the Forest Code stands out.

Article 67th establishes that the legal reserve of rural land with up to 4 fiscal modules must be constituted with the native vegetation area existing on July 22nd, 2008, with new conversions of land use being prohibited. Meanwhile, Art. 68th establishes that assessment of the conformity of Legal Reserve in Brazilian rural lands must be based on the legislation in force when native vegetation was suppressed, regardless of the property's size.

Both interviewees, representatives of the productive sector, approached the matter as an acquired right, claiming that it was an incentive for the public policies in force at the time. They also defend themselves from criticism of environmental setbacks on the grounds that the Forest Code forbids the suppression of new areas of native vegetation.

When dealing with the applicability of Art. 67th, interviewee C points out that the environmental agency in Bahia follows a legalistic stance on the norm. Therefore, he explains that the agency respects suppressions before July 22nd, 2008, for properties of up to 4 fiscal modules, even if it results in properties with no legal reserve area. In this sense, the same interviewee mentions that the norm was mainly applied to small rural producers.

The interviewee from the Public Prosecutor's Office, on the other hand, contradicted the previous positioning. He reported that he was aware of and supported the positioning of the environmental agency of Bahia, according to which there must exist some remnant of native vegetation. Therefore, at least 20% of the property area should be restored as a legal reserve when the property has no remaining native vegetation.

The applicability of Art. 68th was also discussed in the interviews concerning Mato Grosso. Interviewees D and E reported that interpretation problems were cleared because the topic had already been discussed even before the enactment of the 2012 Forest Code.

Thus, Resolution No. 26, from June 29th, 2009, of the Public Prosecutors of the State of Mato Grosso, ensured legal protection to those producers who suppressed native vegetation following the rules in force at the time. Additionally, the interviewees mentioned that the timeframes for the validity of the legal reserve percentages were disciplined by Decree No. 1,031/2017, which helps to avoid interpretation problems in applying the law.

3.4.6 Environmental Reserve Quotas and other compensations

The issue of the Environmental Reserve Quota (ERQ) was also addressed in the interviews, as well as other compensations and incentives that the State could use in the process of the PRA implementation. However, the respondents from Bahia and Mato Grosso believed that compensations are still in an early stage and that the ERQ has not been fully implemented.

Interviewee F, from the productive sector, considered, "[...] that hasn't happened yet; we haven't reached that level, you know? [...]. Meanwhile, interviewee E addressed the concern of the environmental agency in implementing the Forest Code instruments instead of formulating new ones. He justifies this positioning by considering the difficulties arising from the

competence rules and a fear that legislative innovations could be seen as a measure beyond concurrent competence.

Interviewee E also mentions that the agency is focused on using compensation through donating an area located in a conservation unit pending land regularization to the government. As he claims, this measure would help solve both national problems.

He points out that the main difficulty concerns the lack of a ready compensation module, which would be under development. This system difficulty is also observed in the interview with the representative of the environmental agency in the state of Bahia. The Mato Grosso initiative consists of developing an asset database containing information on areas with a native vegetation surplus, potential compensation sites in private areas, or in conservation units that would be available to producers.

A complementary point raised by the interviewee from the Public Prosecutor's Office of Mato Grosso concerns the lack of a compensation regulation, which requires special attention, especially concerning ecological gain. The interviewee considers it necessary to prioritize areas with more significant ecological gain within the state, considering the composition of the area closest to the deforestation site.

3.5 ANALYSIS OF THE RESULTS CONCERNING THE FOREST CODE

Implementing the Forest Code is undoubtedly relevant to understanding Brazilian efforts to comply with the first NDC. Although the wording of the Code, as a rule, does not directly refer to climate change, the profile of Brazilian greenhouse gas emissions assigns significant importance to the correct execution of the policy to protect native vegetation.

This chapter sought to collect data on the Forest Code implementation process by adopting three approaches: a literature review, content analysis of the webpages of the representatives of

the affected sectors, and interviews with people directly participating in the process of the legislation implementation.

Considerable repercussions and debates in civil society accompanied the formulation and approval of the Forest Code in 2012. Such disputes, however, did not cease with the end of the legislative process, as the legislation implementation process shows, including the interpretative discussions about the legal text.

These methodological choices led this study to gravitate around the theme of "regularization." As a matter of fact, the interviews enabled gathering a common perception from the interviewees about the role of the Forest Code and the "spirit" that led to its approval by the National Congress.

There is not necessarily an agreement with the given legislative solutions, as the expression "the text that was possible" taken from one of the interviews with a representative of the productive sector illustrates. However, there is an understanding that the lawmakers were concerned about legally regulating countless properties, which, strictly speaking, suppressed vegetation in non-compliance with the legislation.

If the legal instruments in this chapter were analyzed from a climate perspective, we would observe at least three roles in their implementation. First, they discipline the national carbon stock in the form of native vegetation through the institution of protected areas. Second, they determine the restoration of part of illegally degraded stocks. Third, they internalize the environmental benefits of native vegetation through the possibility of selling excess native vegetation for regularization purposes.

Nevertheless, these roles were weighted by social and economic issues. In this context, they include the legal institutes that allowed maintaining part of illegal removals (consolidated area) and those that created transitional regimes for regularizing degraded areas (such as compensations).

The literature review identified much criticism of the Forest Code. The norms' lack of clarity, implementation problems,

effectiveness and legitimacy issues, equity issues, and setback accusations mark this set of considerations.

All these criticisms affect the roles of the Forest Code for climate purposes. Issues concerning equity, legitimacy and implementation are undoubtedly important. However, the clarity issues identified here are particularly relevant to the environmental debate, which justified the decision to deepen this topic in the interviews.

Ultimately, the clarity of the rules governing protected areas matters to the delimitation of the national carbon stock in the form of native vegetation. One of the issues involving the clarity of the rules was the complexity of the Code in the face of its numerous regimes, depending on biomes and timeframes, in addition to exceptions.

Part of the clarity involves providing environmental agencies with quality technical data. Analysts must be able to readily identify areas protected by law, which can be partially solved with the use of technologies for inspection and the transmission of high-resolution images, combined with on-site visits to the most difficult areas.

However, some issues are strictly legal. Two important points were the concepts of "consolidated rural area" and "rural property." Depending on what is considered a "consolidated rural area," a larger or smaller portion of native Brazilian vegetation is protected to mitigate new greenhouse gas emissions.

Likewise, a concept of "rural property" that includes contiguous properties of the same owner affects the protection of the national carbon stock. It is so because the Code disciplines the restoration of part of the deficits in permanent preservation areas based on land size and creates a special legal reserve institution regime for those properties with up to four fiscal modules.

In addition to conceptual problems, traditional problems of legal interpretation also affect the Code's implementation. For example, such a fact was observed concerning the judicialization of the applicability of the institute of the "consolidated rural area" in the Atlantic Forest and a worry of the environmental agency for

designing new rules to encourage regularization due to the limits of concurrent legislative competence in environmental matters.

The decision to interview different sectors of more than one state of the Brazilian federation also allowed us to identify discrepancies between the interviewees. Two situations illustrate this phenomenon.

First, regarding the application of Art. 67th of the Forest Code, the interviewee from the environmental agency of Bahia reported that the legal reserves in rural lands of up to four fiscal modules would be constituted with any percentage of suppressions before July 22nd, 2008, even if it implied no legal reserve. On the other hand, the interviewee from the Public Prosecutor's Office reported that the same environmental agency would understand the application of Art. 67th would require a percentage of the remaining native vegetation, so the complete absence of native vegetation would imply the obligation to restore the legal reserve.

The second situation occurred in the state of Mato Grosso. The productive sector interviewee indicated that the environmental agency jointly analyzed contiguous rural properties belonging to the same owner. Meanwhile, the interviewee from the agency maintained that it decided not to follow the guidance of the Ministry of the Environment and autonomously assesses according to each of the registrations unless the owner chooses otherwise.

Due to this study's methodological limitations, we could not confirm the correct information. Additionally, one cannot ignore the administrative management efforts to avoid interpretation conflicts between the environmental bodies members, such as creating conversation groups among analysts and establishing that the same analyst would consider both the CAR and PRA stages.

Although this study focused on clarity, it is important to note other related criticisms identified in the literature review and which emerged during the interviews. These mainly affect the other roles of the Forest Code that impact the climate issue (the obligation to recover carbon stocks by restoring native vegetation

and internalizing the environmental benefit of preserving plant environmental resources).

It is the case of the environmental agencies' delay in validating the CAR, which prevents the implementation of regularization programs and the functioning of environmental compensation institutes. These issues revolve around how CAR was designed.

The effectiveness of the CAR depends on environmental and control bodies' parsimonious judgment, weighting between the non-bureaucratization of environmental regularization and disincentive to the occurrence of fraud. On the one hand, the declaratory nature of CAR and the fact that, in practice, the regularization of properties relies on "pending analysis" seek to encourage the producers' cooperation and adherence. However, such easiness has led to severe distortions, such as producers abandoning or not completing the PRA and even illegal practices such as land grabbing.

All these aspects outline a general picture of the obstacles and difficulties in implementing a public policy for conserving native vegetation in a country of continental dimensions and composed of several biomes, such as Brazil. Additionally, there are elements to clarify practical aspects of legal interpretation disputes involving the Forest Code.

4 CASE STUDY No. 2 - PLAN TO CONSOLIDATE A LOW-CARBON ECONOMY

The implementation of the ABC Plan is one of the case studies composing this project. The ABC Plan's relationship with the Brazilian NDC is tenuous and more strongly related to the targets set in the Brazilian National Policy on Climate Change (PNMC in Portuguese). The relationships existing between both will be presented throughout this study. The PNMC provides for the creation of various sector plans aimed at a low-carbon economy. These plans range from energy to urban transportation, reaching even the most primary sectors, such as agriculture and mining.

The PNMC was later regulated by the Brazilian National Plan on Climate Change – established by Decree No. 7,390/2010 (which, together with the regulation of the Brazilian National Fund on Climate Change, comprises Decree No. 9,578/2018). Based on this Decree, aspects necessary to build a sector plan aimed at a low-carbon economy in the agriculture sector were implemented and specified (e.g., structuring, legal nature, specific goals, etc.). The implementation of the Plan, however, has encountered difficulties and bottlenecks.

The case study method was chosen to perform this study, the research unit of which may be: (i) the behavior of a given person, (ii) an institution, or, as is the case here, (iii) the plot of a particular fact. Hence, we seek to understand the history of public policies intended to implement the environmental targets Brazil committed to (or set up) before the international community. Next, we decided to test the hypothesis that emerged during the case study through interviews (social research technique). Therefore, this study was initiated with a case study to generate hypotheses that were later tested in the interviews. In this sense, Machado (2017) highlights two possible objectives for a case study: generating hypotheses

(conceptual elaboration) or testing hypotheses. The result is the same in both cases, i.e., research built upon a case study.

Still, on the case development and its context, the author above understands that "the construction of a case depends on establishing what types of facts, for how long, and which actors, will compose the case. So it is a way of determining where to cross the line between a case and its context."

This study's timeframe is between 2009 and 2020. The fact addressed here concerns the implementation of the ABC Plan in Brazil. The actors are subdivided into financing entities (represented by Banco do Brasil), the ABC Observatory, and the scientific community. Everything else, such as, for example, discussions about funds determined by the Brazilian constitution or other types of subsidized credit, is part of the context but not part of the case itself. Finally, the units of analysis concern components that will receive greater attention and care during data collection and processing (YIN, 2005). The unit of analysis, in this case, is the ABC Plan's accountability chain, either from the perspective that the plan lacks an accountability chain or the perspective that the plan lacks a well-defined accountability chain.

Thus, several tools were used to analyze this case: a content analysis of the related legislation, a systematic bibliographical review, a content analysis of the webpages of representatives of the sectors impacted by the regulation, and, finally, interviews were held with the policy participants. In this analysis, several factors hindering the implementation of the ABC Plan were raised. These critical factors were classified and schematized.

One category was chosen among the various factors and is highlighted here: the criticisms of the Plan's institutional arrangement, which involved choosing one type of criticism for the unit of analysis. As previously mentioned, the absence of a well-defined accountability chain.

4.1 REGULATORY SURVEY AND CONTENT ANALYSIS OF THE ABC PLAN RELATED LEGISLATION

The Plan for the Consolidation of a Low-Carbon Economy in Agriculture (known as the ABC Plan) is a national-wide public policy at the federal level, based on Art. 3rd of Decree No. 7.390/2010 (BRASIL, 2010), which is currently revoked by Decree No. 9.578/2018, i.e., it was effective between 2010 and 2020. It comprises a set of actions that seek to promote sustainable Brazilian climate policy technologies in the AFOLU sector, with a high potential for mitigating greenhouse gases (GHG) (BRASIL, 2018).

Therefore, these actions are intended to reduce GHG emissions to meet the reduction targets (between 36.1% and 38.9%, compared to what would be emitted in 2020 if nothing was done). In 2009, Brazil voluntarily accepted the so-called NAMAs (Nationally Appropriate Mitigation Actions) at the 15th meeting of the Conference of the Parties (COP-15) in Copenhagen. The connection between the ABC Plan and the National Policy on Climate Change arises precisely from the fact that the targets to which Brazilian agreed internationally at COP-15 were internalized by Article 12 of Law No. 12,187 (PNMC) (BRASIL, 2009).

When disciplining the PNMC and developing the ABC Plan, Decree No. 7.390/2010 established that the action will integrate the "National Plan on Climate Change plans to prevent and control deforestation in the biomes and by the sector plans for mitigation and adaptation to climate change, dealt with, respectively, in Arts. 6th and 11th of Law No. 12,187, from 2009", in the caput of its 2nd article. In other words, the ABC Plan is part of the National Plan on Climate Change.

It is also interesting to connect the *Programa de Incentivo à Produção Sustentável do Agronegócio* (Produsa in Portuguese) [Incentive Program for Sustainable Agribusiness Production]. The National Plan initially established this program on Climate Change to the ABC Program (ABC Plan credit line). The ABC Plan precedes the Nationally Determined Contributions (NDCs), and therefore, it

contains the targets, measures, principles, and guidelines of Decree No. 7.390, from which it originated. As previously mentioned, these targets are supported by the NAMAs.

At COP-21, the 2015 NDC determined that Brazil would commit to "strengthen the Low Carbon Agriculture Plan (ABC Plan) as the main strategy for sustainable development in the agriculture sector, through an *additional* restoration of 15 million hectares of degraded pastures by 2030 and an increase of 5 million hectares of integrated crop-livestock-forest (ICLFS) systems by 2030" (BRASIL, 2015, p. 8).

However, such commitments were never introduced into the internal juridical order. In reality, 5 million hectares of integrated crop-livestock-forestry systems were foreseen, that is, more than 4 million, which was the target set with the NAMAs. There is, in fact, a forecast to restore 15 million hectares of degraded pastures. Nonetheless, it was already foreseen by Decree No. 7,390/2010, even before the NDCs, equal absolute numbers. We say absolute numbers because the parameters of the two documents are different: the NDC's timeframe is from 2005 to 2030.

Nonetheless, the national law hampers these targets internationally "pledged." The proof is that the targets contained in Decree No. 7,390/2010, within the ABC Plan, remained in Decree No. 9,578/2018, i.e., they are the same specific targets because the general target remains the one established in COP-15 and PNMC. Hence, the NDC was not accepted by any of the aforementioned normative acts.

The two decrees mentioned above provide that Brazil will adopt measures to achieve the *voluntary national commitment* referred to in Art. 12th of Law No. 12/2009. The term "voluntary national commitment" should be confused with "nationally determined contribution" (NDC) but understood as a more generic term because, in this case, the term refers to the NAMAs, which were the targets established by the PNMC (BRASIL, 2009) before the Paris Agreement.

In addition to internalizing the targets for reducing greenhouse gas emissions, the National Policy on Climate Change determined that the Executive Branch would establish Sector Plans for Mitigation and Adaptation to climate change. Hence, the Executive Branch instituted Decree No. 7,390/2010 in December 2010, among other devices, to regulate Article 11th of the PNMC. In article 3rd, item IV, the Decree provided the Plan for the Consolidation of a Low Carbon Agriculture (ABC Plan).

Based on the PNMC's principles, Decree No. 7,390/2010, as expressed in its Art. 1st, imported the principle of citizen participation, established by Art. 3rd, caput, of Law No. 12,187/2009, PNMC. Thus, the ABC Plan was created by a Working Group coordinated by the Civil House of the Presidency of the Republic, between 2010 and 2011, with the broad participation of various entities from different sectors (BRASIL, 2010).

Finally, Decree No. 9,578/2018 repeats Decree No. 7,390/2010 regarding the ABC Plan, as it is a mere consolidation of normative acts of the Federal Executive Branch, referring to the National Fund on Climate Change, the object of Law No. 12,114, from December 9th, 2009, and the National Policy on Climate Change, established by Law No. 12,187, from December 29th, 2009 (BRASIL, 2018).

4.1.1 PNMC's instruments

In order to implement the general target established in the PNMC's Art. 12th, the ABC Plan is divided into seven programs, each with its specific target. Six programs focus on mitigation and one on adaptation. The seven programs (or subprograms) are a. Restoration of degraded pastures (RDP); b. Integrated Crop-Livestock-Forest System (ICLFS) and Agroforestry Systems (AFS); c. Direct-Planting System (DPS); d. Biological Nitrogen Fixation (BNF); e. Planted Forests; f. Animal Waste Management, and g. Adaptation to climate change.

Each subprogram has a specific target linked to the general one; these targets were defined in Decree No. 7,390/2010, Article 6th,

and Article 19th of Decree No. 9,578/2018. In addition to these instruments are cross-sectional actions, such as monitoring, State Plans, and the ABC Program.

4.1.2 State plans

The governance structure of the ABC Plan is divided into three levels: 1) Strategic at the national level, 2) Tactical at the national level, and 3) Operational at the state level.

> 1) Strategic at the National level is responsible for evaluating the implementation of actions by proposing new measures that may be necessary to reduce GHG emissions in agriculture (BRASIL, 2012, p. 47);
> 2) Tactical at the National level is responsible for periodically supervising and monitoring the Plan implementation. It may also propose measures to overcome any difficulties in implementation (BRASIL, 2012, p. 47); and
> 3) Operational at the State level is responsible for creating the State Management Group, which, in turn, will create a scenario that will serve as the baseline for elaborating the State Plan.

The State Plan has some requirements: i. Elaboration according to the ABC Plan; ii. Participatory elaboration; iii. Approval by state decree; and iv. Components of material nature. The material components concern the "identification of potentially strategic regions for its implementation," "determining the actions that will be implemented," and a "forecast of the targets to be achieved by 2020" (BRASIL, 2012, p. 49).

The State Plan is considered an instrument at the state level that expresses each State's formal commitment regarding their contribution to the general national target, i.e., how much the State is committed to reducing GHG emissions in agricultural and livestock activities.

4.1.3 Restoration of degraded pastures (RDP)

The ABC Plan (BRASIL, 2012, p. 76) defines pasture degradation as "the evolutionary process of loss of vigor,

productivity and the natural restoration capacity of pastures to sustain production levels and the quality required by animals." In other words, a degraded pasture cannot sustain the production and quality required by animals due to a loss of productivity and restoration capacity.

Restoration aims to increase the soil's vegetation cover, consequently, storing carbon in the soil. The specific target of this subprogram is the restoration of 15 million hectares of degraded pastures (BRASIL, 2010; BRASIL, 2018), through fertilization and proper soil management.

4.1.4 Integrated Crop-Livestock-Forestry Systems (ICLFS) and Agroforestry Systems (AFS)

ICLFS within the ABC Plan is "a sustainable production strategy that integrates agricultural, animal farming and/or forestry activities carried out in the same area, through intercropping, crop succession, or crop rotation, seeking synergistic benefits between the agro ecosystem components" (BRASIL, 2012, p. 86). In short, it is the use of crop rotation, crop succession or intercropped planting. AFS, on the other hand, concerns "land use and occupation systems in which perennial woody plants are managed in association with herbaceous, shrub and tree plants, agricultural and forage crops, in the same management unit, according to a spatial and temporal arrangement, with a high diversity of species and interaction between these components" (BRASIL, 2012, p. 86 and 87).

Both AFS and ICLFS are mechanisms aimed at "promoting the restoration of degraded areas, maintaining and reconstructing of forest cover, and also towards socio-economic objectives such as job and income generation, the adoption of good Brazilian climate policy practices in the AFOLU sector (BPA), improving social conditions, adapting the production unit to environmental legislation, and appreciating the environmental services provided by agro ecosystems (BRASIL, 2012, p. 86).

ICLFS and AFS group four modalities, namely: Integrated Crop-Livestock (ICL), Integrated Crop-Livestock-Forest (ICLF), Integrated Livestock-Forest (ILF), and Integrated Crop-Forest (ICF). The subprogram aims to expand the Integrated Crop-Livestock-Forestry system by 4 million hectares (BRASIL, 2010; BRASIL, 2018).

4.1.5 Direct Planting System (DPS)

The DPS is a "complex of technological processes aimed at the exploration of productive agricultural systems, which includes soil mobilization only in the sowing line; permanent ground cover; species diversification (through crop rotation, crop succession and/or intercropped planting); and minimization or suppression of the time interval between harvest and sowing" (BRASIL, 2012, p. 100).

Furthermore, if associated with conservationist agriculture, that is, agriculture intended for the conservation of the soil and natural resources, DPS can contribute to the preservation of water and soil, to an increase of organic matter in the soil, and, most importantly, for mitigating GHG.

There is also a classification for different types of DPS, Partial No-Tillage Systems, and quality ones (*apud* BRASIL, 2013c, p. 23). Partial DPS is not yet fully developed. According to Batista de Medeiros and Calegari, there are three assumptions for having a quality DPS: minimum soil disturbance, maintaining the soil permanently covered by straw and crops, and planning the land with crops for income and using plants that can generate short-term income. This subprogram aims to expand the no-till planting in straw practice to over 8 million hectares.

4.1.6 Biological nitrogen fixation

Biological Nitrogen Fixation (BNF) is defined as "a process by which atmospheric N2 gas is captured by microorganisms and converted into nitrogenous compounds available to plants"

(OBSERVATÓRIO ABC, 2013c, p. 24). BNF enables the total replacement of nitrogen fertilization. This process, therefore, reduces emissions from manufacturing, transporting, and using chemical fertilizers but also increases the amount of organic matter in the soil and carbon sequestration; hence, it works as a type of carbon sink (under the terms of Art. 2, item IX, of Law No. 12,187).

BNF is also economically advantageous. For example, according to data from Embrapa (EMBRAPA, 2016, p. 4), the cultivation of soybeans in Brazil is based on BNF, which represents savings of approximately US$ 9 billion compared to the amount that would be spent if nitrogen fertilizers were used.

This subprogram's specific goal is to expand biological nitrogen fixation in 5.5 million hectares of cultivated areas, replacing nitrogen fertilizers (BRASIL, 2018).

4.1.7 Planted forests

This program aims at planting forests on rural properties that generate income. Its economic aspect, present in three of the four objectives of planted forests, is highlighted. These objectives concern "the implementation of a long-term source of income for the producers' families; increase the supply of wood for industrial purposes (pulp and paper, furniture and wood panels), energy (charcoal and firewood), civil construction and other uses; reduce pressure on native forests; and capturing CO2 from the atmosphere, reducing global warming effects" (BRASIL, 2012, p. 122).

This subprogram's specific goal is to expand the planting of forests by 3 million hectares, following Art. 6th, inc. VIII, of Decree No. 7.390/2010, or Art. 19th, inc. VIII, of Decree No. 9.578/2018 (BRASIL, 2010; BRASIL, 2018). Note that, at least initially, the species chosen for planting forests were species from the genera Pinus and Eucalyptus (OBSERVATÓRIO ABC, 2013c, p. 28).

4.1.8 Animal waste management

Animal waste management gives a proper destination to waste and effluents from barn-raised animals. Such management reduces the emission of methane, one of the gases causing the greenhouse effect. It also generates income for producers because methane can be stored and used as automotive, thermal, or electrical energy. This subprogram's specific goal is to expand the use of technologies to treat 4.4 million m3 of animal waste (BRASIL, 2010; BRASIL, 2018).

4.1.9 Climate adaptation change

According to Art. 2nd, item I of Law No. 12,187 climate change adaptation concerns "actions and measures to reduce the vulnerability of natural and human systems to current and expected climate change effects" (BRASIL, 2009). Vulnerability, in turn, can be defined as the degree of a system's susceptibility and inability to cope with climate change's adverse effects.

Therefore, climate change adaptation refers to actions that reduce a system's susceptibility and inability to overcome the adverse effects of climate change. As for the nature of these actions, there is no definition of the nature of the actions comprising this adaptation subprogram. They are not end-actions, as they have exclusively mitigating purposes, and do not constitute cross-sectional actions; instead, they permeate all of the Plan's subprograms, not limited to just one, as we see below.

This adaptation subprogram presents specific regionalized goals. As the ABC Plan show, "the establishment of regional targets for such actions should consider a mapping of vulnerabilities, opportunities and/or investments and the social profile of the different regions, recognizing the family farming segment as a priority" (BRASIL, 2012, p. 144). Thus, the targets are established according to the context, considering different priorities among the different regions, which is one of the actions proposed by the ABC

Plan for this subprogram, i.e., the definition of criteria for prioritizing the recipient areas within the states of adaptation/mitigation actions based on a synergy between the Federal and State Plans objectives.

4.1.10 Cross-sectional actions

Cross-sectional actions are opposed to end-actions. End-actions integrate *one of the six mitigation subprograms* (RDP, ICLFS, SAF, BNF, DPS, Planted Forests, or Animal Waste Treatment). Note that the end-actions only achieve one of the specific targets and only fit into one of the subprograms. Additionally, end-actions are those with mitigating rather than adaptive purposes (OBSERVATÓRIO ABC, 2013a, p. 19 and 22).

Cross-sectional actions, in turn, concern initiatives that permeate all the programs composing the Sector Plan for Agriculture (BRASIL, 2012, p. 154), i.e., cross-sectional actions fit into all the ABC Plan's subprograms.

4.1.11 ABC Plan's monitoring

The ABC Plan also mentions, "it is necessary for Brazil to develop monitoring strategies to ensure that the reductions foreseen in the Sector Plans will be subject to accounting and verification in 2020. Hence, the monitoring strategy will describe how the reductions will be periodically measured and accounted for across the country" (BRASIL, 2012, p. 166).

However, it does not provide further descriptions besides predicting the need for monitoring. This absence of supervision, called Regulatory Power, is one of the criticisms of the ABC Plan (OBSERVATÓRIO ABC, 2013a, p.7 and p.18).

4.1.12 ABC Program

The ABC Plan is intended to reduce greenhouse gas emissions to achieve the targets set out in the PNMC and internationally established through the "NAMAs." In turn, the subprograms are sets of actions to achieve specific targets linked to the general one.

The ABC Plan's last instrument, which is of great importance, is the ABC Program. The ABC Program is a rural credit line associated with the ABC Plan. Such credit presents subsidized rates, and the ABC Program is divided into subprograms. Seven subprograms meet the original proposal (ABC Restoration, ABC Direct Planting, ABC Integration, ABC Forestry, ABC Environmental, ABC Waste Treatment, and ABC Fixation). In addition, three other subprograms (ABC Organic, ABC Palm Oil, and ABC Amazonia biome) were specifically created from the ABC Program.

Much criticism is directed to these last three programs since the ABC Program is a credit line associated with the ABC Plan. The forecast of subprograms not related to the ABC Plan's subprograms shows a divergence, which impairs clarity and, in many cases, the very purposes of the Plan (OBSERVATÓRIO ABC, 2013a, p. 26).

Data provided by the ABC Observatory show an important divergence between the credit the Program makes available and what is actually utilized, as shown in the following table (OBSERVATÓRIO ABC, 2017, p. 19).

Table 1 – Relationship between credit available and credit utilized

Harvest	Available Credit	Credit Utilized
2010/2011 Harvest	R$2 billion	R$0.42 billion
2011/2012 Harvest	R$3.15 billion	R$1.526 billion
2012/2013 Harvest	R$3.4 billion	R$3.05 billion
2013/2014 Harvest	R$4.5 billion	R$3.03 billion
2014/2015 Harvest	R$4.5 billion	R$ 3.66 billion
2015/2016 Harvest	R$3.014 billion	R$2.05 billion
2016/2017 Harvest	R$2.9 billion	R$1.81 billion
2017/2018 Harvest	R$2.13 billion	R$1.55 billion

2018/2019 Harvest	R$2 billion	R$1.63 billion
2019/2020 Harvest	-	-

Source: Developed by the authors based on Observatório ABC, 2017.

To a large extent, such a discrepancy stems from the Program's unattractive interest rates. For example, the interest rate of the National Program for Strengthening Family Farming (Pronaf in Portuguese) in the 2020/2021 harvest was between 2.75% and 4% a year (depending on the crop to which credit would be used), while the interest rate in the National Support Program for Medium Rural Producers (Pronamp in Portuguese) for the same harvest, was 5% a year. In turn, the ABC Program's interest rate was 4.5% a year, provided that it would be used to "adapt or regularize rural properties according to the environmental legislation, including the restoration of legal reserve areas, permanent preservation areas, or degraded areas, and implementation and improvement of sustainable forest management plans (ABC Ambiental)" (BNDES, 2021), and 6% a year, for other purposes.

4.2 SYSTEMATIZED BIBLIOGRAPHIC ANALYSIS: CRITICISMS FROM THE LITERATURE

The CAPES publications portal was used to collect criticisms from the scientific community and create this study's corpus of analysis (BARDIN, 1977). The term "Brasil" was used in the portal with the search filter "Plano ABC" between 2012 and 2020, and 11 manuscripts were identified on July 11th, 2021. The criticisms identified in these manuscripts were organized to represent the scientific community's current thought. CAPES platform was chosen because it is the qualitative indicator used by CAPES to assess production in the field of law.

Six of the 11 articles did not criticize the ABC Plan; instead, most of the time, the Plan was mentioned only to provide an example of the low-carbon climate policy. In the remaining cases, the Plan was merely described.

Hence, two categories were created to systematize the criticisms of the ABC Plan. The first is related to the origin of criticisms (subjective classification), based on who is criticizing. The second refers to the topic that is the target of criticism (objective classification). In the "subjective classification" category, the criticisms were divided into those coming from (i) the scientific community, (ii) the productive sector, and (iii) public agents. In the objective classification, the criticisms were based on the following: (i) training, (ii) the country's structural aspects, (iii) financial arrangements, and (iv) the ABC Plan's institutional arrangement.

As for the theme of the criticisms (objective classification), two articles (GARRETT; RAUSCH, 2015; and VIOLA; FRANCHINI, 2012) criticized the lack of proper training concerning the ABC plan. Consequently, the hiring rates decreased, and producers and technicians had poor or insufficient knowledge to implement the Plan satisfactorily.

Three articles criticized structural aspects (OLIVEIRA; PANTOJA; BRISOLA, 2016; GARRETT; RAUSSCHD, 2015; and TEIXEIRA; NOGUEIRA; IMBROISI, 2019), such as the country's bureaucracy, limitations due to socioeconomic conditions and the low effectiveness of land regulation; e.g., the expropriation (in a non-technical/non-legal sense) of lands. One article (TEIXEIRA; NOGUEIRA; IMBROISI, 2019) criticizes the country's unstable political context.

Three articles criticized the Plan's financial arrangement (VIOLA; FRANCHINI, 2015; OLIVEIRA; PANTOJA; BRISOLA, 2016; and TEIXEIRA; NOGUEIRA; IMBROISI, 2019) that is, aspects involving the granting of credit. The criticisms concerned the low hiring of small producers, the unequal distribution of resources, the disincentive to investors, the excessive requirements for granting credit, the low accessibility of farmers, and the absence of fiscal and market incentives.

Finally, three articles (TEIXEIRA; NOGUEIRA; IMBROISI, 2019; OLIVEIRA; PANTOJA; BRISOLA, 2016; and GARRETT;

RAUSSCHD, 2015) criticize the ABC Plan's institutional arrangement and its lack of monitoring and supervising.

Thus, note that the ABC Plan was intensely criticized by the legal doctrine, with a greater incidence of criticisms referring to the institutional arrangement and the homogeneity of criticisms, i.e., the criticisms focused on the lack of monitoring and financial arrangement. At the same time, the structural arrangement received criticism of the most diverse kinds.

4.3 CONTENT ANALYSIS OF THE WEBPAGES OF THE SECTOR AFFECTED: CRITICISM FROM THE PRODUCTIVE SECTOR AND THE THIRD SECTOR

After examining the criticisms from the academy community, we turned our attention to those manifested by the financial and third sectors, using documental analysis.

The "Ubersuggest" resource was the method used (on September 3rd, 2021) to rank the most frequently accessed addresses that contained the keyword "Plano ABC," according to the order in which the websites were accessed. Thus, 98 websites were found. First, the 15 best-ranked websites were selected. Note that ranking the websites is important to eliminate excess and determine an order of preference among the 15 selected.

The following exclusion criteria were used to refine the selection of the remaining 15 websites further: (1) mere reproduction of legislation; (2) institutional presentation of policies, (3) academic articles (material already addressed in the systematic bibliographic review), and (4) having an exclusively local or regional scope. Accordingly, results 1 and 2 were excluded due to criterion No. 1; results 3, 9, and 10 due to criterion No. 2; results 5, 7, 8, 11, and 13 due to criterion No. 4.

Those not eliminated either by ranking or exclusion criteria were further classified according to the valuation criteria (preference) for the ABC Plan: the agent's greater importance in the Plan's achievement and greater specificity in the ABC Plan.

On the one hand, one of the financing agents was chosen (based on its importance) between the National Bank for Economic and Social Development (BNDES), and Banco do Brasil (BB), which occupy the fifth and seventh positions, respectively. On the other hand, according to importance, Banco do Brasil was chosen to represent the financing agents as it is the most prominent ABC Program's financial backer, comparing the total credit Banco do Brasil and BNDES have granted.

Regarding specificity, after excluding those previously mentioned, the ABC Observatory, the Agroicone, and the Rural Channel remained. Based on this specificity criterion, the ABC Observatory was chosen because it is the author closest to the ABC Plan, coinciding with the Plan itself. In summary, Banco do Brasil and Observatório ABC were chosen, given their importance for achieving the Plan and specific treatment given to the Plan, respectively, to proceed with the analysis of the documents published on the respective websites.

Overall, eight texts related to the ABC Plan or its Program were found on Banco do Brasil's website, representing the financial sector. All eight reports, including an Executive Summary, refer to the "analysis of the economic and financial viability of forest restoration in legal reserve areas with a focus on the ABC Program." Despite its name, the reports covered the entire ABC Plan, including the subprograms not aimed at forest restoration. Except for one report, all the seven remaining reports presented criticisms related to training, including training on the Plan's dissemination and communication of its benefits (i.e., how well the Plan has been publicized), and technical training (BANCO DO BRASIL, 2017b).

As for criticisms related to structural aspects, reports 2 (BANCO DO BRASIL, 2017b), 3 (BANCO DO BRASIL, 2017c), 4 (BANCO DO BRASIL, 2017d), 6 (BANCO DO BRASIL, 2017f), and the executive summary (BANCO DO BRASIL, 2017h) presented criticisms that fit this classification. On the other hand, no such criticisms were found in reports 1, 5 (BANCO DO BRASIL, 2017e),

and 7 (BANCO DO BRASIL, 2017g). The types of criticisms are the most varied. However, the ones that stand out the most are the conservatism of producers, mainly animal farmers, the land regularization deficit, and bureaucracy external to the plan (a "general" bureaucracy in the Brazilian context, and not necessarily resulting from the formulation of the ABC Plan – this was considered to belong to criticisms of the institutional arrangement).

The criticisms in reports 2, 3, 4, 6, and 7 and the executive summary can be classified as financial criticisms, that is, criticisms of the ABC Plan financing program (ABC Program), including both structural and functional issues. Structural financial criticisms (or criticisms of the financial arrangement) result from the creation of the ABC Program, while functional financial criticisms result from the Program's execution. For example, structural criticism concerns the inclusion of "Organic ABC," and difficulty in obtaining information on the management of the credit-taking process is a functional criticism.

Finally, reports 2, 3, 4, and 6 and the executive summary set out criticisms regarding the institutional arrangement of the ABC Plan. This criticism category is directed at failures in elaborating and structuring the ABC Plan and not the ABC Program; hence, it is a financial-structural criticism. The criticisms that stood out were the absence of general monitoring, a deficiency that the ABC Platform may meet, though there are no objective data to confirm this statement, in addition to the absence of individual contracts, the lack of coordination among ABC Plan agents, and internal bureaucracy.

The absence of criticism in report 1 stems from its merely introductory nature. The report itself recognizes this fact, and the subsequent reports refer to it as "[...] report 1 presents only the work plan of this project" (BANCO DO BRASIL, 2017g, p. 7). In turn, report 7 was more propositional; basically, a presentation of ideas that emerged during workshops held by Banco do Brasil.

On the other hand, Observatório ABC represents the third sector precisely because of its expertise concerning the ABC Plan.

Nineteen texts were analyzed, and 18 were on the Observatory's website in the "ABC Observatory publications" tab. One of the texts (OBSERVATÓRIO ABC, 2013a) cited by the Banco do Brasil reports was not on the Observatory's website, though the Observatory produced it. Instead, it was on the FGV's digital library.

As for the criticisms concerning training (classification), all[1] texts, but one of them (OBSERVATÓRIO ABC, 2015e; OBSERVATÓRIO ABC, 2016), expressly raised criticisms in this regard, in most cases, in more than one type. Thus, the highlighted criticisms were: low dissemination among producers; the benefits to the producers were poorly publicized; the producers were unaware of the implementation of the ABC Plan or the Program; the producer's lack of knowledge regarding sustainable agricultural and livestock practices; the credit analysts' lack of training; the lack of technical assistance, and an absence of specific and regionalized technical knowledge.

Regarding criticisms, the object of which was Brazil's structural aspects[80] (e.g., economic, political, social, etc.) in the period under analysis, all the texts, no exception, explicitly criticized Brazilian structural aspects, fitting into this classification. The criticisms of Brazilian land irregularities stand out. However, other criticisms should be highlighted: the concentration of hiring in the Midwest and Southeast, to the detriment of the North and Northeast; the poor education of producers in the agricultural sector; budget constraints at the Ministry of Agriculture, hindering dissemination and training; outdated current culture in the field, with producers, especially animal farmers, distrusting and resisting modern productive techniques; heterogeneous Brazilian climatic and environmental conditions; the high fiscal deficit, which has shown a reduction of the public sector's investment capacity in some years; bureaucracy outside the ABC Plan; logistic deficiency, and the infrastructure deficit.

[80] The same caution was mentioned in the previous chapter. Hence, structural aspects include structural aspects *per se* and conjuncture-related aspects.

Regarding criticisms of the ABC Program, all texts reported financial criticisms except for two (OBSERVATÓRIO ABC, 2015e; and OBSERVATÓRIO ABC, 2017d). Of the financial-structural criticisms, the inclusion of actions in the program not foreseen in the ABC Plan (e.g., ABC Orgânica) and sufficiently low-interest rates (compared to other lines of credit) stand out; the banks' credit granting model stands out in terms of financial-functional criticisms, as the model follows the methodology and logic of the financial system, not taking into account the goals underlying the credit granting. Additionally, the following stand out: the subjectivity of concessions (functional); the bureaucracy in granting credit; lack of special credit lines to finance the acquisition of equipment to analyze carbon in the soil in detail (structural); excessive requirements and conditions for granting credit (higher than those in traditional credit - structural); the low performance of private financial institutions (functional); mismatch between the evaluation and response deadlines of financial operators (banks) concerning the need and productive planning (structural); lack of clarity during the credit granting process; and credit restrictions as a result of previous default, even if subsequently settled (structural).

Finally, as for the criticisms targeting the institutional arrangement of the ABC Plan, most of the texts found in the "OBSERVATÓRIO ABC publications" contained criticisms that fit into this category (OBSERVATÓRIO ABC, 2013b; OBSERVATÓRIO ABC, 2014a; OBSERVATÓRIO ABC, 2014b; OBSERVATÓRIO ABC, 2014c; OBSERVATÓRIO ABC, 2014d; OBSERVATÓRIO ABC, 2015a; OBSERVATÓRIO ABC, 2015b; OBSERVATÓRIO ABC, 2015c; OBSERVATÓRIO ABC, 2015d; OBSERVATÓRIO ABC, 2016; OBSERVATÓRIO ABC, 2017a; OBSERVATÓRIO ABC, 2017b; OBSERVATÓRIO ABC, 2017c; OBSERVATÓRIO ABC, 2017e; OBSERVATÓRIO ABC, 2019). Thus, only two texts did not criticize the institutional arrangement (OBSERVATÓRIO ABC, 2015e; OBSERVATÓRIO ABC, 2017d). However, the text found on the FGV Digital Library

website (OBSERVATÓRIO ABC, 2013a) stood out in this criticism category, dealing almost exclusively with notes on the ABC Plan's structure.

The most common type of criticism in this category was the lack of monitoring (whether of mitigation effectiveness, "general" monitoring of compliance with targets, or monitoring of individual contracts). The following criticisms still deserve mention: failure to establish a well-defined accountability chain and decision-making; poor integration between the bodies integrating ABC Plan's structure; failure to comply with governance elements, such as transparency (disclosure), accountability, and adequacy to internal rules (compliance); low performance of the State management group; lack of a regulatory power (the one responsible for compliance and control of actions related to the ABC Plan, mainly, end-actions aiming to achieve one of the ABC Plan's six targets financed with public money); no sanctions in case of non-compliance with the plan; internal bureaucracy (related to very long deadlines or their absence, the requirement for a systemic technical project, etc.); and a lack of effective communication channels and mechanisms to guide local producers.

Note that in 2019, the ABC Platform, in partnership with FGV AGRO, moved forward to create a monitoring, reporting, and verification (MRV) model to supervise the ABC Plan's contracts. However, this criticism is manifested by the most recent texts (OBSERVATÓRIO ABC, 2019), and it is not yet known whether the methodology used will lead to the monitoring of individual contracts.

Therefore, many of the notes in Banco do Brasil's reports align with those from the ABC Observatory. Criticisms are concentrated on the lack of monitoring (institutional arrangement), technical incapacity, and low dissemination of the ABC Plan and its credit line (training); the insufficiently attractive interest rate, which does not include the financing of technical (financial) projects, for instance; and the ineffectiveness of soil regulation laws, leading to low land regularization rates that prevent the granting of credits.

Criticisms target structural matters that are difficult to solve. In the study by Paragominas (OBSERVATÓRIO ABC, 2015b), the Observatory concluded that the current culture in the countryside prevented efforts to disseminate the ABC Plan. At the same time, the Plan started to be frowned upon as word was transmitted from one producer to another. In other words, lack of training and failure to publicize the Plan was intensified due to structural problems. Such a situation was further aggravated due to the low capillarity of technical knowledge concentrated in certain regions. Furthermore, training depends on investments, but even if training is provided, producers may still not be interested in participating in the Plan because of uncompetitive rates compared to traditional credit.

Finally, in addition to a confluence of the ABC Observatory's criticisms with those of Banco do Brasil, there is also a similarity with the criticisms appointed by the theory, i.e., the criticisms previously addressed. Similar criticisms concern the producers' poor knowledge regarding the Plan; poor technical training; lack of environmental regulation; excessive requirements for granting credit; and the absence of monitoring.

The problems addressed in this study relate to institutional and financial arrangements (financial-structural criticisms). It is so because they depend on public policy elaboration. It is, therefore, for the same reason that, from now on, this will be the focus of the analysis.

Considering the targets, their fulfillment depends on the effectiveness (social effectiveness in the real world) of the ABC Plan. The bibliographical review supported an analysis of (i) the scientific community's positioning on the ABC Plan; the documentary method supported an analysis of (ii) the Banco do Brasil's opinion on the ABC Plan and the (iii) ABC Observatory's opinion on the subject, which revealed a wide range of failures and problems.

The problems encountered were classified into four large classifications, each with many different types of criticisms. The classifications of criticism were (i) training; (ii) financing (being

further subdivided into two sub-classifications, (a) financial-structural and (b) financial-functional); (iii) institutional arrangement, and (iv) structural aspects (being also further subdivided into two sub-classifications (a) criticism to the state of affairs, and (b) structural criticism). Due to reasons that will be better explained later, the criticisms that will be deepened here are those concerning the criticisms of the institutional arrangement, more specifically, those related to the accountability chain of the ABC Plan and its program, and lack of monitoring and supervision of mitigation targets in general and individual contracts.

4.4 INTERVIEWS

Considering that we sought a greater degree of internal validity, with no intention to make generalizations, we chose semi-structured interviews based on the questions that emerged from theory and the documents made available on the respective websites. Therefore, the objective was to verify whether the lack of effective monitoring and supervision is an obstacle to the good implementation of the ABC Plan.

Note that interviews are a social research technique, the objective of which is the interaction between two people to collect information on a particular subject a researcher wants to investigate (RIBEIRO; VILAROUCA, 2019). There are several ways to conduct an interview, so choosing one model or another depends on the research problem guiding the research proposal (XAVIER, 2017). However, using one of the models does not necessarily imply the exclusion of others, as each model has its ranges and limitations, so that complementation is necessary to understand specific problems (BABBIE, 2015).

Qualitative interviews aim to describe systems of relationships (BACKER, 2014), seeking to understand a subject in depth. Hence, there is no standardization of answers, and interviewees enjoy greater freedom, which is why internal validity is privileged (congruence between an interviewee's thoughts and his/her

answer). Semi-structured interviews (qualitative interviews) have a script of questions to be asked to the interviewees, though the questions do not need to be asked in the same order and with the exact words.

Open qualitative interviews refer to a "relaxed chat," the main objective of which is to collect as much information as possible. In this model, the interviewer introduces "topics," and interviewees can discuss the topics freely.

Finally, the so-called "life history" interview can be thematic or "complete." This modality of interviews is used to "depict in depth the experiences of certain individuals" (RIBEIRO; VILAROUCA, 2019). Thematic interviews collect experiences related to a particular event or context, while complete interviews collect information regarding a person's life in all aspects. In this case, interviewees are free to tell their stories.

A qualitative interview was chosen considering the questions that emerged from the legal doctrine, and interviewees and documents published on the websites of the entities mentioned above. We also sought greater depth and internal validity rather than generalizations.

Among the qualitative interviews, we first opted for semi-structured interviews. However, as previously mentioned, due to the need to complement the models, questions were asked in the form of topics; hence, the interviews also presented characteristics of an open interview (e.g., question 1, part 2, script B).

Note that there is a decreasing degree of structuring, with fewer structured questions. The interviewees were three representatives of the Financial Sector, two of the third sector, and two representatives of the first sector. The script was divided into Script A, with questions written specifically for the financial sector, and Script B, with questions directed to the first and third sectors. Several of the questions were identical; however, some questions were exclusive to one or another.

Each script was divided into three parts. Part 1 intended to collect the respondents' personal data. Part 2 intended to gather

information about the relationship between the respondent's institution and the ABC Plan. Finally, Part 3 is the central part of the script, in which questions are asked regarding the problems of the ABC Plan or its Program. The questions were organized from the most general to the most specific.

The questions are classified as interviewee data (part 1), the relationship between the institution and the ABC Plan (part 2), and the problem (part 3). The latter is divided into 2: (i) general and (ii) inspection and monitoring.

The third part is subdivided into two. The first subpart concerns general, broader questions with greater freedom of response. The second subpart concerns issues related to the critical problem that is the object of this study: the absence of an accountability chain. The lack of an accountability chain manifests itself in many ways; the most common (i.e., the most frequent) are supervision and monitoring.

4.5 ANALYSIS OF RESULTS – ABC PLAN

4.5.1 Description of the interviews

Overall, five interviews were held, including a press conference in which three representatives were heard simultaneously. Thus, eight interviews from different institutions were chosen from different sectors. Hence, there was an attempt to follow a partially flexible script (semi-structured interview), always with a set of universal questions to all interviewees; however, with some exclusive questions depending on the specialty of the topic and interviewee's domain or according to how the interviews progressed.

As the objective of the interviews was to seek a representative response from each agent regarding subjective criticisms, at least one representative of each Sector was interviewed. Two representatives from different institutions in the Third Sector were interviewed. One is from an institution specialized in monitoring

and supervising the ABC Plan (Representative A). The other interviewee (representative B) was asked about the remaining aspects. The interviews were held on October 6th, 2022, and November 4th, 2022, respectively. Three representatives from the second Sector (Financial Sector) were interviewed in a single and collective interview, which took place on February 5th, 2022 (these will be collectively referred to as Representative C). Finally, there were two representatives of the First Sector. One addressed the more general aspects (Representative D), and the other addressed aspects of the Plan's elaboration (Representative E). The interviews were held on June 13th, 2022, and July 7th, 2022, respectively.

The questions can be grouped into four major themes, which will be used later as a parameter for analysis. These two significant themes group one or more questions that could be included in the initial script or not due to the semi-structured model. The two major themes are listed here in order of importance according to the research thesis rather than chronologically. The two major themes are:

> 1) Supervision and monitoring (covering more specific questions within the classification of arrangement mistakes, qualified by a failure in preparing a mechanism to verify compliance with the ABC Plan – addressing both the monitoring of individual contracts and mitigation targets).
>
> 2) Miscellaneous criticisms, subdivided into: a. Credit taking process, addressing questions related to the institution and the ABC plan; b. General criticisms contain questions related to criticisms but not specified by the interviewers; and c. Institutional arrangement failures with questions related to criticisms specified by the interviewers, i.e., explicitly asking which criticisms would refer to the plan's elaboration. Note that it is impossible to correlate the theme with exact and specific questions in the interview script due to the flexibility of the semi-structured model. Hence, questions not included in the script were asked to the interviewees.

a. Supervision and monitoring

This is the main topic addressed here, and its importance was verified both in the interview with the third and second sectors, in which the interviewee spontaneously addressed the subject without being previously asked about supervision. However, note that the third sector's representative (A) researches the subject of monitoring. The second sector made some criticisms, but only after he was provoked in this regard. Both representatives of the first sector addressed the issue only superficially.

Regarding representative A, he said, "there is enormous potential for you to add environmental value to the ABC plan, among those adopting technologies, but today there is nothing, monitoring is flawed, it has not been done, it has not. It was not assembled correctly." His opinion regarding individual monitoring (i.e., individual contracts) is also of interest, considering that it is entirely the banks' responsibility and they have the competence to carry it out.

> The bank can do the monitoring. But we still don't have fully developed technology or a protocol. In fact, I think this technology already exists. So, we already have an application, satellite image. But the bank still doesn't have a structure or a protocol set up for it to be done at an affordable cost. So, how do I go to each property, take a soil sample, cross it with a satellite image, take a photo using an application, and make sure that the guy really applied everything he had to?

In short, representative A believes that the financial institution already has the conditions to carry out the monitoring (and it seems that even on-site); however, due to a lack of an adequate protocol, the costs would be high, which gives rise to arguments, made by the second sector, including that would be economically unfeasible carrying out on-site monitoring of all projects.

In turn, representative E said that there are some difficulties related to the situation in Brazil that end up making monitoring difficult: the difficulty in obtaining data, the differences in

treatment necessary for monitoring the different sub-programs, that is, some remote methods of monitoring can be implemented in some sub-programs, though in others this is no longer possible. Incidentally, representative E believes in the role certifiers can play in monitoring; however, he recognizes the possibility of this entailing some costs that make the Plan even more inaccessible to small and medium producers, which may even favor opportunism.

The second sector mentioned that they inspected individual contracts by sampling because of the impossibility of on-site visiting, considering there are many areas. The interviewee also considered that sampling inspection was satisfactory, considering its low cost and minor non-compliance on the part of the producers, i.e., once the credit was contracted, the producers generally complied with the project.

In turn, representative B gave an extensive explanation about the monitoring, as the object of his work and research consisted exclusively of the Plan's general monitoring. Thus, his understanding was different. In summary, he believes that on-the-spot monitoring is necessary to verify both whether there is a real need for the program and check compliance with the agreement:

> […] field campaign is expensive, right? So having people going there, you know, going through many aspects and the declaratory document people say they want, you know? So if I ask if the person has degraded pasture, for instance, he'll say no [...], And nobody will check if the land is in fact, degraded or not.

Thus, the problem is verifying whether the person's statement is true. Representative A recognizes that the cost of this type of monitoring is high. However, the representative also states that the most significant difficulty for general monitoring (i.e., mitigation targets as a whole, not of specific contracts) concerns a lack of accurate and up-to-date data. Therefore, it is impossible to know precisely how much was mitigated.

b. Miscellaneous criticisms:

b.1 Credit process:

Such difficulty was addressed in one of the interviews with Representative D, as follows:

> [...] it got to the point where many producers went to the bank's branch and asked for credit, but the manager would not provide any information, and the credit wouldn't come out. There was much difficulty in the beginning; it was much work on the part of the Ministry of Agriculture for this credit to be utilized. [...] So, it seems that today there are not many problems with that.

Thus, both sectors described a problem, the object of which lies in the second sector's performance, with an indication that the problem had already been overcome. With that in mind, this question was asked to the representatives of the financial sector (second sector agents) to see whether there had been an improvement or if the problem persisted. They denied that the credit process was a problem; on the contrary, they stated that the credit granting process positively affected the Plan: "we believe that we have structured a contracting process that brings us reassurance of how the resource is applied." However, there is no denying that there were problems at the beginning and representative A and the scientific community seems to agree on a change in the financing model. However, the second sector believes that such difficulty had been overcome right from the start. In the bank representatives' words:

> [...] the moment when the decision was made that the bank would be the inductor of this type of program - and this was a top management decision here at the bank - in the first year of the ABC plan, the entire system, including the bank, worked a lot because it implied a greater complexity in the credit process, you know? As (...) said, it changed the paradigm from financing a more straightforward business where the client finances items, a machine, soy plantation, [now] it's a project with many connections between purposes, like what will be done with the technological issue.

In summary, there were three opinions: one representative acknowledged that there was a problem but claimed that it had been resolved; another defended that there was no problem in this regard; and the third said that not only was there a problem but there still is. In other words, there is a problem; there was, but it was solved; or there never was.

b.2. General criticisms

As previously mentioned, the objective of asking this 'open' question was to verify whether previous criticisms would be verbally confirmed and whether there were criticisms that had not yet been officially manifested by the institutions but were already in the representatives' minds. In this regard, the interviewees' answers did not deviate much from the considerations their respective institutions had already manifested.

Representative B reiterated the producers' lack of knowledge regarding the impact of technologies, the very existence of technologies, the program, and the lack of adequate training. However, the fact that the interviewee spontaneously addressed this problem without us telling him the object of our study drew our attention. He stated:

> The *lack of monitoring* and the credit problem is worth mentioning: it is difficult for producers to borrow this money, as there's a more bureaucratic process. The farmer, designers, and technicians working on the projects and requesting the resource from Banco do Brasil, BNDES, or any other bank are unaware of the logic behind the productive system. So, today you don't know.

In short, as highlighted, the interviewee mentioned the absence of monitoring:

> [...] there was a severe governance problem in how to make decisions at the federal level, which would become State decisions, which would then become local, regional, or municipal decisions. So that was one of the plan's big problems. So I think that was basically it, governance, credit, monitoring,

lack of knowledge, technical assistance, and technology dissemination to farmers.

Representative C, in turn, mentioned that the main difficulties were a lack of training and low dissemination of technology and knowledge regarding the Plan, suggesting the need to "have a course within agronomy undergraduate programs to provide training directly related to these alternative systems, of more modern production models."

Even though representatives D and E did not address the aspects of general criticism, we can extract some aspects: monitoring (discussed in the last topic), the low outflow of credit, and, mainly, the low publicity about the credit existence: "the bank manager wouldn't have much information, and the credit wouldn't come out. So at first, there was much difficulty, so it was much work on the part of the Ministry of Agriculture for this credit to be used, to be known".

Finally, representative A reported a problem that, later, will impose an even greater difficulty on effective monitoring, a census problem: the "lack of structure, data, and information" (a conjuncture-related criticism). Again, the relationship between both criticisms is evident: it is difficult comparing two mitigation moments and determine Plan ABC's mitigation results when there is a lack of information and data, and sometimes of accurate data and information.

b.3. Institutional Arrangement's Mistakes

As for the criticisms of the institutional arrangement, representative C said there was no difficulty regarding the institutional arrangement. Once the bank's top management decided to be the primary inducer of the ABC Program, the financial institution created an internal structure to carry out this activity. However, note that this opinion stems from the fact that

the bank's contact with the Plan is indirect, through the latter's credit line.

Representative E, who took part in the Plan's elaboration, also believes there are no problems in this regard, as the Plan's preparation followed a scientific method and was permeated by much discussion. It seems to be the same opinion of the third sector, as representative A notes

> When we look at the plan's material, the plan's booklet, when it was written and elaborated; it's very complete and contains many details. But it's something widespread in Brazilian politics; you write a very beautiful policy on paper. [...], but one of the problems of designing it, concerns the teams, what will be needed, how much resources will be spent, and where resources will come from, and the ABC plan was very well put together in terms of how much money would be needed, [...]. However, they did not think about where that money would come from, or they could not run after sources to fund these activities.

Therefore, it appears that the representative above agrees that there is merit in detailing the activities and the Plan as a whole. However, there is little detail on how to implement the policy, mainly regarding the origin of the resources to fund Plan ABC or human resources to apply these resources.

However, there are some comments about institutional mistakes. The first of these comments emerges when representative A criticizes the problematic relationship between the State groups and the national group: "you need people who will liaise with State committees, who will work on the field, and it was not considered. An interesting criticism, which, despite appearing only occasionally in the texts explored so far, was emphatically manifested by the third sector; a lack of coordination between the management groups and the CIM/GEX. That is a lack of coordination between the State and the federal spheres. So, the Plan progressed only in the States that took the initiative. The same representative also seems to be critical of the absence of an accountability chain for the Plan's executors:

> [...] when you have the policy to comply with but do not assign responsibilities, like who is responsible if it does not work out? What's the penalty? What is the punishment? [...] There was never a chain of command that made it clear who was responsible, what the penalties were, or what the consequences were for not achieving the objectives.

The representative suggests that the Public Prosecutor's Office pressures policy managers to solve the problem. Another comment also seems to refer to an institutional mistake (classification) concerning inspection and monitoring (type): "the monitoring is flawed; it has not been done and has not been set up correctly".

4.5.2 Summarized comparison between the interviews and data from the bibliographic review

As seen previously, the Sector Plan for Mitigation and Adaptation to Climate Change for the Consolidation of a Low-Carbon Agriculture (ABC Plan) is an instrument instituted by Brazil (Art. 11th, sole paragraph, of the National Climate Change Policy, and by Decree No. 9,578, regulating it) to comply with the climate targets accepted internationally.

The general target of the commitments Brazil voluntarily agreed upon (voluntary national commitment) was set by the National Policy on Climate Change (BRASIL, 2009) in its 12th article, which concerns a reduction "between 36.1% and 38.9% of its projected emissions by 2020".

There are specific compatibility issues with the NDC (nationally determined contributions) of 2016. The reason is that the National Climate Change Plan and Policy are from 2011 and 2009, respectively, while the first NDC is from 2016.

The general target foreseen in the 2016 NDC was "to reduce greenhouse gas emissions by 37% below 2005 levels in 2025", while the general target of the PNMC is "to reduce between 36.1% and 38.9% of its projected emissions by 2020".

This difference arises because the PNMC is not linked to the commitment made in Paris (NDC), as it is from 2009. Therefore,

officially, the ABC Plan itself is detached from NDCs. However, in reality, they are linked to the target assumed in the Kyoto Protocol (as the ABC Plan recognizes it), predating the first NDC since the ABC Plan was concluded in 2011, one year after the Decree (Decree nº 7,390) that institutes it.

The other difference stems from the following 2016 NDC forecast: "in the agriculture sector, strengthen the Low Carbon Emission Agriculture Program (ABC) as the main strategy for sustainable agriculture development, including by restoring an additional 15 million hectares of degraded pasturelands by 2030 and enhancing 5 million hectares of integrated crop-livestock-forestry systems (ICLFS) by 2030". Note that the restoration target of 15 million degraded pastures is the same as in the Decree. However, the target set out in the NDC for implementing the crop-livestock-forest integration system is *1 million higher* than what was foreseen in the Decree, the target officially adopted.

In short, during this study's first stage, the CAPES Periodicals Platform was used to identify the scientific community's criticisms. Thus, the subjective criticisms of the scientific community were systematized. In the second stage, we sought a general opinion representative of the State and the financial sector based on a documental analysis. As a result, representatives D and E represented the State, and Representative C represented the financial sector. Next, we conducted interviews to present the criticisms collected thus far and have the interviewees assess them and give their opinions on the matter.

A common aspect of the interviews was for the interviewees to criticize each other's performance. Hence, the purpose was to verify the institution's opinions and compare the different actors' opinions. Hence, the interviews considered topics chosen from the bibliographical analysis.

Thus, the matter concerning the process of granting credit was addressed. In line with what is commonly found in the literature, the third sector manifested, "credit represents a challenge regarding how the policy credit actually reaches the producers."

However, as previously seen, the financial sector openly denied that its concession process had a negative impact. From Representative D's perspective, there were some failures, but these had already been remedied.

The importance of the research problem was also verified in the report of both representatives of the third sector (A and B). In this regard, the legal doctrine criticized the lack of supervision, and many problems were pointed out. The texts mention the absence of a monitoring mechanism, which is no longer accurate, considering that some mechanisms were already created, such as the ABC Platform. There are also articles mentioning issues regarding the monitoring of individual contracts. Representative B broadly addressed monitoring-related criticisms that had not been identified thus far. The main one concerns a census problem that hinders the monitoring process, such as missing or outdated data, which impedes comparisons between the years before and after the Plan was implemented, preventing an analysis of whether mitigation improved or worsened.

As for the second sector, its representatives (C) addressed the issue of monitoring individual contracts. They recognize the competence of the second sector to supervise individual contracts but also acknowledge the impossibility of verifying on-site whether all projects at the level of individual contracts had been executed. Human and financial resources spent on such monitoring would be greater than occasional non-compliance. According to the sector representatives, non-compliance is very low.

The interviews revealed that the second sector performs sampling inspection to verify compliance with individual contracts, while it denies competence to pursue the general monitoring of mitigation targets.

Representative D considers that the issue of monitoring arises from difficulty obtaining data. Representative A also noted that the certifiers could positively influence the Plan by increasing Program ABC's economic attractiveness. Note that such a lack of data is the

central aspect pointed out by the Platform that impedes the general monitoring of mitigation targets.

This sector also harshly criticized credit granting, stating that the second sector's credit granting process did not favor the Plan's implementation. In fact, on the contrary, it harmed its implementation, an opinion the third sector shares. In turn, the second sector denies these criticisms vehemently, as it believes that its process is positive for the concession.

Representative E's opinion is also interesting. He states that the elaboration of the ABC Plan presents no problems since several actors and agents participated in it. The literature's comments on the Plan's elaboration always emphasize the Plan's high emphasis on the principle of citizen participation, with a diverse plurality of participants from all sectors. However, the articles identified in the documentary analysis describe some problems, such as not having specific predictions to the detriment of more general ones. General predictions contemplate the various interests better; however, may not apply in specific cases.

Thus, the more significant divergences were between the representatives of the third and second sectors. The representatives of the second sector affirm that the problem of the granting credit process never existed because there was an internal effort to organize the bank's structure right from the beginning. However, it contradicts representative A, who says such an effort was only exerted after and during the Public Prosecutor's Office actions.

Additionally, Representative E's reasoning seems right. He stated that sampling inspection of individual contracts and satellite monitoring is possible but not for all Plan's subprograms.

The second sector, in turn, also seems to be right when stating that monitoring individual contracts is within its competence, but not general monitoring, considering there is currently an entity in charge of performing general monitoring (Platform ABC). An interesting fact, however, is that the problem noted by the third sector (representative B), the census problem, can be alleviated if the information is shared between the second sector and the

general monitoring entities, considering that data concerning individual compliance can help calculating mitigation targets, which supports monitoring the whole.

5 CASE STUDY No. 3 – NATIONAL BIOFUEL POLICY - RENOVABIO

The Brazilian National Biofuels Policy - RenovaBio implementation process is one of the three cases analyzed here that compose the general objective of assessing compliance with the Brazilian NDC under the Paris Agreement. The relationship between this public policy and the treaty is clear and is one of the explicit objectives of the governing legislation[81].

Law No. 13,576 was enacted on December 26th, 2017, as a measure to comply with the Brazilian commitments to the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC). The National Biofuels Policy was established under this law, which, among other measures, established a decarbonization credit market to mitigate greenhouse gas emissions and combat climate change.

The implementation of this market is still recent, as its operation began on December 24th, 2019. Therefore, analyzing this instrument supports understanding the public policy creation and implementation process, the elements chosen to compose its institutional design, and criticisms conveyed by stakeholders.

When structuring a case study, Yin (2021) mentions three elements of analysis: phenomenon/intervention, context, and units of analysis. Likewise, Machado (2017, p. 378-379) explains that at least three parameters can be used to delimit the phenomenon-context dyad.

The first possibility is to select the target of inferences based on an author. In this case, the study involves the behavior of a personality capable of making decisions, even if not natural, as it occurs with legal entities. Another possibility is delimitation according to institutional structures, such as a prison unit, a health

[81] See Art. 1st, I Law No. 13,576/2017).

unit, or a courtroom. Finally, an event (or plot) can also serve as a beacon to justify the research focus.

Machado (2017, p. 378) considers it challenging to differentiate the perspectives based on events from those based on an institutional milieu when studying public policies. However, it is unnecessary to consider such categories as exclusionary, as they can be combined. When dealing with the relationship between an event and intervention practices, she also explains that retrospective or prospective operations may occur. In these terms, we may initially determine the institutional practices and conducts that led to an event (whether by action or omission), though it is also possible that a given event triggered a series of reactions from policymakers and those implementing such public policies.

The RenovaBio case study is a research proposal defined by the event concerning the presentation of the Brazilian NDC in 2015. This research proposal will support understanding the interferences initiated since then and which resulted from the commitments assumed therein. "Implementation challenges" are used as the unit of analysis, adopting what Yin calls a holistic unit of analysis.

Therefore, different data collection instruments were used, consisting of content analysis of the related legislation, systematic bibliographical review, content analysis of the webpages of representatives of the sectors impacted by the regulation, and, finally, interviews with those participating in the policy. These instruments were intended to understand the criticisms toward RenovaBio and the measures that revolve around overcoming the challenges of implementing the decarbonization credit market.

All these instruments were used to answer the question about how the bottlenecks in the implementation of RenovaBio are dealt with, as these may prevent carbon intensity from being reduced in the Brazilian energy matrix by encouraging the consumption of biofuels.

5.1 REGULATORY SURVEY AND CONTENT ANALYSIS OF THE RENOVABIO-RELATED LEGISLATION

5.1.1 Trajectory of the Brazilian National Biofuel Policy

The National Biofuels Policy was instituted by Law No. 13,576 on December 26th, 2017. Its formulation process, however, began a year earlier within the scope of the Brazilian Ministry of Mines and Energy (MME). The proposal MME submitted to public consultation in 2017 indicates that a set of actors participated in this policy formulation, including public authorities, representatives of the productive sector, and society representatives. Public authorities were subdivided into an operational center, a governmental center, and parliamentary fronts (BRASIL, 2017, p. 10-11).

The public authorities working in the daily policy formulation belonged to the operational center. The government center, the parliamentary fronts, and other stakeholders contributed to the discussion, and their interactions began in August 2016. The operational center comprised the Brazilian National Agency of Petroleum, Natural Gas and Biofuels (ANP in Portuguese), the Energy Research Office (EPE in Portuguese), the Ministry of Agriculture, Livestock and Food Supply (MAPA in Portuguese), and the Ministry of Mines and Energy (MME) (BRASIL, 2017, p. 10-11).

Several measures were proposed during the interaction with the representatives of the productive sectors according to the interests associated with each biofuel. For instance, representatives of biogas and biomethane producers addressed "the goal of replacing heavy diesel vehicles and agricultural equipment with gas-powered vehicles" (BRASIL, 2017, p. 4). In addition, tax differentiation measures, credit lines, technology research, and decarbonization targets, among others, were mentioned.

Thus, a working group (RenovaBio WG) was created through Resolution CNPE No.14/2017. Its purpose was to continue the development of the public policy proposal, the guidelines of which involved determining the role of biofuels in the Brazilian energy

matrix. The proposal should encourage production, consumption, and research in the biofuel sector, as well as new investments, taking into account its positive externalities. Furthermore, the guidelines foresaw the adoption of carbon pricing instruments based on the relationship between fuel efficiency and emissions.

When enacted, Law No. 13,576/2017 affirmed the objectives, fundamentals, and principles of the National Biofuel Policy. These guidelines conferred systematicity and coherence to the interpretation of the legislation. Four objectives were established. The first is to contribute to the goals and commitments accepted by Brazil under the Paris Agreement. The second is to establish a satisfactory relationship between energy efficiency and the reduction of greenhouse gas emissions in the biofuel sector. The third and fourth objectives involve promoting the expansion of production and use of this renewable fuel in the Brazilian energy matrix and the predictability of its competitive participation.

One of the legislative foundations is the strategic role of biofuels, considering their contribution to energetic security, environmental preservation, and development promotion with economic and social inclusion. Furthermore, it is based on promoting free competition and adding value to Brazilian biomass.

The principles addressed in the objectives and fundamentals consider aspects of predictability, agroindustry sustainability, supply security, and energy efficiency. However, they also include consumer protection, job and income generation, regional development, and promoting technological development. The latter emphasizes the inclusion of new and advanced biofuels.

5.1.2 Connection between the instruments that make up the decarbonization credit market

The speech of the Deputy Executive Secretary of the Ministry of Mines and Energy in May 2019 considered that "The Brazilian National Biofuel Policy translates into the creation of the Carbon Credit Market, called CBIOS, in the certification of production and

targets definition" (BRASIL, 2019). His pronouncement emphasized the market instruments in government communication, sometimes even mixing up the National Biofuels Policy with the decarbonization credits market.

Article 4 of Law No. 13,576/2017 provides six public policy instruments. The idea of a market instrument is to combine the first three, consisting of (i) targets for reducing greenhouse gas emissions, (ii) decarbonization credits, and (iii) certification of biofuels. The other three instruments correspond to measures already provided for in the legal system (compulsory additions and tax, financial and credit incentives) and actions under the Paris Agreement.

Therefore, RenovaBio's legal regime does not restrict the biofuel policy to the decarbonization credits market. The latter is just one of the measures established, resulting from the three foreseen instruments. When dealing with the constitutive elements of emissions markets, the arrangement of rights and duties involved must restrict the use of the atmosphere as a waste deposit and create a marketable unit. In the case of RenovaBio, the decarbonization credit is a tradable unit, while the reduction targets act as a restriction on the use of the natural resource.

The monitoring mechanisms and participants' sanctions were also addressed when the need to control the emission and reduction of greenhouse gases was mentioned. In addition, the certification instrument within RenovaBio contributes to the task of verifying the environmental benefits achieved by the production and consumption of biofuels.

The executive branch, the regulatory authority, is responsible for setting the reduction targets and conducting the accreditation of inspection firms (certifiers). The producer (or importer) of biofuels is the issuer of credits, while the fuel distributor is the buyer of CBIOS based on predetermined targets. Other actors may also participate in credit purchase and sale operations, the negotiations of which occur on the Brazilian stock exchange (B3).

5.1.3 Decarbonization credit – CBIO

Law No. 13,576/2017 defines the decarbonization credit (CBIO) as the "[...] instrument registered in a book-entry form, for purposes of proving the fuel distributor's individual target [...]". This definition indicates that the CBIO does not have physical materiality but only represents a tradable unit registered in a book or registration system.

One CBIO unit represents a ton of carbon dioxide, resulting from the difference in greenhouse gas emissions in the biofuel life cycle and total emissions of its equivalent of fossil origin. Thus, one CBIO is the equivalent of a ton of carbon dioxide that is no longer emitted into the atmosphere because consumers used biofuel instead of its competitor of fossil origin.

The primary issuers, i.e., the producers and importers of biofuels duly authorized by the ANP and qualified to participate in the market, can request the registration of new credits. In addition, potential CBIOS issuers can voluntarily participate in the market.

An electronic invoice and proof of receipt that indicates the sale, remittance of future delivery, sale to order, or sale of the establishment's production delivered to the recipient on behalf of the original purchaser of eligible biofuels is necessary to issue CBIOs. An invoice can be used only once to generate CBIOs, and the recipient must be an authorized economic agent or registered within the ANP.

The operations authorizing the creation of CBIOs are only those in which ethanol is destined for the fuel market, excluding those destined for industrialization and export purposes. Furthermore, ethanol must be produced in the corresponding production unit and cannot be purchased from third parties.

If the invoice is later canceled or does not meet the requirements, the credits generated are deducted from the subsequent issuance requests. In this case, the primary issuer must inform the ANP of the cancellation within 48 hours.

To issue a CBIO, the primary issuer needs to hire the bookkeeping services of a bank or financial institution. This bookkeeper is responsible for bookkeeping the CBIOs owned by the contracting party. In addition, communication between the primary issuer and the bookkeeper is conducted by the CBIO Platform, an electronic registration system developed by a company contracted by the ANP to control the agency's compliance with compulsory targets and control the ballast (documentation) of the credits generated.

The bookkeeper creates the credits proportionally to the volume of biofuel sold and the energy-environmental efficiency score present in the certificate of efficient production of biofuels. The invoice shows the difference in emissions between the biofuel sold by the issuer and its equivalent of fossil origin.

The denomination "Decarbonization Credit – CBIO" must be recorded when registering the credits, in addition to the control number, the date of issue, the identification, and qualification of the parties highlighted in the invoice, the product code, gross weight, and volume traded. In cases where the primary issuer is linked to a cooperative, invoices it issues against third parties are accepted.

Once registered, CBIOs can be freely traded on the stock exchange. There are three categories of market participants: (i) the primary issuer, the one generating CBIO rights as it produces, imports, and markets biofuels; (ii) the obligated party, represented by regulated agents subject to compulsory reduction targets; (iii) the non-obligated party, corresponding to other CBIO holders.

Finally, the CBIOs legal regime provides that its credit is valid until retirement. Upon retirement, a CBIO is withdrawn from circulation and no longer subject to future negotiation.

5.1.4 Mandatory targets for reducing greenhouse gases emissions

Fuel distributors understood as the economic agents authorized by the ANP to carry out the fuel distribution activity, are subject to targets. These agents sell fuels in the market through

retail networks (supplying stations) or large consumers. Examples of distributors are Petrobrás Distribuidora S.A, Ipiranga Produtos de Petróleo S.A, and Raízen Combustíveis S.A.

Carbon intensity is a measure that expresses the relationship between the total greenhouse gases per unit of energy produced. Hence, targets are named in grams of equivalent carbon gas per megajoule of energy (gCO^2/MJ).

Each fuel marketed in the country has a carbon intensity measure. For example, regulation considers that gasoline emits 87.4 gCO^2/MJ and diesel 86.5 gCO^2/MJ. Therefore, based on the volume and share of each fuel in the Brazilian fuel matrix, one can assess the carbon intensity of the fuel sector.

Although carbon intensity is a relative measure, Decree No. 9,308/2018, replaced by 9,888/2019, determines the setting of targets and their tolerance intervals in the number of carbonization credits so that the target becomes absolute.

Targets must be annual and designed to cover at least ten years. Note that the international commitments accepted by Brazil and their distribution among sectors must take into account the protection of consumer interests, the impacts of fuel prices on inflation, the availability of biofuels, the appreciation of energy resources, and how domestic consumption and fuel imports behave.

For example, Resolution CNPE 5/2018 determined a 10% reduction in the carbon intensity projected for the Brazilian fuel matrix between 2019 and 2028. For 2019, the Brazilian National Council for Energy Policy determined a reduction of 1% of carbon intensity for the national fuel matrix. Considering that one CBIO is equivalent to one ton of carbon dioxide, it was estimated that 16.8 million decarbonization credits would be required as a mandatory annual target in order to achieve the reduction intended.

Individual targets are set out based on the annual target and individually assigned to fuel distributors proportionally to their market share in the fossil fuel market in the previous year. Therefore, the distributors must prove that they hold the number of credits corresponding to the target assigned to them every year.

Flexibility is foreseen in article 7, paragraph 4 of Law No. 13,576/2017. Up to 15% of the individual target for a year can be distributed/postponed to the subsequent year, provided there are no pending items from the previous year.

Acquiring credits is how distributors are expected to comply with the legislation, and the volume of CBIOs determines the targets. At the same time, distributors can also reduce their share in the fossil fuel market, which would reduce their targets. This solution, however, does not encourage behaviors that would enable achieving the same environmental benefit with reduced loss of economic performance (cost-effectiveness ratio).

The goal of Resolution No. 5/2018 was not fulfilled. It was expected to come into effect from July 24th, 2018, to December 31st, 2028, but was replaced by Resolution CNPE No. 15/2019, which redefined the mandatory annual targets. The targets determined by the second resolution remained similar to the previous ones, but the effective deadline was changed to December 24th, 2019.

Notwithstanding, the effects of the COVID-19 pandemic led the Ministry of Mines and Energy to review the annual targets again. Ordinance No. 235/2020 released a new target proposal for public consultation. When comparing the first and second proposals, we note that the long-term objective (ten years) is similar, but the first years' targets were reduced. As considered by the Ministry of Mines and Energy, the country's energy demand has changed, and the supply of fuels decreased. Consequently, the supply of CBIOs was also reduced (BRASIL, 2020).

The explanatory note from the Ministry of Mines and Energy goes so far as to compare RenovaBio's target regime with that established by the Central Bank for controlling inflation, in which the government is committed to adopting measures to maintain the inflation rate within predetermined intervals. In addition, it considers that there is an automatic adjustment in the value of CBIOs because when market factors lead to a reduction in the supply of biofuels, the credit price tends to increase, re-stimulating

the production and participation in the fuel matrix (BRASIL, [2017?], p. 54).

Therefore, the target provides, in a peculiar way, tolerance intervals. For this reason, the carbon intensity target may not coincide with what was actually achieved.

5.1.5 Biofuels Certification

The third instrument that makes up RenovaBio's decarbonization credit market is the certification of biofuels. Law No. 13,576/2017 defines biofuel certification as

> [...] a set of procedures and criteria in a process, in which the inspecting firm assesses the conformity of the measurement of aspects related to the production or import of biofuels, in terms of energy efficiency and greenhouse gas emissions based on the life cycle assessment (art. 5, I) (BRASIL, 2017).

The certification concept established by Law No. 13,576/2016 explains the methodology adopted to assess the potential for mitigating GHG emissions from fossil fuels: the life cycle assessment. This concept is determined by ANP Resolution No. 758/2018, in which the life cycle corresponds to the "consecutive and linked stages of a product system, from the acquisition of raw materials or its generation from natural resources to final disposal [...]".

In theory, all material and energy flows are evaluated in the certification process. In the case of biofuels, it starts with biomass production up to combustion in engines, also covering the phases of transportation. Because of this scope, it has been called a "cradle-to-grave" assessment.

In addition, any type of biofuel is eligible for certification. The program begins with pre-established routes for the main biofuels sold in the country. Then, it authorizes interested economic agents to propose new routes to calculate the energy-environmental efficiency score.

Certification occurs per production unit, considering all stages of production and consumption of biomass and biofuel. Thus, it is possible to compute the difference in carbon intensity compared to the fossil alternative for each primary emitter. At the end of the certification process, a certificate of efficient production of biofuels is generated, which contains the energy-environmental efficiency score of the biofuel traded.

The certification process is carried out by inspection firms, consisting of independent private companies contracted by primary issuers among those previously accredited by the ANP. Only these inspection companies can assign an energy-environmental efficiency score by comparing the life cycle assessment of the fossil fuel against the accredited biofuel. This score is displayed in the "biofuels efficient production certificate."

Even though Law No. 13,576/2017 determined a four-year validity period for the certificate, Resolution No. 758/2018 established three years from the date of approval of the certification process by the ANP. Additionally, the law determines that the issuer must monitor the information provided each year so that, in case a decrease greater than 10% is identified compared to the score, a new certification process is required.

Unlike other quality certification methods, the participation of a producer or importer of biofuels in the accreditation process does not require compliance with a minimum efficiency standard in the production process. Any producer or importer can become accredited and issue CBIOs, differing only in terms of the energy efficiency score.

Nevertheless, the producer or importer must prove that the biomass used as an input in the production process was not produced by suppressing native vegetation from the effective date of ANP Resolution No. 758/2018 (November 27, 2018). In case of suppressions occurring between the enactment of Law No. 13,576/2017 and the resolution above, it is sufficient to show that it happened in compliance with current environmental standards.

5.1.5.1 Renovacalc

RenovaCalc is a tool used to calculate the carbon intensity of biofuels submitted for certification developed to support the biofuel certification process. Hence, it is a spreadsheet where the primary issuer can add information about the production process, classifying it into agricultural and industrial phases. For example, it indicates the planted area, the use of agricultural inputs, the industrial process stages, and the type of transportation used to distribute the biofuel.

In the agricultural phase, the primary issuer can fill RenovaCalc using each biomass producer's specific or standard profile. The standard profile represents a filling simplification in which the calculator uses the average production data already fed into the system. Meanwhile, in the specific profile, the primary issuer provides its data to be verified by the inspecting company.

The spreadsheet is parameterized according to data from the life cycle assessment database (Ecoinvent v. 3.1, BR, GLO2, and RoW3). Thus, how much the production process of each biofuel producer emits greenhouse gases is conservatively calculated and based on prevailing scientific knowledge. Finally, it compares the result with the emissions from the alternative fossil fuel. r

5.2 SYSTEMATIZED BIBLIOGRAPHICAL ANALYSIS: CRITICISM FROM THE LITERATURE

The bibliographic method was conducted through a search in academic papers. Initially, the literature review on the challenges of implementing the Brazilian National Biofuels Policy must consider the date of enactment of Law No. 13,576/2017, on December 26th, 2017, as well as the date when the decarbonization credits market started operating, which was December 24th, 2019.

The established timeframes show that little time has passed since the public policy was implemented. For this reason, it is unreasonable to expect a large sample of academic papers

addressing the subject, especially peer-reviewed papers, given the naturally slow pace of scientific research and the specialized journals' review processes.

The CAPES platform's native search tool was used in the advanced search mode. The expression "RenovaBio" was the keyword used, added to "peer-reviewed" filters. Sixteen papers published between 2009 and the search date, June 16th, 2021, were identified. The sample comprises one article from 2018, five from 2019, seven from 2020, and four articles from 2021. Hence, the years when the manuscripts were published coincided with the relevant legislation frameworks, and publications gradually increased in the following years.

The analysis of the full texts resulted in the exclusion of four papers (ARAÚJO; MEDEIROS, 2021; ANDRADE, OLIVEIRA, 2017; CHERUBIN et al., 2021; KLEIN et al., 2019) as none of these refer to RenovaBio from a regulatory/normative perspective. Instead, the papers merely surveyed policies or discussed aspects of other fields of knowledge.

Based on the remaining sample, criticisms toward the implementation of RenovaBio were classified under three categories. The first stemmed from manuscripts discussing the integration and coherence of the biofuel policy with other policies relevant to agriculture (PIMENTEL, 2019). For instance, Fraudorfer and Rabitz (2020) and Gonçalves et al. (2021) present some inconsistencies between biofuel incentive policies and gasoline price policies.

Similarly, Paim *et al*. (2020), Lazaro *et al*. (2021), and Hernandes *et al*. (2021) criticize the low level of assessment of RenovaBio's effects on land use. Such criticism is reinforced by Benites-Lazaro *et al*. (2020), who also discuss the necessary integration of biofuel policy with water and food (water-food-energy integration).

A second criticism category stemmed from the asymmetry of influence and representativeness in the decision-making of policymakers and those implementing the public policy. In this sense, Paim *et al*. (2020) and Lazaro *et al*. (2021) deal with the

representation of the agribusiness and energy sectors to the detriment of others, such as NGOs. Within the biofuel production chain, they deal with more relevant participation of the agroindustry *vis-a-vis* the producers.

Finally, the last category considers RenovaBio's suitability and environmental integrity. This grouping includes considerations regarding the actual capacity of the public policy proposal to achieve its objectives. These criticisms concern the emission of greenhouse gases in the biofuel chain itself (BRANCO; BARTHOLOMEU; VETTORAZZI, 2020). In addition to the fact that, as noted by Benites-Lazaro *et al*. (2020), encouraging biofuels also increases the demand for their inputs and other natural resources (GRASSI; PEREIRA, 2019), such as the case of fertilizers.

Considering the ability to meet the objectives, there are criticisms of the sector's high debt ratio and the low investment capacity of the biofuel production sector (MACHADO e SILVA, 2020). Similarly, LIMA et al., 2020 note the low adherence of economic agents and the low participation of 2nd generation biofuels in the program. In this sense, Gonçalves *et al*. (2021) and Carvalho *et al*. (2020) note the current high costs of this technology, which would have led to its low share in the program.

5.3 CONTENT ANALYSIS OF THE WEBPAGES OF THE SECTORS AFFECTED

Documentary research was conducted on the web pages of public policy recipients to identify the opinions of those affected by the regulation. Complementarily, the search's second stage sought websites to identify the perspective of those affected by RenovaBio. Additionally, the sector's most recent assessments were collected, considering that content development and Internet portals are more dynamic than academic production.

The "Ubersuggest" platform was used to identify sources that conveyed criticisms from RenovaBio recipients. The keyword

"RenovaBio" used in the survey on September 3rd, 2021, resulted in 97 findings, which were ranked according to the webpages' traffic data.

The analysis of the first 42 (forty-two) results proved to be a representative sample of the complexity involving public policy. Of these, 4 (four) exclusion criteria were used. These were selected to remove from the sample those results that were not useful at this point of the investigation.

Thus, the pages that: (i) conveyed the mere reproduction of the legislative framework; (ii) only intended to institutionally present the policy; (iii) were in the form of academic papers; (iv) only consisted of news portals; or (v) represented secondary sectors, such as machinery or consulting companies, were considered irrelevant to identify criticisms on the part of policy recipients regarding the implementation of RenovaBio.

Such exclusion enabled identifying the following groups of recipients: (i) agroindustry representatives – results "3 – Unica", "17 – Copersucar", "36 – Biosul", "37 - Atvos", (ii) representatives of the financial sector – results "6 – BNDS", "12 - Santander"; (iii) representatives of the certification sector – results "8 – Instituto Totum", "33 – SGS Sustentabilidade"; (iv) representatives of the fossil fuel distributor sector – result "34 – IBP"; and (v) producer representatives – result "42 – Socicana".

Representatives were selected from these groups based on the quality and representativeness of their portals' content. Regarding agribusiness, the Unica portal conveyed the sector's intense fear regarding a lack of definition or regulatory changes in the target regime, mainly due to pressure from other recipients in the context of the Covid-19 pandemic. Two other topics Unica dealt with, though less frequently, were the low participation of non-mandatory CBIO purchasers and distributors' judicialization of credit acquisition targets.

Regarding the financial sector responsible for the custody of credits, Banco Santander (2020) produced a comprehensive report analyzing RenovaBio's regulatory situation. The document criticizes the volatility of the CBIO prices, the constant legislative

changes, the difficulty in applying the eligibility criteria for biomass to oilseeds, and the non-participation of importers in public policy.

When presenting proposals, the same report (SANTANDER, 2020) indicates: (i) the possibility of industries' annual certification; (ii) a review of eligibility criteria; (iii) an explanation about the possibility of having CAR pending; (iv) the creation of a regulatory adjustments system that allows for predictability; (v) and the projection of a regulatory design that allows linking the CBIOs market with other market instruments initiatives.

When dealing with Renovabio from the perspective of fossil fuel distributors, the Brazilian Petroleum and Gas Institute (IBP) emphasizes a concern with legal certainty and targets flexibility, arguing that there is an imbalance between the targets for the compulsory purchase of CBIOs and the offer of credits by the agroindustry.

The Institute also presents arguments about the integration of RenovaBio with other government programs, especially "Combustível Brasil"/ "Combustível do Futuro" [Brazil Fuel Initiative/ Fuel of the Future Program], as well as raising a debate on new technological routes, especially green diesel (HVO).

The finding related to biomass producers represents Socicana's electronic portal. The webpage contained little content relevant to this study but referred to another institution representing the sector at a national level. It is the Brazilian National Federation of Sugarcane Planters, an entity representing independent sugarcane producers. Its digital content shows an active role in at least two agendas: the inclusion of biomass producers in RenovaBio and opposition to CBIOs taxation.

In the stage of searching academic sources, three categories of criticism were proposed consistent with the relationship with the (i) integration and coherence between policies; (ii) asymmetry of influence and representativeness; (iii) environmental suitability and integrity. The search on the electronic portals of those affected by RenovaBio reinforced the relevance of this triad.

IBP's criticism regarding the harmonization of RenovaBio with other fuel programs, or Santander's report on linking the CBIO market with other economic instruments, recall the academic criticism toward the coherence of public policies. In addition, the active positioning of independent sugarcane producers, represented by FEPLANA, is part of the criticisms about the program's asymmetry, questioning the distribution of the value generated by CBIOs in the production chain.

The adequacy and environmental integrity issue also permeates the sectors' criticisms. For example, it is the case of the low adherence of importers and other market agents, identified by Santander and Unica. The difficulty in applying the eligibility criteria in oilseed crops is also within this criticism category of the program implementation.

However, this second stage of the study also allowed the development of an additional category called legal certainty. It includes criticisms regarding constant regulatory changes, judicialization on the recipients' part, and difficulty establishing parallels with foreign regulations. The criticisms concerning the alignment of agricultural policy with energy policy, which is the object of study, were also selected.

For this reason, the continuation of the study considers those criticisms that involve the agricultural phase of biofuel production, as follows:

1) integration and coherence between policies: financing policies for the production of raw materials; considerations of the interconnections between water-food-energy;
2) asymmetric influence and representativeness: distribution of value added by RenovaBio in the relationship between producers and agribusiness;
3) environmental suitability and integrity: adherence of producers to RenovaBio; eligibility of oilseeds and imported crops in the certification process;
4) legal certainty: regulatory changes, judicialization, and parallels with foreign regulations.

5.4 INTERVIEWS

A qualitative interview was held with public policy participants to deepen the National Biofuels Policy implementation topic. Furthermore, considering that the objective is to understand the point of view of different groups affected by RenovaBio, semi-structured interviews were held to gather the opinions and organizational practices gravitating around the challenges imposed on the implementation of the decarbonization credit market.

The questions focused on those criticisms or challenges regarding the implementation of RenovaBio identified in the study's previous stages. Specifically, those criticisms or challenges that could interfere with the achievement of the objectives set out in the Nationally Determined Contribution. In the case of the biofuels sector, these criticisms refer to bottlenecks in the implementation of RenovaBio with the potential to prevent the carbon intensity of the Brazilian energy matrix from being reduced by encouraging the consumption of biofuels.

The interview script was developed to address more generic questions and gradually deepen aspects identified in the bibliographic and documentary research. In addition, the wording allowed a relative degree of openness in the questions so that the respondents would be more spontaneous and contribute more freely.

The sample comprised seven interviews with 7 representatives from 4 sectors. Of these, three interviews were conducted with participants from the biomass production sector; one interview was held with a representative of the agro-industry sector that produces biofuels; one with a representative of the financial industry working with RenovaBio; and finally, two interviews with members of inspection firms accredited by the ANP.

The interviews were held via video call between June 1st and September 29th, 2022, and lasted between 30 and 60 minutes. In addition, the participants consented to the interviews being recorded and transcribed for later analysis.

In general, the interviews indicated that the public policy participants understand the policy as an encouragement to produce and consume biofuels. In this sense, its purpose would be similar to other policies historically implemented in Brazil, such as the compulsory addition of biofuels to fossil fuels.

Additionally, from a global point of view, two topics emerged from the content analysis concerning the interviewees' perception of RenovaBio's effectiveness. The first stems from its ability to increase the share of biofuels in the Brazilian energy matrix. In this case, the interviews indicated a relevant concern with legal certainty, which would facilitate and encourage investment in the sector. The second topic concerns elements identified by the interviewees to be improved, especially concerning financial incentives for adopting better practices and technologies from the climate perspective.

The bottlenecks involving these topics were grouped into two themes, such as (i) the role of legal certainty in encouraging investment in the production of biofuels; and (ii) the improvement of the rules for internalizing the positive externalities of biofuels.

5.4.1 The role of legal certainty in encouraging investment in the biofuel production

The interviewees share a general understanding that Brazil has, historically, a series of public policy instruments intended to encourage biofuel production or consumption. Nonetheless, the interviewees expressed that they prefer free market arrangements to state intervention measures.

During the interviews, we verified that the participants' negative perception of the idea of "state intervention" would be more linked to the absence of a safe and predictable legal environment than the absence of public policies *per se*. Only one interviewee questioned the general structure of RenovaBio and whether its arrangements would prioritize the environmental

benefit to the detriment of the economic interests of the beneficiaries.

Most considered the policy a good initiative, even from an environmental perspective. However, all interviewees agreed that RenovaBio is a policy under construction and that improvements may be necessary.

Thus, one of the results that emerged in the interviews concerned a legal environment that allows investors to anticipate their participation in the biofuel sector. In this context, we verified two concerns. The first stems from RenovaBio's interaction with other public policies of State intervention in the industry. The second arises from the predictability of the CBIO purchase targets established by the CNPE.

5.4.1.1 Coherence of the Brazilian state's actions in the biofuel and fossil fuels sectors

The interviewees were aware that the fossil and renewable fuel sectors are closely linked, which is why State intervention in one affects the other. In this sense, they perceive that RenovaBio aims to promote biofuels and, as a consequence, it would negatively affect its fossil competitors. However, they doubt the State's capacity and interest in handling public policy instruments to consistently maintain the incentives for renewables.

One issue raised in the interviews refers to a conflict of interests generated by Petrobras as a government-owned company, the revenue of which comes from the exploration of fossil fuels. Interviewees A and B, representatives of the raw material production sector, supported this perception.

Interviewee B, in particular, highlights the role of electoral cycles in government actions. In his words:

> [...] governments, especially in election years [...] want popular actions. They want to lower fuel prices, and that obviously impacts the biofuel sector [...]. Generally negative [...]. So you have two negative impacts. You have a negative

> impact [...] concerning the loss in the Brazilian state-owned company, which [is] Petrobras, and a negative impact on the biofuels sector [...].

The conflict of interests inherent to Petrobras' actions was also mentioned in the case of compulsory additions of renewables. Interviewee A believed that the increased addition of biofuels could negatively impact the state-owned company's sales.

The same interview depicted Petrobras as a competitor in the biofuels sector, although it has, in the past, behaved as a strategic player. The following is an example provided by the interviewee in the case of the state-owned company's divestments in fertilizers:

> The war that's going on there in Ukraine [...]. Look at the difficulty of getting [...] fertilizer from Russia [and] Ukraine here. Perhaps, if we had an industry [...] that produced fertilizers, this impact would not be so significant [...]. [...] Petrobras [...] is not worried about that. It has shut down fertilizer companies for decades. Oh, that doesn't give me a lot of money. So, it didn't consider the country, only itself [...].

Another concern interviewees C and D manifested is the tax issue for the biomass production sector. Interviewee D is a representative member of the biofuel-producing agroindustry. Both consider that tax differentiation is relevant to ensure the competitiveness of biofuels.

Interviewee D further discussed this topic and its relationship with RenovaBio. He considered that CBIOs alone would not correct the competitive differentials of fossil fuels due to environmental externalities. Therefore, he noted the amendment to the constitution that inserted item VIII in Art. 225 of the Federal Constitution, ensuring tax differentiation between fossil fuel and its competitors at the existing levels.

The same interviewee added that the measure still needs to be regulated by a complementary law, but it would first seek to maintain the tax differentiation where it currently exists. He notes that some federation states still would have no tax differentiation. Depending on local contexts, renewable fuel could even be subject to higher taxes than fossil competitors in terms of ICMS.

A final issue involved funding as a public policy instrument. Interviewee D, a financial sector representative, considered that a transitional regime is in progress. He mentioned the social aspect as a complex factor in the case of developing countries like Brazil.

The interviewee recognized the relevant participation of the Brazilian State in fossil fuels but mentioned that there is already a ban on investments in coal and an internal policy of gradual disinvestment in oil. He also considered the contributions in the natural gas sector, an aspect under discussion, which, although not regarded as renewable, would have gained some flexibility for investment as a transition fuel in a context of oscillations in the price of oil as a result of international events.

5.4.1.2 CNPE's target setting: ambition and predictability

In addition to the need to establish harmony between RenovaBio and other State intervention instruments in the fossil fuels and biofuels sectors, another finding refers to the interviewees' concern with how the CNPE set decarbonization targets. Interviewees C, D, and E manifested such concern, with interviewee E representing the sector of certifying companies accredited by the ANP.

Respondents E and D noted that the CNPE's decisions depend on the CBIO demand. Interviewee E even highlighted the idea of a demand determined by the government's decision to a "natural market."

Interviewee D's concern revolved around measures to ensure that the Executive Branch does not drastically change the targets, especially in the case of an abrupt decrease, which could negatively affect the value of CBIOs and the revenues from their sale.

Regarding the target setting, interviewee C considers it a bold goal and highlights the importance of integrating crops beyond sugarcane biomass with RenovaBio. In his words: "[...] the soybean chain is much longer than the sugarcane chain. And it also has the possibility of issuing CBIOs. Corn can also issue CBIOs [...]".

Thus, there is a perception that the ethanol agroindustry is better incorporated into RenovaBio, but that integrating other chains is necessary to meet the long-term decarbonization targets.

5.4.2 Improvement of the rules of internalization of biofuels positive externalities

In addition to creating a legal certainty environment for investment in biofuel production, the interviewees took a position on measures to improve RenovaBio. The correct internalization of the biofuels' positive externalities was highlighted at this point.

The correct internalization of biofuels' positive externalities was linked to the adequate allocation of financial incentives. In this sense, in addition to increasing the total production of biofuels, another front of analysis of RenovaBio's effectiveness should be its ability to improve the energy-environmental efficiency of existing crops and production plants.

The interviewees frequently emphasized how the design of individual certification of biofuel production plants tends to generate meritocracy and encourage the adoption of practices and production methods that are more climate-wise suitable. However, such a narrative was accompanied by a need for fair financial compensation.

For example, interviewee A, a representative of the biomass production sector, reports measures that could be adopted if producers received the appropriate financial incentive. The interviewee considers that:

> [...] what will prevail is the guy's efficiency. The lower the technology used [...] for him to generate a CBIO, the more bags are needed; more raw material is needed to generate a CBIO. The one more technologically advanced would need fewer bags; a smaller volume is needed to generate a CBIO. So there will be a constant search [... to try] and look for more and more technology. Improving the no-tillage system, reducing soil impact with the best tractors, with [...] tires to reduce the impact [...]. Better spraying system, bio inputs, biological inputs [...]

In this scenario, a discussion that emerged in the interviews with biomass producers concerned the transfer of CBIO values by the agroindustry. In general, the interviewees showed a common feeling that the design of public policy carries, for the most part, the perspective of the agroindustry and, in particular, of the sugarcane chain.

Specifically, regarding ethanol, the debate revolves around the fair proportion that should be passed on to the sugarcane producer. In addition, stressful situations between the agroindustry and producers were reported, such as, for example, the unauthorized use of producers' data to participate in RenovaBio. Nevertheless, both links in the production chain seem to recognize their interdependence for biofuel production.

In the case of sugarcane, the perspectives revolve around a debate on the fair distribution of CBIO revenue. Two of the interviewees from the biomass production sector (B and C) claimed that the agricultural part corresponds mainly to the environmental benefit of decarbonization generated by the production and consumption of ethanol, although they recognize that the managerial decision on the destination of biomass (ethanol or sugar) is in charge of the agroindustry.

In this context, specific issues were identified in the sugarcane, crops, and importers chain. The first stems from the underutilization of the primary data modality for calculating the energy-environmental efficiency score in the initial period of the policy. The second and third arise from the difficulty in designing a certification to deal with "intermediate agents."

Other occasional findings were collected. These were the cases of the impossibility of generating CBIOs when biomethane is not distributed in the pipeline but via cylinder, which would be an ANP's decision, in addition to the deficit in the calculation of environmental energy efficiency by not measuring the storage of carbon in the soil.

5.4.2.1 The professionalization of biomass producers and the control of energy and environmental productive process efficiency

The interviewees reported the issue of choosing between the standard profile and the specific profile in the certification of energy-environmental efficiency in biofuel production. The respondents understand that using the standard profile, in which carbon footprint data available in scientific databases are used, tends to penalize the producer, considering environmental benefits lower than the actual ones.

Even so, the interviewees reported that in RenovaBio's first years, most certifications were generated based on standard data. For this reason, interviewee B believes it reasonable to consider that the policy's potential concerning the internalization of the biofuels' positive externalities is not fully utilized.

In a quest to investigate the reasons for choosing standard data, respondents C and D considered that the use of specific data would demand from producers a greater degree of professionalization, which would be a slow implementation process. Interviewee F considers that RenovaBio's certification model in itself is complex. Nevertheless, the productive sector interviewees considered it a matter of investment in product control.

The interview with members of the productive sector and a certifier representative (interviewee G) indicates that the most important aspects for reducing the carbon footprint of fuels' biomass production concern the use of fertilizers and the fuel used in agricultural machines.

Even so, financial considerations permeate the debate on the adoption of climate-smart measures in production. This is what an excerpt from interviewee B's report highlights:

> [...] first, the producers need to understand this. Having the management of invoices and property management, which is already a very long-term process. And they will do all these as they are remunerated for it [...].

In this sense, there is an overlap of legal norms that seek to deal with the internalization of the environmental benefits with the administrative-managerial issue.

5.4.2.2 The problem of intermediate agents: the matter of crops and importers

In addition to the professionalization of biomass production, two situations were identified in which the adherence of the policy design to the sugarcane chain turned out to be an obstacle for other players, which is the case for the crop chain and importers.

One of the biomass production sector interviewees considers that "the system was created considering only sugarcane." He also emphasizes how rapidly the legislation passed in the national congress: "[...] how long was it from the bill to its sanction? Forty days? The process was hasty [...]". Despite the criticism, the interviewee has a positive view of RenovaBio's proposal, defending specific measures of legislative revision.

The interviews revealed the peculiarity of the crop chain. As the interviewees noted, the purchase of soy and corn for biodiesel production is not usually carried out directly between the agroindustry and biomass producers but through intermediaries.

In this process, biodiesel producers could face difficulties proving that the raw material originated from eligible areas according to environmental criteria. Furthermore, as crop production is pulverized, with the possibility of requiring the transportation of raw materials and switching suppliers, the model based on the sugarcane system, marked by few suppliers closely allocated to agro-based industries, does not seem adequate.

Therefore, the interviews showed a coordinated movement by biomass producers to sponsor a legislative change of the RenovaBio certification model (PL 3149/2020) in the national congress. The proposal is intended to enable producers to be certified directly. Hence, the producers would sell already certified

biomass without requiring producers and agroindustry to work together.

A similar issue was identified in the case of biofuel importers. Interviewee G highlighted that the agent accredited by the ANP is the importer, which is then entitled to issue CBIOs. Therefore, it is up to the importer to certify the product imported rather than the biofuel producer abroad. As importers have a relatively dynamic list of suppliers, the model designed for the sugarcane chain also encounters implementation obstacles for foreign biofuels.

5.5 ANALYSIS OF THE RESULTS REGARDING THE RENOVABIO IMPLEMENTATION

The case study on the implementation of RenovaBio finds two peculiarities concerning the other two case studies addressed here involving the Forest Code and the ABC Program. First, this is the only one dealing with a public policy formulated after the Paris Agreement was signed. For this reason, the debate about the environmental benefit to be achieved directly concerns a climate dialogue.

Additionally, the case study on RenovaBio emphasizes the interrelationship between energy and agricultural policy. When describing the main tools that compose the market instrument created by RenovaBio, we observed how the bodies linked to the Energy Policy manage these public policy tools. However, as the study progressed, the agricultural phase for reducing the carbon footprint of Brazilian biofuels became more relevant.

This correlation is also apparent in the prominent role given to the need for regulatory coherence between biofuels and fossil fuels. This topic permeated both the literature review and the interviews, showing, to a certain extent, the reproduction of some global challenges of energy transition regimes.

Since the survey concerning RenovaBio's development, we noted many sectors discussing the proposal. Furthermore, the data collected from the entities' websites and interviews show that

RenovaBio tends to be a policy that leads to continuous clashing between these sectors, which will seek to influence regulatory bodies according to their interests, especially concerning the setting of decarbonization targets.

The debate on decarbonization targets is directly linked to the first topic on Renovabio's effectiveness concerning the Paris Agreement targets. It involves the policy's ability to increase the participation of biofuels in the Brazilian energy matrix, which requires political decisions to reduce the participation of competitors of fossil origin continually.

Both the literature review and the interviews generated results that tended toward skepticism regarding the intransigence of the Brazilian State in this decision-making in favor of fossil fuels. Although the targets were the subject of much debate in the first years of RenovaBio's implementation, one cannot disregard the unusual setbacks in the period, especially regarding the COVID-19 pandemic, the fluctuations in the oil market due to the war between Russia and Ukraine and, finally, worldwide inflationary processes.

Another way to reduce the carbon intensity of the Brazilian energy matrix would be by reducing the carbon footprint in the production of biomass and biofuel industrialization, which would enable the improvement of Brazilian indicators with less harm to the market share of fossil fuels.

This other way, less conflicting in the dispute between fossil fuels and biofuels, is permeated by the discussion of RenovaBio's adequacy and comprehensiveness. A series of regulatory and legislative reforms are underway to readjust the certification instrument to other crop contexts, especially oilseeds, in addition to the debate on the low participation of importers in the program.

The matter of the distribution of the CBIO value within the biofuel production chain is inserted in this same context. Behind the financial issue is a debate about the legal norms for internalizing positive externalities and building incentives for adopting climate-appropriate agricultural practices.

The participation of agents involved are of qualitatively different natures, sometimes involving the effective use of nature as a greenhouse gas sink, sometimes involving decision-making for biofuel production. From this arises the need to allocate resources that encourage productivity gains and expand Brazilian biofuel production's energy-environmental efficiency.

6 CONCLUSION

Addressing the implementation of public policies is a complex task, especially when it comes to a phenomenon that is contemporary to the research itself. This study's objective was to analyze the first five years of implementation of the first Brazilian NDC submitted to the Paris Agreement within the scope of the Conference of Parties.

The facts after the submission of the NDC update that occurred on December 9th, 2020, could not be included in this study, as it deserves additional research. Furthermore, political change is expected after the 2022 general elections. Nevertheless, significant results have been achieved thus far. The multi-method design adopted here and the possibility to further deepen the subject through a multiple case study enabled relating legal doctrine, the specialized literature, and the perceptions of agents affected by the public policies relevant to the implementation of the Brazilian NDC.

A general approach to the public policies selected for further analysis (i.e., Forest Code, PLANO ABC, and RENOVABIO) reveals that a relevant part of the NDC implementation revolves around the implementation and effectiveness of existing Brazilian policies. It is the case with the Forest Code and the ABC PLAN. Only RENOVABIO was designed after the Brazilian commitments to the Paris Agreement.

Indeed, the Brazilian public policies related to climate protection had already been adopted in the form of law, i.e., they were mandatory. However, before the advent of the Paris Agreement, the international community considered these policies merely voluntary.

The period analyzed in this study marks the beginning of a paradigm shift from the perspective of International Environmental Law. The Forest Code, ABC PLAN, and

RENOVABIO gain international relevance in the legal sphere because they impact the success of binding nationally determined commitments under the terms of the climate governance regime created by the Paris Agreement, though the policies were proposed by the Brazilian government.

The duality between two political-social groups marked the study addressing the Forest Code, i.e., environmental protection movements, on the one hand, and the productive sector on the other. Land and credit available to the latter are relevant factors in the production process. This debate enabled a deeper analysis of two legal institutes created to accommodate both political perspectives: the Rural Environmental Registry (CAR) and the Environmental Regularization Program (PRA).

Both institutes deal with the "regularization" of rural production. Thus, the basic structure for implementing public policy provides for different situations. Hence, the rights of owners and occupants of rural land who suppressed native vegetation according to the legislation on legal reserves in force at the time are safeguarded. One of the Code's primary objectives is to implement a more beneficial transition regime for suppressions that occurred until 2008, enabling owners or occupants to adapt to the environmental legislation. However, those responsible for suppressions after 2008 must restore the entire area unduly deforested.

Such a context enabled the identification of administrative and management barriers and legal issues. The rule is marked by exceptions and parameters, the measurement of which in concrete cases is not simple either for environmental protection agencies or landowners. The problems involving the conceptual clarity of legal institutions are also highlighted. Examples collected throughout the study include the owners' autonomy to register contiguous land belonging to the same owner, the meaning of consolidated rural area and the fallow land concept.

This study concludes that there are some possibilities to overcome these hermeneutic problems. Indeed, the legislative reform route is always available, though it encounters natural

obstacles in the National Congress. On the other hand, administrative practices to standardize understanding coupled with the monitoring bodies' expanded structure, such as access to satellite images, can facilitate routine activities concerning the implementation of the Forest Code.

Access to credit is also an essential variable in the current energy transition process. In the Brazilian case, the study of the ABC PLAN facilitated understanding part of the efforts and implementation barriers that a public policy of this nature encompasses.

The study of the ABC PLAN allowed us to see the context of a public policy systematically criticized and analyzed by scholars and civil society. Therefore, the literature already described many barriers. The study focused on monitoring, dividing it into individual contracts (individual monitoring) and general monitoring (the general performance levels of greenhouse gas emissions on the part of the credit recipients and the Plan's level of success). While the first, as noted in the interviews, is implemented by the financial sector, the second is implemented by the recently created ABC Platform.

Regarding individual monitoring, budgetary restrictions that impede inspecting case-by-case on-site gained relevance. In this case, the discussion about the role of creditor banks stands out. The results also show that the inspection modalities are incompatible with all of the Plan's subprograms. For example, integrated crop-livestock-forest needs a different monitoring method than the one used to inspect the restoration of degraded pastures. The use of satellites seems appropriate for the latter but not for integrated crop-livestock-forestry integration, which may require a systematic and more detailed analysis.

Thus, for the financial sector to properly inspect properties, establishing clear and specific individualized monitoring for each type of subprogram seems necessary. From this perspective, the budgetary problem would be partly equated, as the creditor bank

would perform on-site monitoring only in those subprograms requiring such expenditure.

On the other hand, general monitoring is conducted via the ABC Platform. The main barrier identified during the study concerns the "census problem" (i.e., a lack of data). In this sense, strategies need to be devised to overcome these obstacles.

The integration of information between the financial sector and the Platform is possible. For example, information regarding inspections carried out by the financial sector being sent to the ABC Platform is a way to partially solve the problem, at least for calculating estimates on general mitigations. However, one should recognize that data sharing is sensitive, given the regulations and necessary safeguards (such as anonymity/identity confidentiality).

As for the National Biofuels Policy (RENOVABIO), a scenario of difficulties typical of the implementation of a market instrument was portrayed. However, one should remember that this public policy represented the first national effort to create a regulated market for carbon credits, albeit with a sectoral scope only.

In the Brazilian case, RENOVABIO is very significant from the perspective of the intersection between national agricultural and energy policies. It is so because Brazil is prominent in bioenergy production, primarily via biofuels.

The results were harmonious throughout the study, considering that the agricultural phase of biofuel protection is the most relevant from the environmental and climate gains perspective. For this reason, the difficulties in implementing the policy among biomass producers have unique relevance in reducing the carbon intensity of the energy matrix of the national transportation sector.

Therefore, the core aspect of the implementation of RENOVABIO for climate purposes seems to be ensuring that the instrument is capable of increasing the production and consumption of biofuels and encouraging a reduction of the carbon footprint in the production of these same biofuels. Regarding this aspect, the results led to two legal barriers.

The first consists of the role of legal certainty in the implementation of the market instrument. Legal certainty is essential to encourage investment in biofuels, which is hampered when there is a misalignment between RENOVABIO and other policies aimed at fossil alternatives for biofuels. At the same time, the goals determined by the CNPE must be ambitious and predictable.

The second hurdle consists of a set of improvements to the policy rules. This study's results indicate that the sectors involved are particularly aware that adjustments are needed, especially regarding better adherence to the certification rules and eligibility for biomass production based on crops other than sugarcane, such as soy and corn.

This study represented an effort to discuss the implementation of the Brazilian NDC at an intersectoral level based on the AFOLU concept. In this sense, we could observe the relevance of greenhouse gas emissions on Brazilian soil, the object of human intervention. Ultimately, the Forest Code's rules prohibiting the suppression of native vegetation, the necessary control of low-carbon agriculture projects, and the instruments encouraging the production and consumption of agro energy all go through political and legal choices on the management of the Brazilian soil to promote sustainable development.

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Brazil occupies a prominent place in global agricultural production. Like the United States, Russia, China, and India, Brazil has a population of over 80 million people, an agricultural area larger than 30 million hectares, and a GDP that exceeds 1 trillion dollars. At the same time, the agriculture, land use, land-use change, and forestry sectors were responsible for 60.3% of greenhouse gas emissions in 2016. Given this prevalence in the Brazilian gas emissions profile, this study's objective is to analyze the intersection and alignment of Brazilian climate policies in these sectores and the measures adopted under the Paris Agreement.

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