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ARTICLE

Interest Groups in Brazilian Climate Policy: an Analysis of the Agricultural and Energy Sectors*,**

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Climate governance in Brazil is necessarily connected to the interests of three sectors: deforestation and land use change, agriculture, and energy, which, combined, represent around 90 percent of the country's emissions. While there is a significant number of studies on the first sector, few studies have looked into the bottlenecks of decarbonization in the agricultural and energy sectors. Thus, this article addresses some modulations in Brazilian climate politics and policy by analyzing the interest groups associated with low-carbon transitions in these two sectors. We particularly look into corporate and industrial interests and their dynamic relations with domestic and international policies, which so far have resulted in 'climate coordination gaps' that hinder deep decarbonization in these sectors. The results of the study detail actors, agendas, policies, interests, and challenges for a low-carbon transition in agriculture (family farming and agribusiness) and in the energy sector. The results corroborate the relevance of interest group analysis to understand the complexity of Brazil's domestic climate politics and policy, as well as the country's behavior in foreign policy arenas regarding climate change.
Keywords: Climate change; climate policy; climate governance; climate coordination gaps; agriculture; energy.

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While climate governance requires coordinated institutional responses at multilateral, national, and local levels, political fragmentation and scattered engagement among most economic stakeholders have prevailed so far, ultimately resulting in slow, largely ineffective responses to the global climate crisis. Even the Sustainable Development Goals (SDGs) proposed by the United Nations in 2015 as coordinated attempts at socio-environmental governance have had extremely limited results in advancing sustainability transformations (BIERMANN et al., 2022). This also applies to climate governance in Brazil. We believe that a better understanding of climate policy modulations in Brazil can provide clues to understand the country's preferences, relevance, and challenges in international climate policy.

In 2021, Brazil's share of emissions by sector was as follows: land use, land use change, and forestry (LULUCF) (49%), farming/agriculture (24.9%), energy (17.9%), industrial processes (4.5%), and waste (3.8%) (SEEG, 2023), as shown in Graph 1. LULUCF emissions are connected to deforestation and forest degradation, and many authors have investigated their causes in Brazil, as well as strategies and policies to reduce such emissions (SEEG, 2023; VIOLA and FRANCHINI, 2018). However, agriculture can contribute to greenhouse gas emissions beyond initial land clearing, as we address in this article (QIN et al., 2021). Moreover, the literature on sustainability transitions demonstrates the challenges faced by the country to reach a low-carbon future (VIOLA and MENDES, 2022). In essence, in the agricultural and energy sectors, which, combined, accounted for 42.7 percent of the Brazilian emissions in 2021, low-carbon transitions are slow.

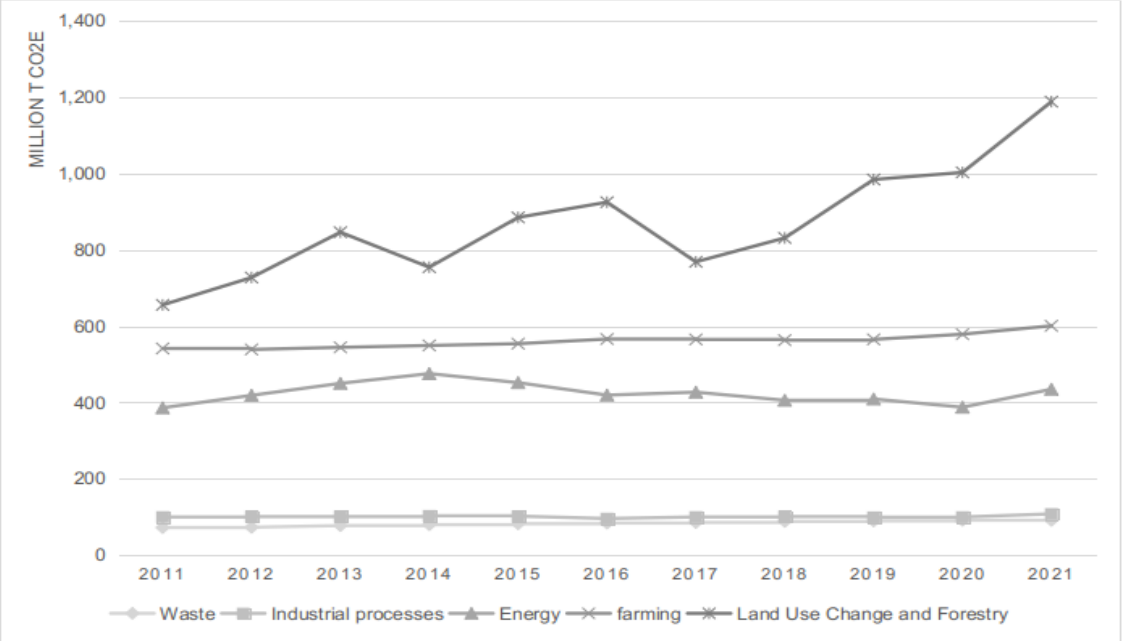
In the energy sector, for example, Lampreia et al. (2011) argued that, of the clean technologies applied in Brazil (hydroelectric; liquid and solid biomass and biogas; nuclear energy; wind and solar energy; energy generation from urban waste; carbon capture and storage), only hydroelectric power is used on a large scale. Hultman et al. (2012) observed some determining factors[1] for adopting (or not) two low-carbon technologies: bioenergy and nuclear energy. Technological

[1] The authors addressed nine key factors in the history of technological change: industry characteristics, characteristics of the technology, corporate culture, the firm's decision-making characteristics, domestic policy and preferences, the firm's structure and organization, international policy and foreign relations, regulation, and miscellaneous external conditions.

characteristics and domestic political preferences were considered central, which means that the political dimension is a critical factor in whether adopting or not low-carbon technologies (HOLCHSTETLER, 2020).

The scenario is not different in the agriculture sector. Challenges including deforestation, expansion of the agricultural frontier in the Amazon and Cerrado biomes, and land conflicts in rural areas are some of the obstacles to the decarbonization of the sector. However, few studies have analyzed how interest groups influence domestic policies affecting the decarbonization of agriculture. Low-carbon transitions in agriculture are less frequently investigated globally when compared to the energy and mobility sectors (LOORBACH et al., 2017; VIOLA and MENDES, 2022). In the United States, while agriculture is responsible for only 11 percent of emissions, the transportation (27%), electricity (25%), and industrial (24%) sectors combined accounted for 76 percent of the country's emissions in 2020 (EPA, 2022). Meanwhile, in the European Union, two sectors alone accounted for 80 percent of emissions in 2018: energy (60%) and transportation (19.7%). That year, agriculture was responsible for only 9.8 percent of the emissions in the EU. The fact that agriculture represents a small share of the overall emissions of these 'climate powers' may justify the low number of studies on low-carbon transitions in this sector.

Graph 01. Brazilian emissions by sector, 2011-2021.



Source: Elaborated by the authors, based on data by SEEG (2023).

In Brazil's case, the Low-Carbon Agriculture Plan (ABC Plan), established in 2010 by the Ministry of Agriculture, Livestock, and Food Supply (MAPA) is a chief guideline of the country's climate policy, aiming to promote sustainable agriculture through financial credit. The ABC Plan includes seven programs. Six of them are focused on mitigation—recovery of degraded pastureland; crop-livestock-forestry systems (ICLFS) and agroforestry systems (AFS); no-till system (NTS); biological nitrogen fixation (BNF); planted forests; animal waste treatment—and one is focused on climate change adaptation.

The ABC Plan achieved some success, including above-average expansion in areas where it was adopted (e.g., in 2010-2019, ICLFS, NTS, and FBN exceeded their established goals by 177.5%, 119.4%, and 210.9%, respectively). However, in 2010-2019, the program only reached 55 percent of its mitigation potential. This was partly because financial agents (e.g., banks) were not aware of the plan, were not interested in offering this type of credit line, not to mention the bureaucracy involved and excessive requirements to substantiate the funding (SILVA and VIEIRA FILHO, 2020, pp. 10-12). Moreover, the governance of the ABC Plan, which includes the strategic national level (via the Interministerial Committee on Global Climate Change—CIM and its executive group—GEx), the tactical national level (National Executive Committee of the ABC Plan), and the operational level (State Management Groups—GEE) does not have institutional mechanisms [2] for civil society participation for achieving mitigation goals. In short, the impact of the ABC Plan is below the expected.

These examples illustrate the challenges involved in low-carbon transitions in the agricultural and energy sectors in Brazil. Nevertheless, the political nuances, economic actors and interests, power games, incentives, and diagnosis about who the winners and losers from these transitions are have not yet been investigated. Given the relevance of these sectors for climate governance, our research question is: who are the main interest groups in the agricultural and energy sectors, and how do their agendas influence the Brazilian climate policy? Based on this gap in the literature, and the aforementioned research question, this article looks into

[2] ABC Plan - Low-Carbon Farming, available at <https://www.gov.br/agricultura/pt-br/assuntos/sustentabilidade/plano-abc/plano-abc-agricultura-de-baixa-emissao-de-carbono>.

the interest groups (in the agriculture and energy sectors) in the Brazilian climate policy (HOCHSTETLER, 2021; MILDENBERGER, 2020; SPEKTOR et al., 2022; VIOLA and FRANCHINI, 2018), supported by the literature on low-carbon transitions (LOORBACH et al., 2017; NEWELL, 2020; VIOLA and MENDES, 2022) and the political economy of climate change (ALVES et al., 2019; COPLEY, 2022; FALKNER, 2017; LAZARO and THOMAZ, 2021; MECKLING, 2021; NEWELL and PATERSON, 2010).

The analysis of interest groups reveals 'climate coordination gaps' in the agricultural and energy sectors. We define climate coordination gaps as highly relevant areas for climate policy (with great potential for decarbonization), but within which there is no alignment and, therefore, effective decision-making among stakeholders. For example, while the dilemma between expanding the agricultural frontier versus increasing productivity without deforestation has long been solved among the scientific community (RAJÃO et al., 2020), it also reveals a lack of coordination within the agricultural sector, in which agricultural expansion via deforestation (particularly at the agricultural frontier) prevails over investments and technologies to increase productivity without increasing the amount of land needed. The outcome of this is a climate coordination gap between different subgroups of the Brazilian agricultural sector, making deep decarbonization difficult. The concept of 'climate coordination gaps', therefore, allows us to draw general profiles of private actors who have great autonomy to influence the direction of the climate policy (as we do, in this article, for the agricultural and energy sectors). We argue that better understanding these climate coordination gaps is critical to design more effective climate policies. We develop our argument through a qualitative research method, based on the review of the relevant literature and analysis of secondary data, in addition to both authors' background in climate change research.

The article is divided into three sections plus this introduction. The next section provides a conceptual survey on the role of institutions in low-carbon transitions, aiming to clarify the relationships between companies, industries, institutions, and (domestic and international) policies with regard to climate governance. The subsequent section applies this theoretical-conceptual framework to empirically analyze the different interest groups in low-carbon transitions in the

agricultural and energy sectors. In the concluding section, we point out the implications of our findings for the future of Brazilian climate policy.

Climate governance stakeholders: corporations, industrial coalitions, domestic and international political institutions

In this section, we address how domestic and international policy actors and agendas are connected to climate governance. We also point out why companies and industries are key agents in climate policy and are therefore fundamental to understanding the motivations and interests involved in deep decarbonization. Finally, we outline what the relevant literature points out as the main mechanisms of action by the private sector aiming to influence climate policy.

Institutions and climate governance in Brazil

Climate institutions in Brazil have been analyzed through different lenses, including the history of emissions in different economic sectors and the political requirements for decarbonization (HOCHSTETLER, 2021; LAZARO and THOMAZ, 2021; PEREIRA and VIOLA, 2021; SPEKTOR et al., 2022; VIOLA and FRANCHINI, 2018; VIOLA and MENDES, 2022). In this section, we revisit this literature to point out some limits of the 'climate policy institutions' in Brazil, supported by the literature on the 'political economy' of climate change.

Interest groups in the agriculture and energy sectors, low engagement of the elites with the climate crisis, and precarious educational levels in a very unequal society are aspects that prevent Brazilian climate institutions from playing a more prominent role. We can highlight five modulations of the climate policy in Brazil's recent history: 01. 'no climate action' (1992-2004): when the country's total emissions increased by 80 percent including LULUCF, or 40 percent excluding LULUCF; 02. 'climate activism' (2005-2010): when deforestation rates in the Amazon dropped nearly 75 percent; 03. 'climate negligence' (2011-2018): when the country's net emissions started to increase again, rising by 60 percent in the period; 04. 'climate skepticism' (2019-2022): when the anthropogenic character of climate change started to be challenged in different institutional contexts within the state and in parts of civil society (FRANCHINI, MAUAD and VIOLA, 2020); and 05. 'revitalization of the climate agenda' (2023—to date), in Lula da Silva's third

term, when climate policy starts to gain traction, but facing important obstacles to implementation, due to factors including: connections between environmental crime and organized crime, strong support from a significant portion of the Brazilian society to Petrobras, and the predominantly conservative character of the Brazilian Congress.

Regarding the period of climate skepticism, Spektor et al. (2022) argued that nationalism was an important variable to explain the government's lack of receptiveness to international criticism about the Bolsonaro administration's 'anti-climate policies'. That is, despite the international criticism around the increase in deforestation in the Amazon during the Bolsonaro administration, the nationalistic sentiment of part of the population reduced the impact of such criticism on the domestic policy. The loss of international support had little influence on Bolsonaro's 'anti-climate' policy.

Hoschtetler (2021, pp. 63-64) used the concept of 'climate institutions' to observe that the president (Executive Branch) carries a disproportionate weight in the Brazilian climate policy. Initially, this policy was modulated by the 'Interministerial Commission on Global Climate Change', established in 1999 within the Ministry of Science, Technology, and Innovation (MCTI), which subjected climate policy to interests regarded as more strategic, such as technological development. Subsequently, institutional climate power was centralized in the 'Interministerial Committee on Climate Change', created in 2007, and connected to the Ministry of the Environment (MMA, now Ministry of the Environment and Climate Change—MMAMC). In 2021, the Presidential Decree Nº 10,845 modified this committee, establishing the 'Interministerial Committee on Climate Change and Green Growth', still linked to the MMA, tasked with establishing guidelines, organizing efforts, and coordinating the implementation of the country's climate change-related actions and public policies. The committee, with the MMA, seriously sought to address the climate crisis, especially by curbing deforestation in the Amazon, but it was undermined during the Bolsonaro administration.

These three institutions are complemented by the 'Brazilian Forum on Climate Change', which has great interface with civil society, and whose role and relevance varies according to the president in office. There are other climate institutions at a secondary level, including private governance arrangements that

aim to encourage deforestation-free soy and beef supply chains (e.g., soy and beef moratoriums) and driving forces in the international market. This set of institutions would constitute a polycentric climate governance framework in Brazil.

Based on this framework, some elements modulate and, in some cases, restrict climate action in the country. First, the challenge of coordinating climate action is extremely peculiar in Brazil due to the low weight of the industrial sector and the extremely high weight of land use, land-use change, and forestry (LULUCF) in the country's emissions profile. Second, political/economic battles to reduce deforestation, in which climate institutions have a great interest, take the focus away from climate actions in growing sectors that progressively influence Brazil's economy and emissions, like the Oil & Gas sector. Third, the interministerial institutional arrangement in Brazil is accountable to a powerful president in its decision-making process (although it shares power with the Congress and the Judicial Branch; if it was endowed with the active participation of civil society and the private sector, the arrangement would be able to carry out more ambitious climate actions, as it did in 2005-2011. Fourth, the corollary of this is that, when there is no climate leadership in the Executive Branch, as it happened during the Dilma Rousseff (2011–2016) and the Michel Temer (2016-2018) administrations (and even more so in the Bolsonaro administration), the interministerial arrangement loses the already established institutional opportunities to advance low-carbon transitions. Fifth, measures such as the soy and beef moratoriums created market institutions that favored deforestation control to some extent, but did not have sufficient impact; not only that, but actors carrying out illegal operations in the Amazon continue to engage in deforestation.

Brazil's climate institutions have experienced notable setbacks in recent years (HOSCHTETLER, 2021). While Presidents Rousseff and Temer already allowed some erosion of the climate institutions by cutting budgets and reducing climate-related commitments, Bolsonaro went further, using executive orders to directly undermine the climate institutions during his administration (2019-2022). Amid this institutional dynamics, the next section looks into how private actors promote their interests in climate institutions and policies.

Corporations and interest groups in climate policy

Corporations adopt climate action for reasons beyond corporate social responsibility (CSR) and the idea of 'Environment, Social, Governance' (ESG). Pressures by interest groups, market opportunities, decisions made by sectoral associations, and interactions with competitors, suppliers, government, NGOs, the media, and consumers may or may not motivate emission cuts. In the past, firms and business coalitions have adopted strategies connected to 'climate disinformation', challenging climate science, trying to minimize the problem, and therefore influencing political decisions to avoid climate legislation (BULKELEY and NEWELL, 2010). Subsequently, as the anthropogenic character of climate change became more generally accepted in society, companies created stalemate in multilateral negotiations.

This dynamics has significantly changed since the late 1990s. Upon the establishment of the United Nations Framework Convention on Climate Change (UNFCCC) itself and the subsequent Kyoto Protocol, climate diplomacy expanded to reach the corporate sector, in an attempt to hold these actors accountable for their carbon footprints (KOLK, LEVY and PINKSE, 2008; NEWELL, 2008, p. 123; PINKSE and KOLK, 2020). This reflects changes toward the private sector's increasing role in climate governance. Corporate strategies to take part in and influence multilateral negotiations became even more apparent at COP 21 in Paris and COP 26 in Glasgow (UN, 2022).

With the Paris Agreement, the emergence of global business coalitions and alliances between companies, international organizations (IOs), and think tanks became more intense as responses to the climate crisis. Different national political contexts and sector-specific characteristics have different effects on companies' motivations and ability to take action (NEWELL and PATERSON, 2010; PULVER, 2007). However, transnational corporate networks can help build minimum response standards. This has led, for example, to the intensification of public-private cooperation and increasingly private-private cooperation in climate policy (BIERMANN, 2010). Some consider these channels as global policy networks (GPN) and include initiatives such as the OECD guidelines on multinational corporations, the Global Reporting Initiative (GRI), the UN Global Compact (GC), Climate Action

100+, the We Mean Business Coalition, the Business Ambition for 1.5°C, The Carbon Pledge, and others (CLAPP and FUCHS, 2009; MENDES, 2022).

Many firms use their power within these coalitions to influence climate policy to promote business-friendly agendas (MENDES, 2022). That is, they frame the discourse around climate change according to corporate interests. Or they do it through climate change bandwagoning (JINNAH, 2017, 2011), a mechanism through which actors strategically connect climate policy with other policies (whether environmental or not) a company or industry may be interested in.

This brings us to a common mechanism of climate action: lobbying. In countries like the United States, firms in the most polluting sectors lobby to maintain business as usual, while less polluting firms see climate legislation as a means to obtain market advantages (DELMAS et al., 2016). In 2000-2016, the main sectors involved in climate lobbying in the United States were transport, fossil fuels, and utilities, with expenditures that exceeded even those of environmental organizations and renewable energy companies (BRULLE, 2018). In Brazil, there are practically no studies on this matter.

Another mechanism of corporate climate action is carbon markets. These markets emerged in the early 2000s and have become increasingly relevant in climate governance, because companies largely support such an instrument, contrary to emissions taxes, still rejected by most companies, especially those in very polluting industries (MILDENBERGER, 2020). The case of the EU Emissions Trading System (EU ETS) is emblematic in this sense, with increasing institutionalization in the European Union. In short, in the logic of 'cap and trade', carbon trading is more widely accepted than emission restrictions (MECKLING, 2011, p. 28).

More recently, the green industrial policy has become a focus of attention. It aims to balance the goals of industrial policy, which aims at economic development, and climate policy, which aims to reduce emissions, so that the objectives of both are often conflicting (MECKLING, 2021). Industrial policy and climate policy generally differ on: 01. goals (one aims at economic development and the other aims at emission cuts); 02. instruments (one aims at public investment in key companies and sectors, while the other focuses on carbon pricing mechanisms, standards and regulations aimed at progressively reducing

emissions); and 03. distributional effects (in industrial policy, benefits are concentrated; in climate policy, costs are concentrated).

According to the literature on policy mixes (KIVIMAA and KERN, 2016), decarbonization trajectories can be planned in an intersectoral way. For example, by combining the development of low-carbon technologies and green industries, while contributing to economic development and decarbonization, aligning the "movement of resources towards sectors deemed desirable in the future" (MECKLING, 2021, p. 03).

Green industrial policy suggests a higher level of direct government intervention than, for example, carbon pricing policies, which basically involve short-term direct business interests. Considering the domestic and international policy arenas, and according to Meckling (2021), there are four power struggles (policy games) being waged in green industrial policy: 01. 'interactions between industrial policy and domestic policy': adoption of competitive technological standards, public investments in strategic sectors and industries; 02. 'interactions between climate policy and domestic policy': laws aimed at reducing emissions, and transparent mechanisms for the operation of national carbon markets; 03. 'interactions between industrial policy and international policy': cooperation and competition between states for the development of low-carbon and strategic industries, sectors, and technologies, as what happens in institutional arenas such as the International Renewable Energy Agency (IRENA), and in global coalitions, including Mission Innovation, a global initiative to accelerate innovation in clean energy; 04. 'interactions between climate policy and international policy': advancement of climate cooperation, establishment of climate clubs, and multilateral negotiations.

This multiple-arena configuration is related to low-carbon socio-technical transitions, which emphasize decisions that must be made at sectoral levels to advance decarbonization (LOORBACH et al., 2017; NEWELL, 2020). Recognizing trade-offs and the inevitable existence of losers and winners is necessary to advance 'fast' and 'equitable' low-carbon transitions. Participatory processes in sustainability transitions make them equitable, but reduce their speed. The presence of incumbent operators (e.g., large oil and gas companies) in decision-

making tends to accelerate the speed of transitions, but at the expense of making them unequal (NEWELL, GELLS and SOVACOOL, 2022).

There is, therefore, a pursuit for promoting low-carbon transitions quickly and equitably. One of the proposed instruments for this purpose is climate-related business opportunities, in the form of economic gains generated by facing the climate crisis and creating 'sustainable businesses'. Some claim that this is the only way to have business engagement and motivation to accelerate such transitions (BULKELEY and NEWELL, 2010). But this is a controversial proposition, especially when we bear in mind that business conglomerates, particularly in very polluting sectors, will have to be discontinued or change (like what energy companies have been doing) to advance deep decarbonization, begetting 'losers' who can exert pressure against climate policies. Table 01 summarizes six key mechanisms used by interest groups to influence climate policy.

Table 01. Mechanisms interest groups adopt to influence climate policy

Mechanism	Source
Market opportunities and the company's willingness to innovate (e.g., creating low-carbon products, markets, and services)	Bulkeley and Newell (2010)
Search for partnerships and participation in climate networks (national or international) (e.g., private-private partnerships, such as the Global Compact)	Biermann (2010)
'Climate change bandwagoning', connecting climate policy to policies in other fields (whether environmental or not) that a company or sector are interested in, as well as the adoption of corporate discourses (e.g., on what is sustainable, the ideal deadline for low-carbon transition, etc.)	Jinnah (2011); Jinnah (2017)
Lobbying in favor of regulations restricting emissions or, alternatively, lobbying against such regulations	Delmas et al. (2016)
Support to, building of, and/or active participation in carbon markets	Mildenberger (2020)
Alignment between sectoral policy (farming, energy, industrial, etc.) and national and/or international climate policy (e.g., industrial or trade policy that prioritizes low-carbon technologies and products)	Meckling (2021)

Source: Elaborated by the authors.

These aspects provide the conceptual guidelines we will apply into in the remainder of this article. Sectoral and public governance arrangements can be structured for or against climate action, and this varies both according to the historical, political, and social context, and the interests of different sectors and economic stakeholders. While interest groups exert more or less pressure on climate institutions, the industries connected to the agricultural and energy sectors

stand out in Brazil. In the next section, we will empirically look into how these interests unfold in the agricultural and energy sectors.

Interest groups and low-carbon transitions in the agricultural and energy sectors

In this section, we analyze interest groups in low-carbon transitions in the agricultural and energy sectors in Brazil. Corporate and sectoral interests will be emphasized, as they generally impose barriers to decarbonization, but, in some exceptional cases, represent opportunities for advancing climate policy. Moreover, we identify several 'climate coordination gaps' in both sectors. In this sense, we demonstrate (public-private) interactions between economic stakeholders and the state, which at times offer opportunities for decarbonization, but often prioritize economic interests and political agendas for which decarbonization is secondary.

Low-carbon agriculture: political economy and climate interests in the agricultural sector

To understand the decarbonization repertoire of the agricultural sector in Brazil, we must note that this is a multiple sector. Considering its level of capitalization, market size, level of internationalization, and sustainability, as well as the relevant literature (FASE, 2022; MILMANDA, 2023; POMPEIA, 2022; RAJÃO et al., 2020; VIOLA and MENDES, 2022), we propose to split up the sector into five segments which are considerably distinct: 01. 'Latifundia' (large low-productivity areas, with limited use of technologies, and often non-sustainable); 02. Modern, but non-sustainable (high capitalization and export-oriented, incorporating modern technologies, but dissociated from or contrary to environmental sustainability); 03. Market-driven sustainability (high capitalization and export-oriented, with use of modern technologies, incorporating the sustainability agenda to protect its business, adopting some environmental, pro-climate or pro-biodiversity practices, with market-driven vested interests); 04. subsistence family farming (includes the majority of the agricultural labor in Brazil, but has few resources and low use of technology); 05. high-capitalization family farming (a portion of this sub-sector adopts sustainability principles, including organic farming and permaculture). By

looking into the interest groups, productive arrangements, and decarbonization challenges in these subsectors, we can better understand the dynamics and challenges of decarbonization of Brazilian agriculture (Table 02).

Table 02. Categorization of the agricultural sector in Brazil

Agribusiness	Family farming
'Latifundia'	Subsistence
Modern, but not sustainable	Capitalized
Market-driven sustainability	

Source: Elaborated by the authors, adapted from Viola and Mendes (2022).

'Latifundia'-based agribusiness

Historically, big landowners have played a prominent role in Brazilian national politics. This segment includes big landowners, who keep large (often low-productivity) properties and part of the agribusiness industry that has not been modernized, and which is also contrary or immune to sustainable practices. As it has expanded into the Amazon, agribusiness has historically caused disputes over land, land concentration, conflicts with Indigenous communities, Quilombola communities, and peasants, also contributing to emissions from deforestation (ACSELRAD, 2012; SAUER, 2018). Low-carbon strategies are not often adopted by this part of the agribusiness industry, which effectively represents a challenge for the decarbonization of the sector. During the Bolsonaro administration, for example, the rural caucus—which includes this segment of the agribusiness industry and other groups—influenced the country's trade policy, helping to loosen environmental measures, in a gradual process of favoring big landowners, facilitating deforestation, and expanding the areas where mining operations are conducted, particularly in the Amazon region (MOTTA and HAUBER, 2022).

Mechanisms this subsector has adopted to influence climate policy include especially working with the media (influencing public opinion), direct action (election of members of Congress), and indirect action (lobbying) in the Legislative Branch, which has been quite accentuated since the Bolsonaro administration. The Brazilian Association of Soybean Growers (APROSOJA) has members who, following the Bolsonaro administration's agendas, deny the recent

increase in deforestation, are opposed to establishing a dialogue with civil society, and reinforce the discourse that 'agribusiness is green' (FASE, 2022). The sector seeks to align sectoral issues with the climate agenda, usually denying its responsibility for environmental problems. It thus clearly uses the mechanisms of climate change bandwagoning (JINNAH, 2017) and alignment between agricultural and climate policies in favor of the former (MECKLING, 2021). In 2019, for example, APROSOJA published the Letter of Palmas (Carta de Palmas), where it stated that "the soy moratorium is not linked to the reduction of deforestation in Brazil" and was an "international advertising campaign" that greatly damaged the image of Brazilian soy farmers [3]. However, even literature that is critical of the soy moratorium recognizes its contribution to reducing deforestation.

In addition to aligning with the Temer and Bolsonaro administrations, APROSOJA has been lobbying hard in the Senate (DELMAS et al., 2016), seeking the passing of instruments including Bill 510/2021 (popularly known as the 'land grabbing bill'), which aims to make the current Law Nº 11,952/2009 (which allows granting land titles of public land that have been occupied privately) more flexible. If passed, Bill 510/2021 may open a loophole to grant titles of occupied and deforested public lands, thus legalizing land grabbing that occurs through illegal deforestation. APROSOJA also supports the Time Milestone Bill (PL do marco temporal) for the demarcation of Indigenous lands (Bill 490/07), according to which Indigenous peoples would only be entitled to the demarcation of lands if they were in their possession in 1988. It also supports Bill 2,159/2021 (Environmental Licensing Bill), which is currently being discussed in the Senate and could make local populations and the environment vulnerable by facilitating the licensing of major operations, such as mining and farming operations, in forest areas.

'Modern but non-sustainable' agribusiness

Another part of the agribusiness industry, despite incorporating technological advances, does so by aiming at increasing productivity, without

[3] 'Aprosoja: A Carta de Palmas' Portal do Agronegócio. 23, July, 2019. Available at <https://www.portaldoagronegocio.com.br/agricultura/soja/noticias/aprosoja-a-carta-de-palmas-186078>.

environmental responsibility. Historically, agribusiness has led to impacts in Brazil including: expropriation or purchase of land from family farmers previously occupied by diverse crops; soil compaction and sealing due to intensive use of agricultural machinery; erosion; water contamination by pesticides; risk to the survival of plant and animal species, and others (DOMINGUES, BERGMANN and MANFREDINI, 2014, p. 37). Between 1990-2020, given the pressures of globalization and economic financialization, the sector became strategic for Brazil's insertion in global supply chains, in a process of agro-industrialization of the Brazilian economy marked by the strengthening of state-agribusiness relations (BARROS, 2018; SØNDERGAARD, 2020). This portion of the agribusiness industry was considered a top priority in sectoral public policies, to the detriment of small farmers. These agricultural ventures were granted strong access to credit and financial capital support, so agricultural commodities became important dynamos in futures markets. Even though they have received resources, these agro-industries have not reduced the environmental and climate impact of their businesses (MILANEZ et al., 2020; VIOLA and MENDES, 2022).

The mechanisms this subsector adopts to influence climate policy aim at creating opportunities to expand the sector. APROSOJA and the Brazilian Beef Exporters Association (ABIEC), for example, seek to frame the expansion of agribusiness as crucial for carbon markets, including through direct planting of soybeans in legal reserves (FASE, 2022). This subgroup (as well as the subgroup that will be analyzed in section 3.1.3) is internationalized and heterogeneous, revealing another window of climate influence: operating in multilateral forums, such as COPs, and private forums. Despite being influenced by pressures from international markets in Japan and the European Union, supply chains in this sector—such as the soy and beef supply chains—remain mostly unsustainable. Thus, an obvious climate coordination gap in this subsector is the difficult alignment between the increase in the production of agro-exporting commodities on the one hand and, on the other, the fall in deforestation levels in the Amazon and the Cerrado. This coordination gap involves complex organized efforts between producers (agricultural elites) in Brazil and stakeholders such as traders, food processing companies, and retailers operating in international

markets. Addressing such a gap could contribute to the deep decarbonization of the economy.

Another characteristic of this subsector is its level of internationalization. The agricultural value chain (seeds, fertilizers, pesticides, agricultural machinery, agroindustries, and trading companies) is composed almost entirely of multinational companies, which, to a large extent, takes climate-related decision-making power away from Brazilian groups. The share of domestic groups in soybean seed production in Brazil has dropped from 16.5% in 2015 to 8.75% in 2020. Regarding the production of fertilizers, multinational corporations have a strong participation in the market in Brazil, especially the company Yara. While national groups held 44.3% of the market share in 2015, they represented only 29.8% in 2020 (MEDINA 2021, p. 238). In the pesticide segment, there are two subsectors: products with patents, dominated by multinational groups, and generic products, the production of which is authorized after a patent's exclusivity period is over. In the segment of products with patents, in Brazil, in 2015, multinationals controlled 95.7 percent of sales, especially Syngenta (21.2%), Bayer (15.3%), and Basf (12.4%). In 2020, multinationals controlled 94.2 percent of this market. In the generic products segment, there is participation of Brazilian groups, but most companies come from China and India (MEDINA 2021, p. 240-241). The agricultural machinery sector is controlled by an international oligopoly. We may highlight three companies as the most important in the world: John Deere, AGCO, and CNH. In Brazil, the three companies combined controlled, in 2020, 99.6 percent of tractor sales and 100 percent of harvester sales (MEDINA, 2021, p. 243). Multinational traders like ADM, Bunge, Cargill, and Dreyfus (ABCD) formed an oligopoly controlling the governance of the global and national soy supply chain. In 2016, the Chinese state-owned trader China National Cereals, Oils and Foodstuffs Corporation (COFCO) became one of the top five soybean buyers procuring from Brazil. In 2020, these multinational corporations controlled 83.9 percent of the Brazilian soybean trade, above the 69.3-percent share recorded in 2015 (MEDINA, 2021, p. 243). In short, in the most technology- and capital-intensive segments (seeds, fertilizers, pesticides, machinery, and agroindustry), the share of Brazilian players dropped from 12.5 percent in 2015 to 7.1 percent in 2020 (MEDINA, 2021, p. 247). This level of internationalization also extends to the

subsector analyzed below. As previously mentioned, this extremely high level of internationalization of the supply chain of the subsector reveals that climate coordination gaps involving this part of agribusiness will hardly be solved through domestic market and policy instruments. It becomes clear that instruments of transnational governance and regulation (such as those proposed in the recent European Union Deforestation Regulation) will become increasingly necessary.

Agribusiness via 'market-driven sustainability'

This segment of the agribusiness sector seeks to reduce its environmental and climate impacts due to market pressures. It strongly targets foreign markets, especially the European Union and Japan. When exporting agro-commodities to these markets, global retailers and food processing companies have elevated their bargaining power in terms of sustainability and deforestation criteria in their supply chains, influencing producers, suppliers, and agricultural traders to adopt decarbonization, zero-deforestation, and due diligence mechanisms in their operations.

This is key to climate governance, because the National Plan for Low-Carbon Agriculture (ABC Plan) is the main climate commitment within the NDCs proposed by Brazil in the Paris Agreement. The ABC Plan aims to reduce emissions from agriculture by 133.9 to 162.1 Mt CO2e, through sustainable livestock farming, zero deforestation, and low-carbon production systems. The plan prioritizes: recovery of degraded pasturelands, integrated crop-livestock-forestry systems, and agroforestry systems, no-till agriculture, biological nitrogen fixation, increased agricultural efficiency, and the end of illegal deforestation. These measures aim at reducing emissions from the sector without harming productivity. One strategy to achieve the goals of the ABC Plan is to use digital agricultural technologies called Agriculture 4.0, aiming to increase productivity and, in some cases, reduce the sector's emissions and environmental impacts (VIOLA and MENDES, 2022). This is a mechanism to influence climate policy, through which large agricultural groups target opportunities for market expansion (BULKELEY and NEWELL, 2010).

In the economic-financial realm, another mechanism of climate influence adopted by this subsector is the support to and active participation in carbon markets (MILDENBERGER, 2020). In 2022, Brazil passed Bill 412/2022, which

regulates the Brazilian Carbon Market (Mercado Brasileiro de Redução de Emissões, MBRE), as provided for in Law Nº 12,187 of 2009 (Brazilian National Policy on Climate Change). Its operationalization will take place via futures exchanges, stock exchanges, and organized over-the-counter entities, authorized by the Brazilian Securities and Exchange Commission (CVM). On the institutional level, the bill creates a Brazilian Greenhouse Gas Emissions Management System (SBGE-GEE), under which the national plan for the allocation of Greenhouse Gas Emissions Rights (DEGEE) has been structured. However, farming and forestry operations do not take part in this regulated market and are more supportive of verified emission reductions (RVE), that is, a voluntary market that, in practice, does not require decarbonization. Voluntary participation in these markets thus becomes a mechanism of climate influence for agricultural groups interested in decoupling their business from climate change, thus associating economic and financial interests with sustainability.

In the economic-productive realm of agribusiness, a mechanism of climate influence via 'market sustainability' is the compliance with due diligence rules and legislation across supply chains and traceability criteria imposed on international agricultural groups operating in Brazil, including the measures implemented by the European Union Deforestation Regulation (EUDR). In practice, the EUDR requires groups that export commodities including soy, beef, coffee, wood, and others to prove that their production does not come from deforested areas, thus contributing to decarbonization and biodiversity conservation goals. Nevertheless, it applies only to products exported to European Union countries, while countries like China (the largest buyer of Brazilian soy) do not yet apply restrictive environmental criteria to the commodities they import, which may include products from deforested areas (THIVES, SØNDERGAARD and INOUE, 2022).

Subsistence family farming

This segment falls under Law Nº 11,326/2006 (National Policy on Family Farming and Rural Family Enterprises), and its updates. According to the Brazilian Institute of Geography and Statistics (IBGE), 76.8 percent of Brazil's 5.073 million rural establishments belong to family farmers (VIOLA and MENDES, 2022). In 2017, family farming generated R$106.5 billion in revenue (23 percent of the total

sector), representing 24 percent of the agricultural area and 74 percent of the labor force in the countryside (MASSRUHÁ and LEITE, 2017, p. 30). Nevertheless, this subsector has been reducing its share of revenues compared to the total sector. Moreover, a large portion of the subsector remains unaware of sustainability, either due to their low level of knowledge about the environment, the lack of access to technologies, or the preponderance of the economic aspect of subsistence in productive activities. Therefore part of the less capitalized family farming sector still maintains business models based on deforestation.

Sustainable techniques have been proposed to address the problem, particularly by Embrapa, including no-till farming (NTF), agro-silvopastoral systems, and integrated crop-livestock systems (ICL). Embrapa also carries out R&D activities focused on rural producers, family farmers, cooperatives, and other segments, to develop technologies to support sustainable agriculture (MASSRUHÁ and LEITE, 2017, pp. 30-31). Such activities have resulted in agro-meteorological information systems like 'Agritempo', which provides data for Agricultural Climate Risk Zoning (ZARC), an instrument for agricultural policy and risk management in agriculture. Additionally, some financial institutions only grant rural credit to borrowers adopting this type of zoning, while Embrapa works with other government sectors to generate more types of agroclimatic zoning.

However, these techniques and technologies are hardly ever incorporated into this less capitalized portion in family farming, as they are associated with extensive capital investments and technical knowledge that usually exceed the scale of small-scale farming. It should be noted, therefore, that the fact that technologies abiding to low-carbon agriculture are not widely accessible (whether due to structural reasons, such as educational deficits, or to the lack of interest of sectors such as the financial sector or the government itself). This is a climate coordination gap that negatively impacts deep decarbonization in this subsector.

Furthermore, despite important advances, public policies for Brazil's family farming sector are still limited for advancing a low-carbon transition. Contracts signed within programs that provide access to credit, technical assistance, and training, such as the National Program for Strengthening Family Farming (Programa Nacional de Fortalecimento da Agricultura Familiar, PRONAF), have been highly concentrated in the South and Southeast regions of the country, compared to the

North and Northeast. Even subsequent policies, like the National Program for the Sustainable Development of Rural Territories (Programa Nacional de Desenvolvimento Sustentável de Territórios Rurais, PRONAT) and the Territory of Citizenship Program (Programa Território da Cidadania, PTC), continued to strongly concentrate the offer of credit schemes for farmers with more capital and resources.

In short, this subsector has a low level of influence on climate policy. When it does have an influence (for example, by adopting organic, pesticide-free farming models), it is typically targeting market opportunities, with secondary environmental due diligence. On the other hand, low-carbon agricultural technologies could contribute to decarbonization if they achieve broad access to actors in this subsector.

Capitalized family farming

Capitalized family farming, which normally uses integrated crop-livestock-forestry systems, is predominant in Brazil's southern states. This subsector incorporates organic family farming, a growing but still minority segment. At different degrees of capitalization, portions of this subsector transition from conventional to organic agriculture, in addition to including agroecology principles. Organic agriculture is fundamental in low-carbon transitions because "agroecological management in an organic production system allows raising the organic matter content of soils by recycling and sequestering atmospheric carbon, confirming its high potential to reduce greenhouse gas emissions" (SOUZA et al., 2012, p. 07).

The low-carbon potential of organic farming is greater than that of transgenic production. Comparing common, transgenic, and organic soybean crops, the latter has a 77-percent probability of having lower climate impacts, and a 60-percent chance of being more profitable to farmers (KAMALI et al., 2017). Transgenic farming in Brazil uses the no-till technique that reduces emissions, but as it uses the glyphosate molecule, it produces deleterious impacts on human health, contributing to undermine the integrity of the gut microbiota, which is fundamental for the regulation of the immune system. That is, when comparing transgenic and organic farming, the latter is more compatible with low-carbon transitions and human health.

In the case of organic farming in Brazil, two legal frameworks are relevant to understand its potential for mitigating climate change: the National Policy on Agroecology and Organic Production (Política Nacional de Agroecologia e Produção Orgânica, PNAPO), established by Decree Nº 7,794 of 2012, and the Food Acquisition Program (Programa de Aquisição de Alimentos, PAA), established by Law Nº 10,696, of July 2nd, 2003. The PNAPO aims to guarantee 'actions that drive the agroecological transition', contributing to sustainable development, the quality of life of the population, sustainable use of natural resources, and healthy food supply and consumption. It also aims to stimulate agricultural systems that incorporate ecologically-based principles and technologies. Despite encouraging the conservation of biodiversity and the social aspects of the agricultural chain, there is no mention about the climate or strategies associating agroecology with reducing emissions. Moreover, the PNAPO was greatly undermined during the Bolsonaro administration.

The PAA, in turn, is an important policy because it associates organic farming with food security and health, although it does not provide explicit guidelines for controlling emissions or adapting organic family farming systems to climate change. The PAA has instituted public food stocks produced by family farmers, promoting food supply through government food procurement and strengthening local and regional circuits and trade networks. While the policy aims to foster biodiversity and organic and agroecological food production, it does not explicitly states the high potential of these practices for low-carbon transitions in Brazil. That is, a clear climate coordination gap is related to the climate and food policy agendas, which are still not strongly linked.

Considering that the subsector of capitalized family farming is under-represented in terms of number of companies and share of revenues (compared to the agribusiness industry), it has little influence on climate policy. When it does (for example, by adopting organic farming models), it is aimed at market opportunities and increases in revenues and profits. In some cases, the sustainability strategies adopted are relevant to decarbonization, especially when applied at scale.

Low-carbon energy: renewables , complex energy matrix, and the 'fossil fuel lobby'

The Brazilian energy matrix is relatively clean compared to international benchmarks. In 2020, 48 percent of the energy used in the country came from renewable sources (including firewood and coal, hydraulic, sugar cane products, solar, wind, and biomass), while the world average was only 14 percent[4]. Also, Brazil is considered to have an ultraclean electricity matrix, where more than 90 percent of the electricity generated in the country in 2022 came from renewable sources, especially hydroelectric (65.2%), solar (10%), biomass (9.1%) and wind (8.8%). Comparatively, the world's electricity matrix only had 27 percent of renewable sources in 2020 (EPE, 2022). In other words, Brazil is considered a powerhouse when it comes to renewable energy, behind only a few countries in terms of the share of renewable sources in their electricity matrix, such as Norway, Austria, and Uruguay.

The energy sector is the third largest vector of Brazilian emissions (only behind deforestation/LULUCF and agriculture). This is mainly due to fossil fuels used in transportation, which increases the volume of emissions from the energy matrix. It should be noted, therefore, that 'fossil fuel interests'—that is, economic agendas of electric utility companies (which prioritize energy security and growing electricity production, associating natural gas to the power grid) and Oil & Gas companies (especially Petrobras, with strong lobbying power in the Brazilian state) influence the decarbonization trajectory of the sector in the country.

Fossil fuel interests (oil and oil products represent 33.1% of the energy matrix; natural gas, 11.8%; and coal, 4.9%) and, on the other hand, the interests of renewable energy generators result in a complex battle field in Brazilian energy politics, often resulting in challenges to the low-carbon transition.

Since the 1980s, energy generation in Brazil has undergone inflections dictated by domestic politics. During the Fernando Henrique Cardoso administration, the electricity sector was privatized, ensuring market-driven—

[4] While the energy matrix represents all of a country's energy sources (fuels used in transport, food preparation, electricity generation, etc.), the electricity matrix includes the set of sources available only for the generation of electricity.

rather than state-driven—growth, as the state was unable to make the system grow proportionately to the demand. Subsequently, during the Luiz Inácio Lula da Silva administration, the remaining state-owned companies in the sector were empowered through long-term planning to increase the security of the system (preventing power outages like the ones that happened in 2001/2002). Affordable rates and universal access were also prioritized.

However, since 2004, Brazil's electricity demand has grown rapidly due to the country's economic boom. To meet the increasing demand for electricity, proposals to install large hydroelectric power plants were made especially in the Amazon, a region with remaining fluvial potential to generate this type of energy.

An important part of the civil society has been opposed to the environmental and social impacts of building large hydroelectric dams in the Amazon. This is why a decision was made to build run-of-the-river power plants, which have limited storage so that electricity production becomes highly sensitive to hydrological variation, compromising productivity and energy security. To ensure the security of the power grid, the number of gas-fired power plants was increased, especially since the Dilma Rousseff administration, which led consumer prices to increase as well (BASSO, 2018). In practice, these moves have made the Brazilian energy policy more sensitive to related socio-environmental impacts, both in terms of the installation of hydropower plants with high environmental impact, like Belo Monte, and increasing degradation in the Amazon forest and rivers.

The Belo Monte Dam, which started operations in 2019, has already caused substantial negative impacts. For example: expropriation of riverside communities, small farmers, and Indigenous communities; substantial decline in fish populations, as well as negative impacts on the 'piracema' (breeding season), reducing local communities' main source of income. Furthermore, even during flood seasons, the dam produced a maximum of 6,882 MW of power a month, far below the 11,233 MW promised to investors and the state. This is due to reductions in rainfall in the area, caused by climate change and deforestation (EXAME, 2021; RIBEIRO and LEITE, 2020). It should be noted that, in this case, even the interests of the renewable energy portion of the energy sector are obstacles to decarbonization and sustainable development, and are supported by the state. The gradual increase in Brazil's energy demand, which has culminated in controversial projects such as

the Belo Monte Dam, reveals one of the most important climate coordination gaps in the energy sector: the increase in energy demand without the corresponding increase in the supply of renewable sources, which can lead to increasing use of fossil fuels in the country's energy matrix (especially natural gas).

Biofuel policy is one of the vectors of decarbonization of the country's energy matrix. Ethanol production has grown significantly between 2003 and mid-2007. Production costs have been reduced through verticalization (the same company controlling many stages of the production chain). The introduction of flex-fuel vehicles and the high prices of oil have also encouraged the sugar-alcohol industry. On top of that, President Lula da Silva used foreign policy instruments in his first term (2003-2006) to promote Brazilian ethanol abroad, despite having failed to constitute a significant export market for this commodity.

However, this scenario of ethanol fuel expansion took a negative turn after the pre-salt oil reserves were discovered in 2007. Since 2006, the government has set subsidized prices for oil products as a mechanism to control inflation. That is, Petrobras started to sell oil products in the domestic market at lower prices than those paid in the international market, which made the company suffer great financial losses. This means that, even with the discovery of pre-salt oil reserves, the country has not become a net exporter, and domestic gasoline prices have become lower than historical prices, becoming disincentives to ethanol production. The country has also failed to become an ethanol exporter, so the sector did not have the expected growth (BASSO, 2018). Domestic ethanol production and consumption fell in 2010-2011 and stagnated in 2011-2017, and only started to grow again thereafter. Fossil fuel interests, therefore, when linked to the state and the growing demand of the supply chain (logistics, transport), contributed to undermine biofuel advances since 2007.

It should be noted that ethanol production is not free of environmental impact, including, for example, the impact of burning sugar cane fields on environmental and human health (RONQUIM, 2010); deforestation for the expansion of sugar cane crops, especially in the Cerrado; contamination; increase in soil pH levels; and contamination of groundwater with vinasse (waste generated in ethanol production).

In 2017, the government passed the National Biofuels Policy, or 'RenovaBio' (Law Nº 13,576/2017) to achieve the goals negotiated in the Paris Agreement. This policy aims to contribute to the country's energy efficiency and reduce emissions; regulate the expansion, production, and use of biofuels; contribute to the predictability of the competitiveness of biofuels in the domestic market; and enable the supply of more sustainable energy. However, a number of vested interests are involved in the political economy of biofuels, making a renewable energy transition more difficult.

When 'RenovaBio' was first established, interest groups (associations, power plants, fuel distributors, Brazilian and foreign companies) submitted technical notes and comments to influence the policy since its inception, when the Ministry of Mines and Energy (MME) held public forums to define its parameters. In these forum meetings, most participants were companies and associations that are more closely connected to the energy sector. In 2017, after the public consultation, an Explanatory Note was released on the MME web portal, which pointed out the institutions directly or indirectly involved in outlining this policy: "the MME, the MMA, the National Agency of Petroleum (ANP), Embrapa (...), the Brazilian National Council for Energy Policy (CNPE). The academic community was represented by the National Institute of Science and Technology for Studies on the United States (INCT-INEU), USP/Esalq, the Brazilian National Bioethanol Science and Technology Laboratory, and the consulting firm Agroícone" (LAZARO and THOMAZ, 2021,pp. 03-07).

Four relevant actors of the energy industry in Brazil were the most prominent participants in public consultations and forums: the Brazilian Union of Biodiesel and Biojetfuel (UBRABIO), the Brazilian Sugar Cane and Bioenergy Industry Association (UNICA), Petrobras, and the Brazilian Petroleum and Gas Institute (IBP). UBRABIO is the industrial association that represents the country's entire biodiesel and biojetfuel production chain. UNICA is the largest organization representing the sugar cane and ethanol sector in the country. The power plants associated with UNICA are responsible for more than 50 percent of Brazil's sugar cane production, 60 percent of ethanol production, and nearly 70 percent of the bioelectricity offered to the national electricity system. In addition to Brazilian associations, US ethanol industry associations including the Renewable

Fuels Association, Growth Energy, and the U.S. Grains Council submitted contributions to the public consultations. Airlines including Gol and Latam, which are major CO2e emitters, also submitted comments and technical reports on issues related to aviation biofuel (LAZARO and THOMAZ, 2021, p. 12).

These moves aimed to accommodate the interests of industrial elites of the energy and related sectors in the clauses of the new policy. This example of the interests involved in the establishment and clauses of 'RenovaBio' demonstrates that incumbent operators' preferences still carry disproportionate weight in the governance of the energy transition in Brazil. Moreover, it illustrates mechanisms of influence of interest groups in the country's climate policy, especially lobbying (DELMAS et al., 2016). Notably, this is a relatively innovative case of lobbying in the industry.

Wind energy sources are additional vectors of decarbonization, but they grow at a slow pace in Brazil. Wind energy represented 8.8 percent of the Brazilian electricity matrix in 2020, therefore being a source of growing relevance and potential for expansion (EPE, 2022). The Program of Incentives for Alternative Electricity Sources (Programa de Incentivo às Fontes Alternativas de Energia Elétrica, PROINFA), created in 2001, encouraged wind energy through BNDES credits, requirements for the use of Brazilian products and technologies, as well as incentive policies, including fixed energy procurement contracts with Eletrobrás at higher prices than those paid to big hydroelectric power plants. As the wind industry and production capacity improved, its participation has reached 8.8 percent of the Brazilian electricity matrix in 2020. As the sector becomes stronger, its economic agents increased their lobbying efforts in electricity auctions, arguing (correctly, from an environmental standpoint) that replacing the hydrothermal system (in force) with a hydro-wind system would be more advantageous to the country. Nevertheless, incumbent operators and the largest portion of the government that accounts for the sector argue that making the grid dependent on an intermittent energy source like wind would be dangerous, despite recognizing the possibility of a hydro-thermal-wind system in the future. In practice, therefore, the country remains dependent on gas-fired power plants.

More recently, Brazil has been seeking to promote the wind and solar energy sectors by setting up industrial locations in less industrialized regions, like the

Northeast. It is doing so through special lines of credit granted by the BNDES, along with the establishment of a feed-in tariff (FiT) to encourage small-scale renewable energy generation. This is an important move toward increasing the share of small producers in the renewable energy sector, as the current auction system favors large producers, who promise energy security when compared to the often higher transmission costs of widely distributed wind and solar energy. This is an example of what Meckling (2021) describes as green industrial policy (climate and energy policies moving in a concerted manner). Nevertheless, climate change and low-carbon transitions have historically been regarded as a minor issue in Brazilian energy planning (HOSCHTETLER, 2020).

Also, we should point out some of the bottlenecks that hinder the expansion of energy generated via: green hydrogen; tidal wave; biomass; electric mobility; and natural gas. Green hydrogen is considered the 'fuel of the future', but there are huge technological challenges to its production, which requires a lot of energy. Germany and Norway have been investing in this low-carbon technology and, in Latin America, Chile has also been making this kind of investment. Brazil, particularly in the Northeast, is expected to build an embryonic industry for the sector. The Northeast has competitive advantages for the production of green hydrogen due to its high wind and solar potential. A green hydrogen hub was established in Ceará in 2022 in a partnership between the Federation of Industries of the State of Ceará (FIEC), the Ceará state government, and the Federal University of Ceará (UFC), aiming at conducting research and attracting national and international investments (BEZERRA, 2021).

Tidal power (energy from oceanic tides) is not yet part of Brazil's energy planning. There are no incentive policies or initiatives to map the potential of ocean energy in Brazil, which, in theory, would have great possibilities to advance in this area. The country does not have specific legislation for renewable sources of energy from the ocean.

Regarding biomass and biofuels and their association with electric mobility (use of electric vehicles—EVs), there is potential for biomass cogeneration with electric power generation. Hybrid electric cars powered by biofuels would therefore be very feasible, and they have been advancing, albeit slowly, in Brazil. In other words, the slow progress of EVs in Brazil is another climate coordination gap, with

a strong interface with the automotive, energy, and electric sectors. A strong argument slowing down further policy developments in this sector is that EVs would only be viable in densely populated areas (mid-size and large cities), because their batteries still have limited capacity, making the necessary infrastructure for ubiquitous electricity supply very costly.

Natural gas is ambivalent, because while it reduces emissions when it replaces coal/oil, its production implies the maintenance of an entire infrastructure for fossil fuels. Around the world, natural gas tends to be used as a transition fuel, a step toward deep decarbonization. This has also been happening in Brazil, as natural gas is the main fuel supplying thermoelectric power plants, which work in conjunction with hydroelectric power generation.

Conclusion

This article outlined the main interest groups regarding the agricultural and energy sectors and their mechanisms to influence Brazil's climate politics and policy. In the agricultural sector, mechanisms of climate influence have been increasingly adopted, especially by portions of the industry that target export markets and are subjected to pressure from international interest groups. There is a growing demand from global traders, food processing companies, and retailers, mainly based in the European Union, for sustainability, zero-deforestation and due diligence in agro-commodity supply chains. However, most parts of the agribusiness remain conservative when it comes to low-carbon practices. This is also an issue in family farming, as low technological capacity and low level of capitalization are barriers to a low-carbon transition.

The decarbonization of the energy sector faces challenges related to the incumbent operators of the electricity sector (whose interests prioritize the maintenance of thermoelectric power plants as sources of support for hydropower) and the Oil & Gas sector (Petrobras, for example, is strongly supported by the state and the population). Brazil does not have enough public policies to support the expansion of the wind, solar, nuclear, and other renewables. Furthermore, the Oil & Gas sector has been revitalized since the discovery of pre-salt oil fields in 2007, which have strengthened fossil fuel interests in Brazilian climate and energy politics. With regard to renewable energies, the

Brazilian government has been promoting some incentives for expansion, especially for hydroelectric and wind and, to a lesser extent, solar energy generation. The country is trying to take advantage of the energy transition to catalyze industrialization. For example, by installing wind power plants in regions that have a low level of industrialization, such as the Northeast. But the country benefits large electricity companies that are already operating and promise energy security, over the relatively higher transmission costs of the wind and solar sectors. This means Brazil has a peculiar aspect to it when it comes to low-carbon energies: a battle between hydroelectricity, on the one hand, and wind and solar, on the other, in electricity generation.

In this context, we understand that climate governance in Brazil focused on agriculture and energy should: 01. significantly reduce asymmetries and the competition between agricultural operations and Brazilian biomes (particularly the Amazon and the Cerrado), closing climate coordination gaps including those addressed in this article; 02. adopt policies to increase energy efficiency and the rapid and equitable expansion of renewable energies in the national energy matrix; 03. prioritize the deep decarbonization of the agricultural and energy sectors, considering climate justice, for example, taking into account food sovereignty, intersectionalities (e.g., policies tackling climate racism, social injustices in low-carbon transitions, etc.), and universal access to electricity in sectoral climate governance plans.

This paper has documented innovations in terms of mechanisms adopted by interest groups to influence climate policy in Brazil. Our research demonstrates that, in addition to what is exposed in the literature, mechanisms of influence of private actors on Brazil's climate policy include: media activism (influencing public opinion), direct action (election of members of Congress), internationalization of production chains (which gives more power to international stakeholders), partnerships with government agencies for pilot projects (Embrapa's work promoting low-carbon agricultural technologies), and participation in public forums that define sectoral policies (including the submission of technical notes by powerful interest groups, as demonstrated by the case of 'RenovaBio'). These elements constitute a theoretical-empirical contribution for the literature on climate change politics in Brazil.

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