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Renewable energies and climate change: analysis of related public policies in states in the Brazilian Northeast

Rylanneive Leonardo Pontes Teixeira [I]
Zoraide Souza Pessoa [II]

[I] *Universidade de São Paulo, São Paulo, SP, Brazil.*

[II] *Universidade Federal do Rio Grande do Norte, Natal, RN, Brazil.*

Abstract: The aim of this paper is to analyze how three states in the Brazilian Northeast have progressed in wind and solar energy while encouraging public policies for the expansion of these energies and addressing climate change, understanding whether such energies are incorporated in these states as strategic to deal with the climate issue. Methodologically, the study is anchored in qualitative research using documentary research and analysis of other secondary data as research instruments to analyze the three states, employing content analysis as a data processing technique. The results and discussions of this paper indicate that public policies encouraging renewable energies and addressing climate change in the states investigated do not present synergies or alignments with each other, even in the context of states that are highly productive in wind and solar energies in Brazil.

Keywords: Energy transition; decarbonization; mitigation; adaptation; Brazil.

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Introduction

Globally, the energy transition in a context of transformation, such as the growth of the use of renewable energies like wind and solar (Guerrero, 2021), has become a key topic in the debate as one of the main solutions to tackle climate change at different territorial scales. This transition is characterized by the pursuit of reducing Greenhouse Gas (GHG) emissions, particularly carbon dioxide (CO2), through the replacement of non-renewable energy sources with renewable ones. The goal is to implement a decarbonization process and address climate change with positive reverberations on sustainability worldwide.

In Brazil, although hydropower resources are the primary source of electricity generation, there has been a constant increase in the exploration and production of other renewable energy sources, such as wind and solar energy. This aspect somehow encourages the diversification of Brazil's energy and electricity matrix, with the country's Northeast region and its states playing a central role in this perspective, especially due to the geographical, environmental, and climatic characteristics and potentialities of the region's territories (such as favorable winds for wind energy generation and high solar incidence for photovoltaic energy generation).

Given these factors, the Brazilian Northeast is a suitable territory for the production of wind and solar energy sources (Santos *et al.*, 2022). However, the region is characterized by intense natural climatic variability, with irregular rainfall and long periods of drought and dry spells, making it a highly vulnerable territory to climate change (Marengo, 2008; Marengo *et al.*, 2011; Darela Filho *et al.*, 2016). Factors such as poor public sector governance, high poverty and inequality rates, and the lack of measures for sustainable development implementation aggravate these vulnerabilities.

In a context of scientific evidence on climate change and its impacts in the Brazilian Northeast, such as the intensification of extreme rainfall and drought events (IPCC, 2014), it is essential to understand the alternatives being developed and implemented by these territories for better sustainability on a global scale. More specifically, there is a need to understand how state governments have sought to build and implement political-governmental agendas related to environmental and, especially, climatic issues, in interface with renewable energy planning and public policies. For this purpose, the states of Bahia (BA), Ceará (CE), and Rio Grande do Norte (RN) are investigated because they stand out as highly productive states of renewable energies in Brazil.

Thus, the objective of this paper is to analyze how these states have progressed in wind and solar energies while encouraging public policies for the expansion of these energies and addressing climate change, understanding whether these energies are incorporated in these states as strategic to deal with the climate issue. The paper is anchored in qualitative research, using a set of methodological procedures detailed in the methodology section.

In terms of structure, the paper is organized into three sections, besides this introduction and the conclusions. In the first section, the research methodology is detailed. In the second, the results concerning the electricity matrix in Brazil, in general, and in the three northeastern states, in particular, are discussed. Finally, in the third section, the

public policies encouraging wind and solar energy and addressing climate change in the states investigated are identified and analyzed, understanding whether there are synergies or alignments between them.

Research methodology

The methodology of this paper, aimed at achieving the objective proposed in the introduction, follows a qualitative approach, conducting case studies in BA, CE, and RN, located in the Brazilian Northeast, as they are highly productive states of wind and solar energies. These studies are based on the analysis of state public policies encouraging renewable energy sources and addressing climate change in the states investigated, to observe synergies or alignments between climatic and energy issues.

Regarding this analysis, the purpose is to map and analyze public policies encouraging renewable energies and addressing climate change collected from platforms such as the Official Gazettes of the states analyzed, as observed in the second analysis and discussion section of this paper. In addition to these public policies, other secondary data were consulted, collected from sites such as the Generation Information System (SIGA) of the National Electric Energy Agency (ANEEL).

To process the collected data, content analysis (Bardin, 2011) was employed, considering that it is a widely validated technique in qualitative research (Mozzato & Grzybovski, 2011). The analytical categories used in this analysis were "renewable energy," "wind," "solar," "climate change," "mitigation," and "adaptation." These categories, following a closed analysis grid (preliminarily defined and identified in the selected material) (Vergara, 2005; Lukosevicius & Soares, 2016), were selected for their ability to capture crucial data and information for the analysis and discussion of the results, as follows in the next two sections of this paper.

A Look at the Electric Matrix in Brazil and in the Northeastern Brazilian States

In the context of the energy transition, which is focused on the incorporation of renewable energies (Parker, 2018), such as wind and solar, the diversification of the energy matrix is understood as the integration and implementation of renewable energies in territories (Eyre *et al.*, 2018), in order to expand the possibilities of electricity generation for their populations. Beyond being a means to provide electricity to individuals in their territories, energy diversification through renewable wind and solar sources is a path to mitigate the impacts of adverse events, such as climate change (Mania; Rieber, 2019).

Thus, the diversification of the energy matrix is essential for the construction and realization of issues such as sustainable development (Ahmed *et al.*, 2022), gaining some prominence in a scenario of concerns, for example, with the growth in energy demands and the intensification of climate change (Aslani; Helo; Naaranoja, 2014). In the context of climate change, one of the central objectives of the diversification of the energy

matrix in Brazil is to reduce water vulnerability to climate change, considering that water resources are highly dependent on rainfall patterns. Recent studies, such as Berga (2016), address the vulnerability of water resources to climate change.

In Brazil, the energy matrix is non-renewable, particularly derived from oil and its by-products (35.7%), according to data from the Energy Research Company (EPE; Brazil, 2023) for 2022. In contrast, the electricity matrix is renewable, as most of the electricity generated in Brazil comes from hydroelectric plants, with hydropower accounting for over 60% of this scenario (EPE; Brazil, 2023). Particularly since 2001, with the Emergency Wind Energy Program (PROEÓLICA), renewable energies, particularly wind, have started to be incentivized in Brazil, with the goal of contracting 1,050 Megawatts (MW) of wind energy projects by the end of 2003 (ABEEólica, n.d.).

However, the program did not achieve its goals and was replaced by the Program for Incentive of Alternative Sources (PROINFA), regulated by Law No. 10,438 (Brazil, 2002), which encouraged the development of renewable sources beyond hydropower. For example, wind and solar energy rank third and fourth in the country's installed electricity capacity (kilowatt – kW), according to data from May 21, 2024, from SIGA: 15.10% and 6.78%, respectively (Table 01) (ANEEL, 2024).

Table 01 – Installed Electric Energy Capacity in Brazil

Type of Plants	Quantity	% (Supervised Capacity)
Hydroelectric Plant	220	51,01%
Thermoelectric Generating Plant	3.107	22,84%
Wind Generating Plant	1.646	15,10%
Photovoltaic Plant	21.222	6,78%
Small Hydroelectric Plant	522	2,88%
Nuclear Power Plant	3	0,98%
Hydroelectric Generating Plant	688	0,42%
Total	27.408	100%

Source: Prepared by the authors based on data from May 21, 2024, from SIGA (ANEEL, 2024).

The participation of renewable energies in Brazil has been encouraged, especially since 2013 with wind energy (González, 2021). The promotion of the expansion of wind and solar energy, through public incentive policies, has been even more prominent in the territories of the Northeast region of the country due to physical-geographical factors, such as winds that are favorable for wind energy generation and the high solar incidence

that plays a central role in photovoltaic energy generation.

Considering both renewable and non-renewable energy sources, the current participation of the Brazilian Northeast in the national installed capacity is 25.8% (54,813 MW) out of a total of 212,659 MW (Brazil, 2023). Of this total participation from the Northeast of Brazil, BA, CE, and RN are responsible, respectively, for 54.2%, 25.1%, and 24.6%, according to data from May 21, 2024, from SIGA (ANEEL, 2024). Table 02 shows the data related to the installed capacity of electric power in these three states.

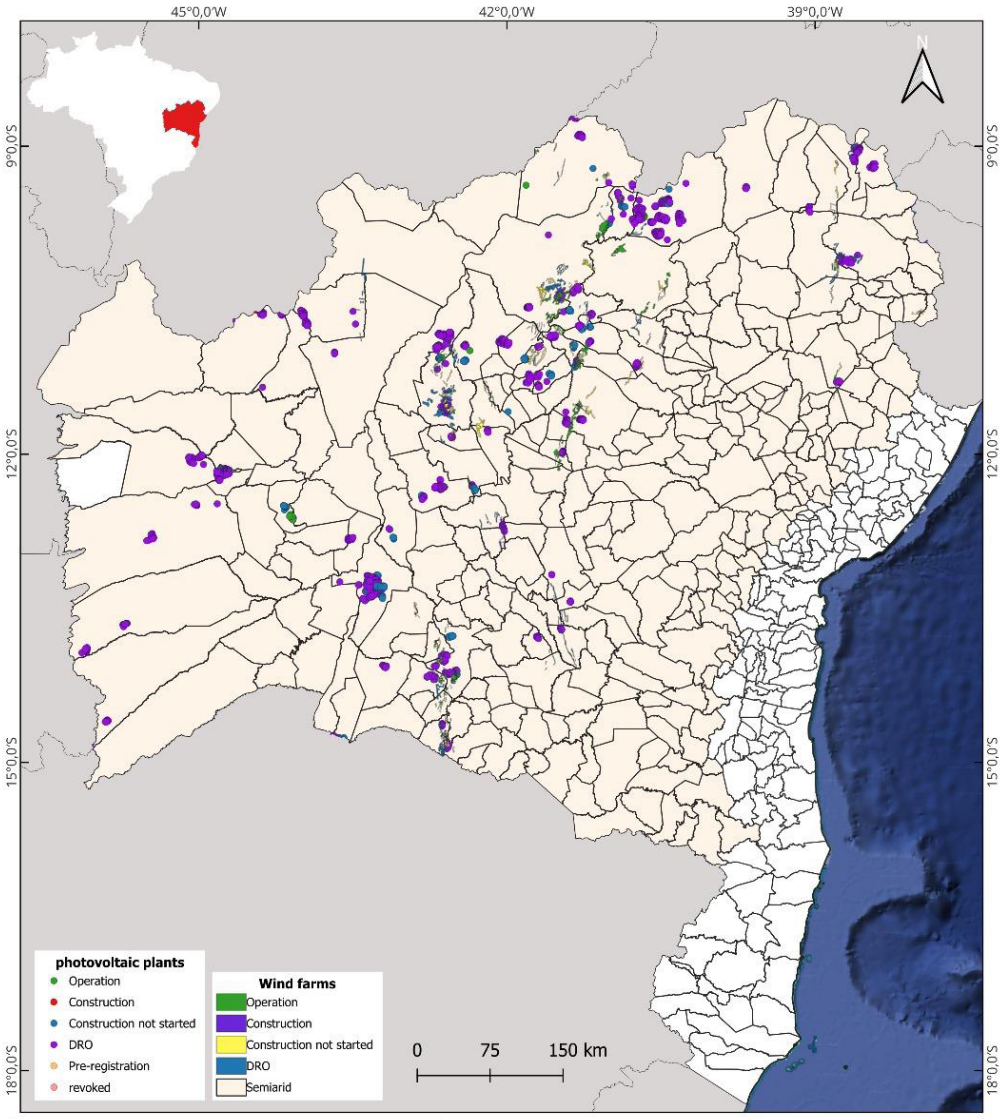
Table 02 – Installed Capacity in Electric Power in the Northeastern States of Brazil

Type of Enterprises	States					
	BA		CE		RN	
	Quantity	% (Monitored Power)	Quantity	% (Monitored Power)	Quantity	% (Monitored Power)
Hydroelectric Plant	10	30,17%	---	---	---	---
Thermoelectric Generating Plant	107	7,65%	---	---	37	4,61%
Wind Generating Plant	577	50,62%	172	46,31%	384	85,70%
Photovoltaic Plant	634	11,03%	479	22,48%	260	9,65%
Small Hydroelectric Plant	8	0,48%	29	31,21%	1	0,04%
Hydroelectric Generating Plant	13	0,05%	---	---	---	---
Total	1.349	100%	680	100%	681	100%

Source: Compiled by the authors from SIGA (ANEEL, 2024) data as of May 21, 2024.

The participation of renewable energies in the Northeast of Brazil, and specifically in the states of BA, CE, and RN, is notable, with these territories accounting for an average of about 66% of the total installed capacity in electric power from renewable sources, particularly wind energy, in the region (ANEEL, 2024). In the meantime, the following Figures present the numbers regarding the distribution of wind and photovoltaic solar energy projects in the analyzed states. Figure 01 shows the distribution of these projects for BA, with 752 projects not yet started, 57 under construction, and 1,211 in operation (Figure 01) (ANEEL, 2024). Of the total in operation, 331 are wind farms and 71 are photovoltaic solar plants (Figure 01) (ANEEL, 2024).

Figure 01 – Map of the distribution of wind and photovoltaic solar energy projects in BA, Northeast Brazil

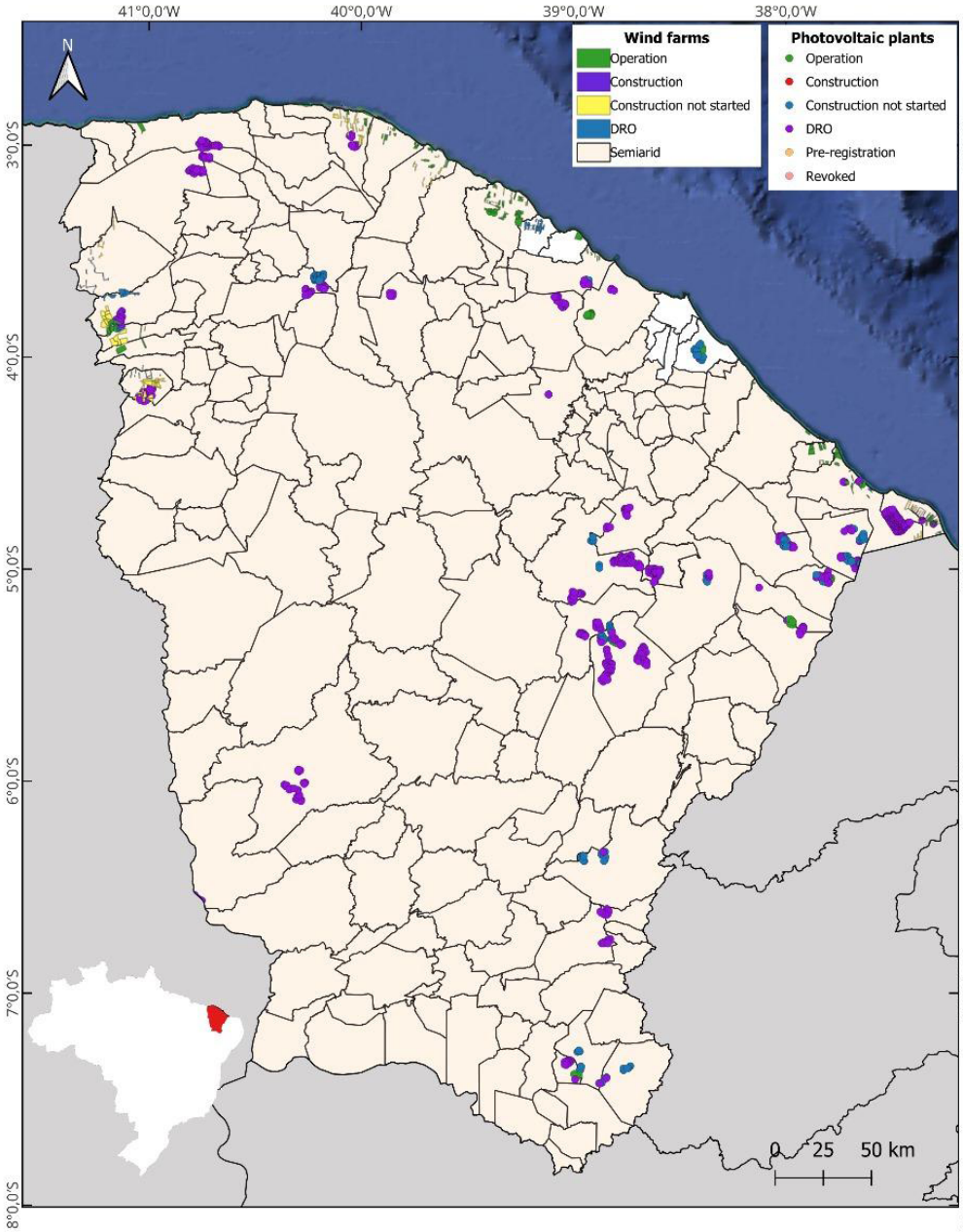


Source: Prepared by Rafael Silva using data from May 21, 2024, from SIGA (ANEEL, 2024).

According to recent studies (Azevedo *et al.*, 2022; Cruz, 2022; Silva *et al.*, 2022), corroborated by data from May 21, 2024, from SIGA/ANEEL (ANEEL, 2024), in general, most wind and photovoltaic solar energy projects or ventures

are located in the Bahia's semiarid region. This characteristic is also observed in CE and RN, as seen in the following maps (Figures 02 and 03). Specifically in CE, the wind and photovoltaic solar projects distribution of wind and photovoltaic solar projects is 482 in the pre-construction phase, 18 under construction, and 151 in operation (Figure 02) (ANEEL, 2024). Of those in operation, 100 are wind projects and 51 are photovoltaic solar projects (Figure 02) (ANEEL, 2024).

Figure 02 – Map of the distribution of wind and photovoltaic solar energy projects in CE, Northeast Brazil

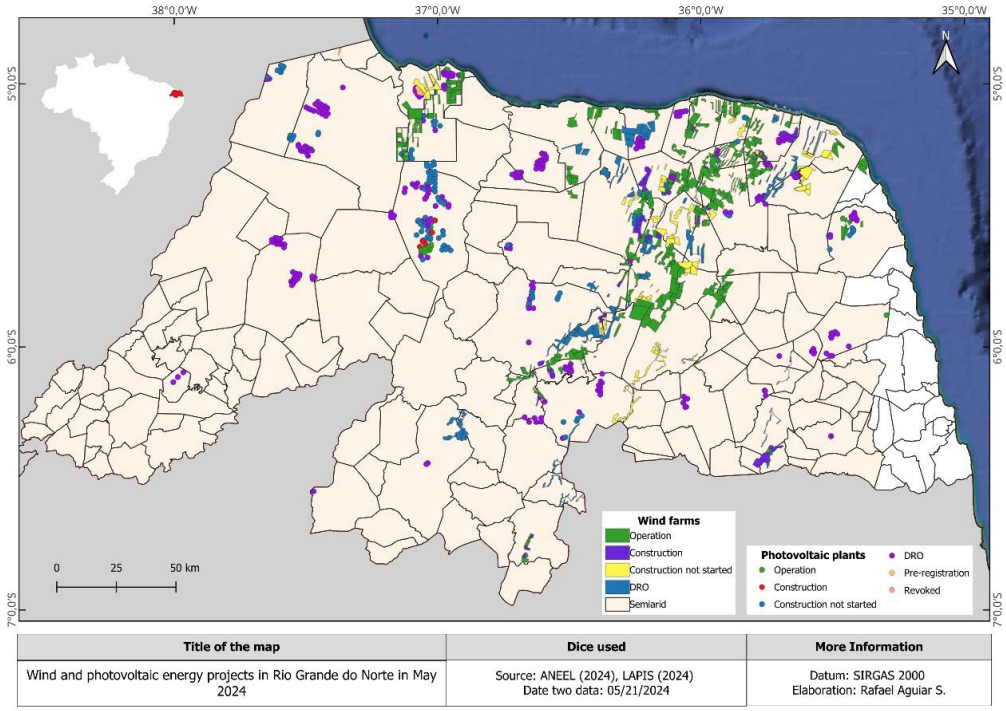


Title of the map	Dice used	More Information
Wind and photovoltaic energy projects in Ceará in May 2024	Source: ANEEL (2024), LAPIS (2024) Date two data: 05/21/2024	Datum: SIRGAS 2000 Elaboration: Rafael Aguiar S.

Source: Prepared by Rafael Silva from data of May 21, 2024, from SIGA (ANEEL, 2024).

In the case of RN, it is noted that currently, the total number of wind and photovoltaic solar energy projects in operation is 342; while those in the phases of not yet started and under construction are 273 and 29, respectively (Figure 03) (ANEEL, 2024). Of the total projects in operation, 302 are wind farms and 40 are photovoltaic solar power plants (Figure 03) (ANEEL, 2024).

Figure 03 – Map of the distribution of wind and solar photovoltaic energy projects in RN, Northeast Brazil



Title of the map	Dice used	More Information
Wind and photovoltaic energy projects in Rio Grande do Norte in May 2024	Source: ANEEL (2024), LAPIS (2024) Date two data: 05/21/2024	Datum: SIRGAS 2000 Elaboration: Rafael Aguiar S.

Source: Prepared by Rafael Silva from data of May 21, 2024, from SIGA (ANEEL, 2024).

When analyzing the figures presented, it is noticeable that where wind and solar photovoltaic energy ventures are located in the Brazilian semi-arid region. Although the implementation of these ventures in the Northeast of Brazil initially began on the coast, it has more recently expanded into the interior and, especially, the semi-arid region (Sobrinho Júnior, 2020). Given this scenario and the other data presented throughout this topic, it is also necessary to understand the extent to which the encouragement of the expansion and production of these energy sources in the analyzed states aligns with the issue of climate change from a mitigation and/or adaptation perspective, as discussed in the following topic.

Facing climate change in Brazilian Northeast states: are wind and solar renewable energies considered strategic?

Tied to the fact that BA, CE, and RN are major producers of renewable wind and solar energy, there is a set of public policies to encourage these energy sources in these territories. But to what extent do these policies show synergies or alignments with the issue of climate change, making them strategic for addressing this problem from a mitigation and/or adaptation perspective?

Before continuing this discussion, it's worth noting what is understood by climate change and its two main approaches: mitigation and adaptation. Climate change, based on the definition established by institutional bodies related to the subject, can be understood as the phenomenon of altering the climate system, which occurs naturally over a long-term period (UNFCCC, 1992), with strong influence from human actions (IPCC, 2007).

In the context of this discussion, mitigation, in the context of climate change, can be defined as the process of reducing or eliminating GHG emissions and carbon sequestration (IPCC, 2007; Smith *et al.*, 2008; PBMC, 2014). Climate adaptation, as understood by the IPCC (2007) and Pelling (2011), is seen as a process of adjusting a system to anticipate possible and potential climate impacts at the local level, based on climate projection scenarios, aiming to reduce vulnerabilities and socio-environmental risks associated with climate change.

With an understanding of these concepts, it is possible to continue the discussion, noting, for example, that in BA, in 2005, Decree No. 9,519 of August 18 was published, with one of its central objectives being to create the Bahia Forum on Global Climate Change and Biodiversity (FBMC-Bio), encouraging the implementation of climate change mitigation instruments (such as GHG emission reduction inventories) as well as adaptation to the impacts of climate change (such as studies on socio-environmental vulnerabilities and risks related to climate change) (Bahia, 2005).

In general, the Forum is more aligned with a mitigation perspective, to the detriment of adaptation. This reality is common when referring to the prioritization of public policies or actions for GHG emission mitigation rather than adaptation to climate impacts, as recent studies point out (Martins; Ferreira, 2010; Obermaier; Rosa, 2013; Lindoso, 2013; Di Giulio; Martins; Lemos, 2016; Rodrigues Filho *et al.*, 2016; Teixeira *et al.*, 2021).

The incorporation of wind and solar energy as strategic for addressing climate change is tangentially addressed by the Forum as it promotes the generation of electricity from renewable energy sources only as a way to reduce GHG emissions. In this perspective, when analyzing Resolution No. 4,180/2011; Law No. 13,914 of January 29, 2018; and CEPRAM Resolution No. 4,636 of September 28, 2018, aimed at renewable energy issues in BA (Bahia, 2011a; Bahia, 2018a; Bahia, 2018b), it is observed that they do not align with the climate issue, as they do not establish any guidelines or objectives for controlling and combating climate change in the state.

In 2011, Law No. 12,050 of January 7, 2011, was also enacted, defining the Climate Change Policy of the State of Bahia, whose objectives align with both the mitigation of

greenhouse gas (GHG) emissions and adaptation to the impacts of climate change (Bahia, 2011b). In general terms, renewable energies, under the term "clean technologies," not limited to wind and solar sources, are presented as one of the instruments of this Policy, playing a crucial role in addressing climate change from both mitigation and adaptation perspectives (Bahia, 2011b).

Unlike Law No. 12,050/2011, wind and solar energies do not appear in the text of the State Plan to Combat Desertification and Mitigate the Effects of Drought in Bahia (PAE-BA), published in 2014 as a state initiative focused on climate change and addressing its impacts, particularly desertification and drought (Bahia, 2014). In 2020, the government of BA, through the State Secretariat for the Environment of Bahia (SEMA-BA) and the Institute for the Environment and Water Resources of Bahia (INEMA-BA), initiated the revision of Law No. 12,050/2011, aiming to support the development of the State Climate Change Adaptation Plan (Bahia, 2020).

In 2022, BA developed the "Inventory of Greenhouse Gas Emissions and Removals: State of Bahia 2022," aiming to diagnose GHG emissions across the state to understand the profile of these emissions and the extent of their environmental impact (Bahia; ICLEI; Tabôa, 2022). Also in 2022, Resolution No. 5,092 of November 25 was published, establishing criteria and procedures for the environmental licensing of solar projects in the state of BA (Bahia, 2022). This Resolution addresses the recognition of the need to reduce GHG emissions.

In BA, based on the presented results, gaps are perceived in the interface between climate and energy issues, which is also observed in CE when analyzing public policies that promote wind and solar energy, as well as the state's climate change response strategies, according to the analysis and discussion of the results from this point onward in the context of this state.

Thus, in 2012, COEMA Resolution No. 06, dated June 14, 2012, was established, defining procedures for the Simplified Environmental Licensing of emergency works necessary to address the drought problem in the state (Ceará, 2012). In 2016, Law No. 16.146, dated December 14, was published, which mandates the creation of the CE State Climate Change Policy, which, in turn, will guide the development of the State Climate Change Plan (PEMC) and the State Adaptation Plan (PEA) (Ceará, 2016a).

Unlike COEMA Resolution No. 06/2012, Law No. 16.146/2016 presents the energy transition through a matrix based on renewable energy as one of the guidelines for the construction of the State Climate Change Policy. However, this does not necessarily mean that energy and climate issues in CE are being considered from a synergistic integration perspective.

From a perspective of promoting energy diversification in the territory of CE, Decree No. 32,438, dated December 8, 2017, highlights the establishment of Law No. 10,367, dated December 7, 1979, which in turn addresses the Industrial Development Fund (FDI) of CE (Ceará, 2017a). It is worth noting that also in 2017, in CE, the Ceará's Forum on Climate Change, Biodiversity, and Combat to Desertification (FCMC) was created, amended by Decree No. 32,161, dated March 2 (Ceará, 2017b), assigning responsibilities

from the perspective of climate adaptation while seeking to reduce climate impacts, with consequences on reducing vulnerabilities and socio-environmental risks related to climate.

In contrast to Decree No. 32,438/2017, Law No. 17,553, dated July 7, 2021, establishes, albeit in an incipient manner, alignments of renewable energy production in CE with climate change. This is because the legislation in question institutes the Program for Attracting and Supporting Renewable Energy Generation in CE, one of whose central objectives is to reduce greenhouse gas emissions (Ceará, 2021), thus encouraging the mitigation of climate change. Climate adaptation is also one of the focuses of the Program, as it seeks to diversify and decentralize the "state's energy matrix, promoting socioeconomic development in the interior to reduce regional inequalities" (Ceará, 2021, p. n.), which is intrinsically aligned with the process of adapting to climate change.

In CE, there are still other public policies aimed at promoting wind and solar energy in the local territory, with none having direct or indirect alignment with climate change. The policies are Resolutions No. 03/2016 (Ceará, 2016b), No. 06/2018 (Ceará, 2018a), and No. 07/2018 (Ceará, 2018b), all developed by the State Environmental Council (COEMA) of CE.

More recently, in 2022, Decree No. 34,733, dated May 12, was published, defining the "State Plan for Just Energy Transition of Ceará – Ceará Verde," with the aim of strengthening the state's low-carbon energy matrix to mitigate GHG emissions and achieve decarbonization, using renewable energy sources, especially Green Hydrogen (H2V) (Ceará, 2022). H2V is an alternative for the decarbonization process and, consequently, for addressing climate change, fostering energy transition by using renewable sources for its production (Brannstrom; Gorayeb, 2022).

The situation faced by CE regarding challenges and barriers at the interface between climate and energy issues is very similar to that of RN, as observed from the analysis of the few state public policies addressing climate change and the policies promoting renewable wind and solar energies in the state.

In 2017, the state government approved Law No. 10,154, dated January 21, establishing the State Policy for Combating and Preventing Desertification in RN (Rio Grande do Norte, 2017a). Also in 2017, Law No. 10,163, dated February 21, was published, regulating the creation of the State Policy for Distributed Generation with Renewable Energies (GDER) in RN (Rio Grande do Norte, 2017b). The following year, in 2018, this legislation was modified by Law No. 10,338, dated January 16, to add and outline the objectives of GDER in RN (Rio Grande do Norte, 2018a). Despite the update in legislation, there is no alignment with climate issues as there is no reference to the topic in the texts of the mentioned legislation .

Still in 2018, the Institute for Sustainable Development and Environment of RN (IDEMA-RN) created Normative Instruction No. 01, dated November 1, which addresses "State Complementary Law No. 272, dated March 3, 2004, regarding criteria and procedures for the Environmental Licensing of Solar Photovoltaic Power Generation Plants in the State of Rio Grande do Norte" (Rio Grande do Norte, 2018b, p. [page number not provided]).

In 2021, Law No. 10,934, dated June 17, was published, which establishes the creation of the State Energy Policy Council (CEPE) of RN (Rio Grande do Norte, 2021). Among the Council's purposes is the development of the State Energy Plan and the Environmental Energy Plan. Just like in this legislation, in the "State Plan for Environmental Prevention and Combat of Burnings and Forest Fires of Rio Grande do Norte (PEPACQIF-RN)," wind and solar energies are also not seen as strategies for addressing climate change.

With initial steps taken in 2020 through Ordinance No. 022, more recently, in 2023, Law No. 11,595, dated November 13, was published, defining the guidelines to be observed by the RN executive branch for the development of the State Climate Change Policy (Rio Grande do Norte, 2023). Wind and solar energies are presented in the legislation text as strategies for mitigating climate change, with adaptation to climate impacts not appearing as a perspective aligned with these sources.

To address the gap at the interface between climate and energy issues at the government level and their public policies, there is a need, for example, for improvement in climate public policies in various forms, particularly in the energy and electric sector, as pointed out by the studies of Tcvetkov (2021) and Collaço and Lazaro (2021). Generally, the discussed results reveal a scenario of challenges and gaps at this interface in the context of the analyzed states, as presented in the conclusions of the following section.

Conclusions

From the results discussed in the previous sections, it is clear that although BA, CE, and RN are highly productive states in wind and solar energy, representing approximately 66% of the total installed capacity in renewable energy sources in the Brazilian Northeast, the public policies encouraging these energies in these states show little synergy or alignment with climate issues. This is because, in general, these energy sources are not understood as alternatives to address climate issues, nor are they viewed from an adaptation perspective.

In turn, public policies addressing climate change also do not align with renewable energy sources, especially wind and solar, as strategic tools to deal with climate issues. When such synergy occurs, it is still from the perspective of mitigating its causes (GHG emissions), with the adaptation to climate impacts being secondary.

Given this scenario, this paper suggests, in conclusion, that governmental planning and agendas related to renewable energies in the states investigated do not integrate climate change as an issue that can be addressed through renewable energies as sources that assist in mitigating GHG emissions or adapting to ongoing climate impacts.

Thus, the objective proposed in the introductory section of this study is achieved to the extent that the public policies encouraging wind and solar energies and addressing climate change in the states investigated are presented and discussed, observing if and how these public policies understand and incorporate wind and solar energies as strategic to deal with climate change from a mitigation and/or adaptation perspective.

Additionally, it is important to emphasize that the advancement of wind and solar energy expansion in the Brazilian Northeast, more specifically in the states analyzed, continues from the perspective of promoting and dynamizing regional and local economic development rather than achieving global climate change goals.

In the field of the interface between Human Dimensions of Climate Change, Energy Geography, and Regional Planning, this paper contributes to a better understanding of renewable energies and climate change. Therefore, the approach taken in this paper is of fundamental importance to the academic field on the subject; but also from a social and public management perspective. Socially, it contributes to understanding problems that are at the heart of contemporary society. In public management, it assists in decision-making processes related to the relationship between climate and energy issues by actors, for example, institutions related to these themes.

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Rylanneive Leonardo Pontes Teixeira

✉ pontesrylanneive@gmail.com

ORCiD: https://orcid.org/0000-0001-8635-3234

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Zoraide Souza Pessoa

✉ zoraidesp@gmail.com

ORCiD: https://orcid.org/0000-0002-9509-5027

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SciELO

Energias renováveis e mudanças climáticas: análise de políticas públicas correlatas em estados do Nordeste brasileiro

Rylanneive Leonardo Pontes Teixeira
Zoraide Souza Pessoa

Resumo: O objetivo deste artigo é analisar como três estados do Nordeste brasileiro têm avançado em energias eólicas e solares ao mesmo tempo em que têm incentivado políticas públicas para expansão dessas energias, bem como de enfrentamento às mudanças climáticas, compreendendo se tais energias são como incorporadas nesses estados como estratégicas para lidar com a problemática climática. Metodologicamente, o estudo está ancorado em uma pesquisa de natureza qualitativa, utilizando-se de pesquisa documental e de análise de outros dados secundários como instrumentos de pesquisa para analisar os três estados, empregando a análise de conteúdo como técnica de tratamento dos dados. Os resultados e discussões deste artigo indicam que as políticas públicas de incentivo às energias renováveis e de enfrentamento às mudanças climáticas nos estados do campo empírico investigado não apresentam sinergias e alinhamentos entre si, mesmo no contexto de estados altamente produtores de energias eólicas e solares no Brasil.

Palavras-chave: Transição energética; descarbonização; mitigação; adaptação; Brasil.

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Energías renovables y cambio climático: análisis de las políticas públicas relacionadas en los estados del Nordeste brasileño

Rylanneive Leonardo Pontes Teixeira
Zoraide Souza Pessoa

Resumen: El objetivo de este artículo es analizar como tres estados del nordeste de Brasil han avanzado en energía eólica y solar al tiempo que han impulsado políticas públicas para expandir estas energías, así como para hacer frente al cambio climático, para comprender si estas energías están siendo incorporadas en estos estados como estrategias para hacer frente al problema climático. Metodológicamente, el estudio se ancla en la investigación cualitativa, utilizando la investigación documental y el análisis de otros datos secundarios como herramientas de investigación para analizar los tres estados, utilizando el análisis de contenido como técnica de procesamiento de datos. Los resultados y discusiones de este artículo indican que las políticas públicas de fomento a las energías renovables y de enfrentamiento al cambio climático en los estados del campo empírico investigado no presentan sinergias y alineamientos entre sí, incluso en el contexto de estados altamente productores de energía eólica y solar en Brasil.

Palabras-clave: Transición energética; descarbonización; mitigación; adaptación; Brasil.

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