



ENERGY JUSTICE FOR AN EQUITABLE FUTURE: THE IMPACTS OF DECARBONIZATION ON TRADITIONAL COMMUNITIES

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ABSTRACT

This work aims to analyze the impacts of decarbonization from the perspective of energy justice, focusing on traditional communities in Seridó, a region located in the hinterland of Rio Grande do Norte. The research seeks to understand how the low-carbon energy transition can accentuate social inequalities when it does not incorporate principles of equity and community participation. The methodology adopted was a qualitative approach, with a literature review on energy transitions and distributive and procedural justice, in addition to conducting a questionnaire with the members of the socio-environmental institution Seridó Vivo, who fight for fair access to energy and suffer the negative impacts of energy inequality. The instrument was answered by fifteen participants, allowing the identification of perceptions about the impacts of the expansion of wind and photovoltaic projects in the region. The results point to significant socio-environmental vulnerabilities, such as deforestation of the Caatinga, loss of territorial autonomy, and lack of prior consultation with communities, as provided for in ILO Convention 169. The study found that the decision-making processes related to the implementation of renewable energy projects lack participatory mechanisms and equitable distribution of benefits. In conclusion, energy justice should be considered as a structuring axis of the energy transition, integrating social, environmental, and political dimensions to ensure a truly equitable and sustainable future.

Keywords: Energy justice; Energy transition; Decarbonisation.

1 INTRODUCTION

The energy transition and the fight against climate change require plans to be drawn up related to the mitigation of greenhouse gas (GHG) emissions and, without carbon capture and sequestration mechanisms, or successful engineering projects, GHGs will impose an increasing load on the atmosphere. However, the challenge of low-carbon energy transitions is not only that of switching to a new, less carbon-intensive technical regime, it is also a challenge in terms of ensuring that the costs, risks and societal benefits of this shift are distributed in a way that can be considered "fair". There are technical approaches to creating decarbonized energy systems, but few consider how to decarbonize without accentuating inequalities and concentration of power.

Energy sustainability is a multifaceted phenomenon. Accordingly, continuous assessments of boundaries and professional competencies are required to address the ongoing disruptions in the energy sector and the studies surrounding them. At the same time, the United Nations' Sustainable Development Goal 7, which aims to ensure access to affordable, sustainable, and modern energy for all, reflects how integrated the challenges are. For a more comprehensive treatment of sustainability, studies on low-carbon energy transitions should address technical transitions and energy justice transitions as complementary and intrinsically linked processes. After all, how can we expect a significant transformation in the way energy is consumed and produced, when, during the construction of net zero systems, there is no constructive interaction between decarbonization with



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measures of comprehensive energy and social justice? Will the dimensions of justice always be considered after the fact and not before developing technological solutions?

Therefore, the objective of this article is to analyze the so-called low-carbon energy transformations seen through the lens of energy justice, where a case study was conducted that evaluates the impacts of decarbonization in a traditional community in Rio Grande do Norte called Seridó.

2 METHODOLOGIES

With epistemological position, the objectivity of scientific knowledge occurs through studies, observations, analyses, and experiments. The qualitative approach comes as an instrument for analyzing reality using methods for a new or broader understanding of the object under study. Once the structuring terms of qualitative research were identified, the process began through readings pertinent to the theme and analyses to structure this work. Reviews allow a qualitative synthesis of different concepts, theories, and debates to be conducted, uniting these bodies of literature to provide more in-depth information.

The studies related to the objective of the research happened into two strands. The first strand of the literature focuses on the study of energy transitions that addresses the interaction between Engineering and justice. Each literature was selected because of its relationship to systemic transitions and justice. The starting point was the speech on energy policy for sustainable development. This body of literature has a long history of advocating for the integration of social and ethical issues along with the economic, engineering, and environmental aspects associated with the expansion of energy systems. It highlights energy access around the world, and that the expansion of environmentally energy systems must be equitable, and affordable. In contrast, the second strand of literature included studies that focused on decarbonization as well as its impact.

It was necessary to build research on transitions and how issues related to power, justice and scale are addressed, as these are critical issues when it comes to justice in relation to system change. Therefore, to understand the socio-environmental impacts and participatory/distributive justice in the traditional communities of Rio Grande do Norte, it was necessary to apply a form. The questionnaire was applied in a socio-environmental institution called Seridó Vivo that works in defense of the use of space, defending the conservation of the Caatinga and the implementation of participatory justice before the implementation of renewable enterprises in the Seridó region. Notice that when traditional communities are mentioned, we mean Indigenous communities, Quilombolas, and Caatingueiros.

For the construction and application of the questionnaire, the Google Forms platform was used, in which 15 participants were able to answer 6 questions related to energy justice and the impacts faced due to decarbonization without the active inclusion of the affected communities. This process was necessary to increase the degree of security in relation to the theme and to promote a fine tuning between the theoretical framework and the first influxes of reality.

3 ENERGY JUSTICE

3.1. Conceptual framework

According to Williams and Doyon (2019), procedural justice concerns the various processes and elements of decision-making. In the context of environmental justice, it is understood as an ethical and political procedure, rather than a



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scientific and technical procedure. Procedural justice refers to equitable procedures that aim to involve all stakeholders in a non-discriminatory manner, thereby ensuring access to a process in which decisions are made in pursuit of social objectives. This includes access to information, the right to participate, recognition of unfair procedures, and a lack of bias on the part of project proponents and/or decision-makers. In the context of communities, key aspects used to evaluate the process include the mobilization of local knowledge, the dissemination of information, and institutional representation. Fair decision-making has been found to be at the heart of establishing and maintaining the legitimacy of rules and outcomes, and it has been argued that fair procedures encourage cooperation with stakeholders.

Distributive justice is concerned with equity in the distribution of decision-making results, considering the costs and benefits involved, as well as the attribution of responsibilities and potential risks. These results can manifest themselves in diverse ways, such as material goods, public goods, or negative externalities. In the context of technological initiatives and innovations, examples of (in)justice include the location of infrastructure, access to energy services, subsidies, investment costs, and the burden of energy costs. When analyzing risk allocation, distributive justice looks at which and whether the most vulnerable groups suffer more from negative externalities than others. Examples include children, who are more susceptible to air pollution, or low-income groups who suffer more because of rising energy prices or who are in energy poverty (WILLIAMS & DOYON, 2019).

In economic terms, distributive equity analysis often involves identifying the winners and losers of energy policies/projects, their socio-economic and demographic characteristics, the order of magnitude of the effects (direct and indirect), the assessment of environmental changes, compensation measures, and whether they offer the potential to reduce or increase specific social inequalities (e.g., Revenues from a carbon tax can be used to tackle energy poverty).

3.2 Case study: vulnerabilities and socio-environmental impacts of decarbonization in Rio Grande do Norte

The State of Rio Grande do Norte has been occupying a prominent role in the production of renewable energy. At the end of 2020, RN had a total granted power of more than 9.7 GW, distributed both in coastal and continental municipalities. There are more than 173 projects in operation installed in twenty-one municipalities, most of which have a small population size and whose human development levels are medium to low (PESSOA; MACEDO *et al*, 2022).

Initially installed in the coastal strip of the north of the state, the new onshore wind projects and photovoltaic panels have also turned inland, especially in the Seridó. The expectation is that the region will supply 25% of the next 9 GW of wind energy planned for Rio Grande do Norte, with 538 of the 1,873 new wind turbines.

All the municipalities where the construction of these wind farms takes place are rural, without an expressive social, economic, and urban dynamics, constituted in territories marked by conditions of multiple vulnerability (PESSOA; MACEDO *et al*, 2022). It is important to emphasize that renewable energies as a final product are considered sources of low greenhouse gas emissions. However, its production process is not clean and already characterized by the generation of socio-environmental impacts. In Rio Grande do Norte, for example, the deforestation of 26.07 hectares of the Caatinga Biome located in the municipality of Currais Novos was mapped, due to the installation of renewable energy projects in the region, as shown in Figure 1.

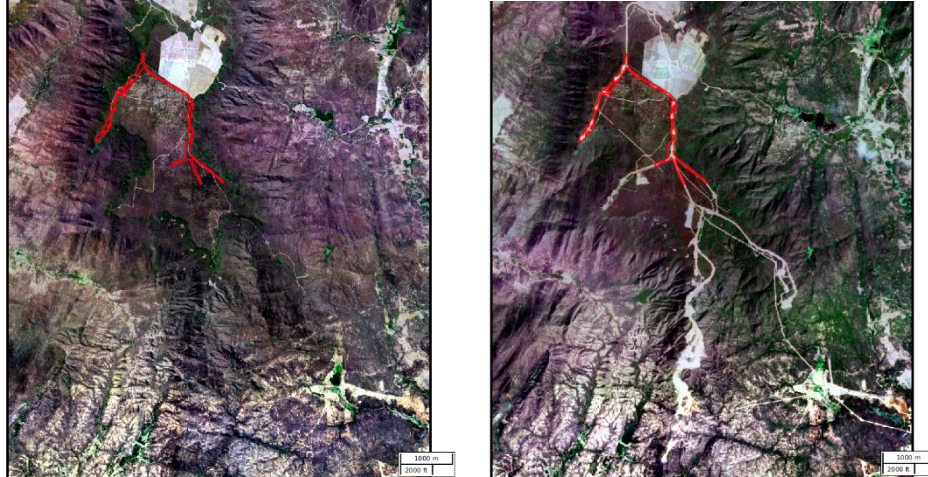


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Figure 1 - Before and after the Caatinga Biome.



Source: MapBiomias (2022)

According to data from MapBiomias, the organization responsible for the annual mapping of land cover and use in Brazil, renewable energy projects are already the second largest vector of deforestation in the Caatinga. This finding is based on the analyses conducted by the MapBiomias Alerta platform, which produces deforestation alert polygons and respective reports based on the detection of affected areas by different monitoring systems, such as DETER/INPE, SAD/Imazon, and SAD-Caatinga/UEFS, among others.

The generation of onshore wind farms, in the interior, takes place in elevated areas, the mountain tops, where there is greater wind speed. These tops are ecological refuges for species, with dense forest, and important for the water recharge of springs and rivers. It is observed that even though there is a verification of the impacts in municipalities of RN, such as Currais Novos, São Vicente, there is still no regulatory framework that considers the items pointed out at any level of government, whether federal, state or municipal, because the regulatory instruments of control, such as environmental licensing, cannot effectively act on the negative impacts on the social and ecological systems existing in the territory. This reality is observed in other states in the Northeast of Brazil, which implies that these are not isolated impacts, but there are already parameters and characteristics of this type of productive activity.

In view of this scenario, this work has information that was obtained through the application of a questionnaire (Table 1) from listening to traditional communities in the Seridó region to better understand the negative impacts of the implantation in the region.



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Table 1 - Dimensions of the socio-environmental impacts faced by traditional communities in the Seridó region of Rio Grande do Norte, Northeast, Brazil

Social and Environmental Impacts		
Dimensions	Kind	Description
Environmental and Social	Mischaracterization of the landscape	Deforestation of the Caatinga;
		Temperature Increase;
		Impact on biodiversity;
Social	Changes in cultural dynamics	Concern with the identity and ancestral erasure due to the construction of enterprises in mountains that are archaeological sites;
Social	Changes in Health condition	Disturbances caused by wind turbine noise;
		Insomnia;
		Headache;
		Acquired breathing problems due to dust;
Social	Contract Land lease	Loss of land autonomy;
		Contract of 20 to 30 years with automatic extension.

Source: (PESSOA & MACEDO *et al*, 2022); Questionnaire conducted with Seridó Vivo.

Adapted by the author.

In this sense, it was observed that the reality of the region has been changing throughout the implementation of the productive exploitation of wind energy. According to the answers obtained through the questionnaire carried out with the members of the socio-environmental institution Seridó Vivo, wind energy projects are installed in traditional communities, or in their vicinity, without free, prior and informed consultation, as recommended by Convention 169 of the International Labor Organization (ILO). Therefore, according to current legislation, traditional communities have not been adequately consulted about the implementation of wind energy projects, the same happens for photovoltaic energy. When asked if the lack of inclusion of traditional communities in decision-making about wind energy projects could lead to inequalities and injustices, they also reported that "the non-inclusion of these residents in decision-making has led to increased social inequality and injustices, such as loss of autonomy over their own land, due to abusive contracts, loss of tranquility, in the face of so much noise, dust and strange people, among other problems".

In the Northeast of Brazil, and in other areas of the Global South, consultative processes of exclusion, vast information asymmetries between members of the host community and decision-makers, and high dependence on land and sea



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resources competing with renewable energy infrastructures are commonly observed. Rigorous and secure collection of valid and reliable data is only possible after prior contacts between community leaders and the investigation team, due to the complicated relationships between host communities and external investor groups, which use the apparent "invisibility" of communities to usurp land and resources (BRANNSTROM et al., 2017; GORAYEB et al., 2018).

In this way, research on energy justice takes place within an interdisciplinary scope, which seeks to apply principles of justice and equity, as well as to understand how access to modern energy services is distributed, how the deployment of large-scale renewable energy projects affects vulnerable populations, and how energy decision-making often lacks adequate representation and involvement of traditional communities.

4 CONCLUSIONS

Energy justice is not just a philosophical endeavor. The application of justice concepts, especially distributive and procedural justice, is a welcome addition to decarbonization studies. In justice studies, it should involve an assessment of how national political actors, institutions and competing interests manage the translation of values into real life, down to the family and individual level. The failure to meet even the most basic energy needs around the world reminds us of the urgency in building an understanding of how to manage the transition to a more equitable and just global energy system. Energy justice could help us achieve a successful transition. In future studies it will be important to assess the strengths and weaknesses regarding justice concepts and research approaches in decarbonization studies, asking what kind of energy justice concepts are appropriate on decarbonization processes.

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