RELISE

LOCAL VOICES, GLOBAL ENERGY: A STUDY ON COMMUNITY PARTICIPATION IN WIND PROJECTS[1]

VOZES LOCAIS, ENERGIA GLOBAL: UM ESTUDO SOBRE PARTICIPAÇÃO COMUNITÁRIA EM PROJETOS EÓLICOS

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ABSTRACT

To ensure an effective transition from fossil fuels to more sustainable energy sources, it is essential to enlist the support of local communities and rely on strategic planning on the part of government bodies at the federal, state and/or municipal levels. However, in many instances, the contribution and involvement of the local community in the implementation of large-scale projects are neglected, resulting in situations of environmental injustice. To expand the analysis of this constantly emerging issue, it is imperative to investigate how the interaction between the community and wind energy projects has unfolded. Therefore, this article aims to map scientific production that addresses the integration between community participation and the implementation of wind farms. The study used a descriptive-exploratory approach and bibliometric methodology, analyzing scientific production from 2010 to 2024 through the Web of Science platform (CAPES) and the VOSviewer software. One of the main findings of the studies is the recurring observation that community participation has been a problematic point in several analyzed contexts. This is often due to the prevalence of business and government interests over the needs of communities. As a result, popular participation in decision-making processes for implementing wind farms is often ignored or seen as just a formality, and not as a legitimate and effective means. It is concluded that this gap, centered on

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community non-participation, is one of the main obstacles to the advancement of wind energy globally.

Keywords: wind farms, community participation, energy transition.

RESUMO

Para assegurar uma transição eficaz dos combustíveis fósseis para fontes de energia mais sustentáveis, é imprescindível angariar o respaldo das comunidades locais e contar com um planejamento estratégico por parte dos órgãos governamentais em âmbito federal, estadual e/ou municipal. Contudo, em muitas instâncias, a contribuição e envolvimento da comunidade local na implementação de empreendimentos de grande porte são negligenciados, resultando em situações de injustiça ambiental. Para expandir a análise dessa questão em constante evidência, é imperativo investigar como a interação entre a comunidade e os projetos de energia eólica tem se desdobrado. Desse modo, o presente artigo tem como objetivo realizar um mapeamento da produção científica que aborda a integração entre participação comunitária e implantação de usinas eólicas. O estudo empregou uma abordagem descritivo-exploratória e a metodologia bibliométrica, analisando a produção científica de 2010 a 2024 por meio da plataforma Web of Science (CAPES) e do software VOSviewer. Um dos principais achados dos estudos é a recorrente constatação de que a participação comunitária tem sido um ponto problemático em diversos contextos analisados. Isso se deve frequentemente à prevalência dos interesses dos empresários e do governo sobre as necessidades das comunidades. Como resultado, a participação popular nos processos decisórios de implantação de usinas eólicas é frequentemente ignorada ou vista apenas como uma formalidade, e não como um meio legítimo e eficaz. Conclui-se que esta lacuna, centrada na não participação comunitária, é um dos principais obstáculos para o avanço da energia eólica globalmente.

Palavras-chave: usinas eólicas, participação comunitária, transição energética.

INTRODUCTION

Due to the impacts of global warming, the urgency and importance of decarbonization measures are increasing worldwide. Renewable energies have emerged as key players in the energy landscape, driving significant advances. The adoption of clean and natural sources, such as wind energy, encourages the pursuit of technological innovation and the identification of areas with potential for sustainable energy production.

It is evident that energy generated from wind is gaining increasing relevance as a viable option, considering its important role in the transition to renewable energy sources in many countries. It plays a significant role in electricity generation with lower carbon emissions, aiming to meet current and future demands. Thus, due to its growing diffusion, according to Suškevičs et al. (2019), wind energy often intertwines with various social aspects, emerging as one of the most debated forms of renewable energy, possibly due to the diversity of public concerns involved.

The concerns raised stem from various criticisms, such as those highlighted by Silva (2023), who notes that wind energy production exhibits dynamics that result in environmental impacts, affecting community and local life due to the effects of “clean” energy. In certain regions, communities directly face the consequences of modifications to their environment and, amid a sense of powerlessness, suffer from pollution - especially noise pollution - originating from wind farms.

To ensure a successful transition from fossil fuels to sustainable energy sources, it is essential to secure the support of local communities and to rely on strategic planning by governments at the federal, state, and/or municipal levels (Karakislak & Schneider, 2023). However, on many occasions, the contribution and participation of local communities in the installation of large-scale projects are underestimated, and their voices are not considered. This situation highlights

cases of environmental injustice, generating territorial conflicts and disagreements regarding the location of wind turbines (Ribeiro, 2021).

To deepen the understanding of this issue, which has proven to be recurrent, there is a need to explore in greater detail the interaction between community participation and wind power projects. This is because the effectiveness and sustainability of wind energy projects do not depend solely on technical and economic aspects, but also on the effective integration of the voices and interests of local communities. In light of this perception, the following research question was formulated: how has community participation been incorporated into the planning, development, and operation processes of wind farms in different geographic contexts? To address this issue, the present article aims to map the scientific literature that addresses the integration between community participation and the implementation of wind farms.

Adopting a bibliometric review methodology, the study sought to identify research patterns, predominant areas of interest, knowledge gaps, and relevant contributions to the field. The bibliometric analysis was conducted using the Web of Science database, aiming to examine the relationship between community participation and wind farms since 1945. The period considered for analysis covered 14 years (from 2010 to 2024), corresponding to the beginning of the indexing of these themes in the database, given the complexity of obtaining results. Of the 44 studies initially identified, only 37 were selected as full articles for analysis. Subsequently, the data were processed using the VOSviewer software to create and visualize bibliometric networks, providing a clearer understanding of the evolution of research in this field over time.

This research is organized into five sections. Following the introduction, the second section presents a theoretical contextualization of the relationship between the categories of analysis under study. Next, the methodological

aspects are addressed. The fourth section discusses the results obtained, and finally, the concluding remarks are presented.

CHALLENGES AND PERSPECTIVES IN THE EXPANSION OF RENEWABLE ENERGIES: A FOCUS ON COMMUNITY PARTICIPATION

The urgency of expanding renewable energy at the local level is one of the main concerns of energy policies aimed at combating climate change globally. However, this priority is not always reflected in the practical implementation of renewable energy infrastructure, often due to the negative social impacts associated with it (Küpers & Batel, 2023; Bidwell & Sovacool, 2023).

Barriers to the adoption of wind energy are often related to the way decisions are approached, as they commonly consider only territorial planning issues and technically oriented energy policies. Studies indicate that this approach limits the implementation of Renewable Energy (RE), since participatory processes and existing mechanisms fail to adequately incorporate the concerns of local communities (Elkjær & Horst, 2023; Clausen, Rudolph, & Nyborg, 2021).

Active participation is essential for debating, implementing, and evaluating wind energy projects in local areas. However, decision-making processes are often conducted in ways that discourage public participation. Members of communities affected by the implementation of wind farms emphasize the importance of dialogue between companies and local authorities that is horizontal and free of technical language, thereby facilitating understanding among all those involved (Silva, 2023).

Corroborating this view, Gorayeb and Brannstrom (2020) highlight the importance of community participation in discussions on wind energy, noting that although it is seen as a solution to conflicts, its application is often limited by the scarcity of local resources and by policies that favor large companies.

Envisioning the participation of local communities aims to drive the energy transition by seeking local acceptance of projects (Park et al., 2022; Kontogianni et al., 2014). If communities have decision-making power over the location of wind farms, including veto power, this can reduce social conflict and promote the development of wind energy. However, when the role of communities is insignificant and their participation is merely a formality, community benefits lose relevance in explaining the dynamics of wind energy development (Simón, Copena, & Montero, 2019).

Thus, the advancement of wind energy becomes a growing dilemma: while it is essential for the transition toward a low-carbon, cost-efficient, and sustainable economy, it faces significant implementation challenges due to strong local opposition. To meet the Paris Agreement goals of achieving net-zero emissions by the middle of this century, a broad and rapid global expansion of wind energy is considered essential (Brandstedt et al., 2024). Therefore, understanding how affected communities have been integrated into this process is crucial, since the energy transition alone is not sufficient; it is also necessary to address the issue of energy justice, ensuring that policies, plans, and programs promote equitable and fair access to resources and technologies (McCauley et al., 2019).

MATERIALS AND METHODS

The article in question adopts a bibliometric review as its methodology, aiming to identify how community participation has been incorporated into the planning, development, and operation of wind farms across different geographical contexts, considering studies produced since 1945. Thus, the study seeks to identify the evolution of scientific production on the integration between community participation and the implementation of wind farms by analyzing

research patterns, predominant areas of interest, knowledge gaps, and relevant contributions to the field.

Initially, to achieve this objective, a bibliometric analysis was conducted, which is a relevant strategy for identifying research trends in academia. This approach allowed for the monitoring of authors, keywords, and countries, as well as the identification of themes addressed over time. The main database used was Web of Science (WoS), which includes journals indexed by the Coordination for the Improvement of Higher Education Personnel (CAPES). The search terms employed were “wind farm” and “community participation,” and the selected period comprised 14 years (from 2010 to 2024), that is, from the beginning of the indexing of these topics in the database, given the difficulty in obtaining results.

It is worth noting that bibliometric analysis is classified as a type of descriptive analysis that involves the application of bibliometrics to selected articles. Bibliometrics is a quantitative and statistical technique used to measure production indicators and to promote the dissemination of scientific knowledge (Araújo, 2006). This approach enables the identification and establishment of various units of analysis, which, in turn, supports the planning, evaluation, and management of science and technology within a specific scientific community or at the national level (De Medeiros & Pimenta, 2022).

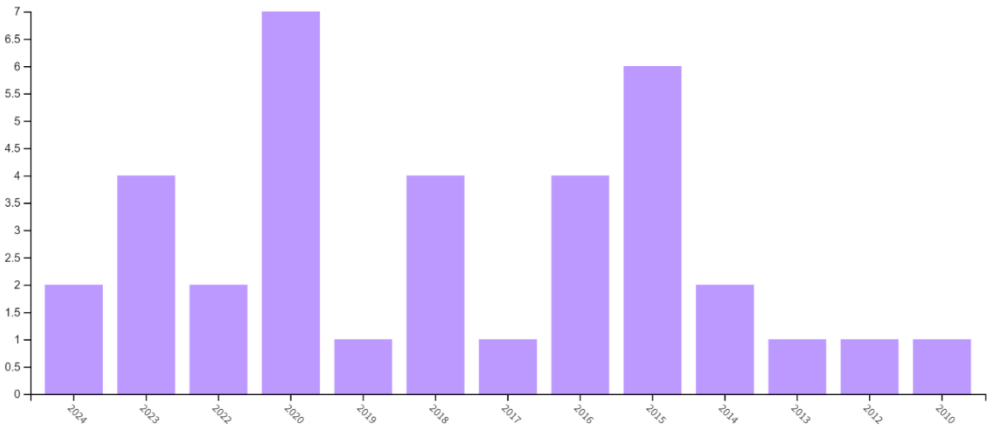
In this process, 44 studies were identified and indexed, of which only 37 were selected as complete articles. Subsequently, a file containing content, title, abstract, keywords, and references was exported for analysis. The data obtained were then processed using the VOSviewer software, a tool that enables the construction and visualization of bibliometric networks.

Based on these results, graphs were developed to represent the evolution of research over the years, as well as maps and tables highlighting the temporal scale, the articles and countries most engaged with the topic, and the most frequently used keywords.

RESULTS AND DISCUSSION

The bibliometric analysis conducted allowed for the survey of works cataloged in the Web of Science database, accessed through the CAPES platform. As a result, 36 works classified as scientific articles were identified over a 14-year period. Although the selected period encompasses 78 years, considering the beginning of the development and indexing of studies on the platform in 1945, no research was found on community participation in the implementation of wind farms until 2010, when these topics began to be included in the database, as shown in Figure 1.

FIGURE 1 – TIMELINE OF PUBLICATION OF SCIENTIFIC ARTICLES (2010-2024).



Source: Research data via *VOSviewer*

Initially, it can be observed that the development of scientific studies on the topic presented only gained prominence in the aforementioned database with the publication of the article “Public attitudes toward wind energy in Texas: local communities near wind farms and their effect on decision-making” (Swofford & Slattery, 2010). This approach marked a crucial point in the development of research on community perceptions of wind energy, especially in local contexts

close to wind farms. Likewise, it can be considered to have influenced the growth of academic interest in this area, stimulating new research and analyses on the subject and, consequently, contributing to a broader understanding of the effects of wind energy on communities and on related policy decisions.

Subsequently, a variety of studies emerged that also sought to present other approaches and nuances regarding community participation in decision-making processes. However, the volume of publications remains minimal, especially when compared to the social relevance of the topic. Thus, from 2014 onward, there was a slight increase in published articles (two), with an emphasis on social conflicts associated with approaches aimed at integrating the population in order to mitigate them, followed by 2015 (with six studies), 2016 and 2018 (with a total of eight studies), 2020 (seven), 2022 (three), and 2023 (five).

The article “Hot air blowing! ‘Media talk’, social conflict and the controversy over Australia’s ‘decoupled’ wind farms” highlights the role of the media in sustaining such conflicts by portraying wind farms as a threat to the sense of local belonging. Nevertheless, it also emphasizes that an energy transition is essential to minimize significant environmental issues, making it necessary to seek a balanced approach to implementation that includes genuinely participatory decision-making processes. This can be achieved by adopting a sociotechnical approach or orientation in siting decisions, in order to promote greater respect for and adaptation within contested areas, thereby enhancing local-level transitions to renewable energy (Hindmarsh, 2014).

Thus, when evaluating media coverage, five main causes of wind farm conflicts are identified, the foremost being the perception that they negatively affect the local landscape. In addition, significant environmental concerns and inadequate community involvement are cited as contributing factors (Hindmarsh, 2014). In this context, the relevance of the population in the development and siting of wind farms is emphasized, underscoring the need for improved

community engagement and for addressing impacts on the local landscape in order to ensure gradual yet continuous transitions to renewable energy sources.

In 2015, it is evident that the approaches presented in the articles reflect a certain degree of public resistance to the integration of wind farms into their social context, prompting reflections on how perception and multifactorial strategic planning are fundamental to building a collective process. Among these, the article “Beyond the NIMBYs (Not In My Backyard): what wind farm controversies can teach us about public engagement in hospital closures” stands out for seeking to promote a paradigm shift in how the implementation of wind farms in communities has been addressed.

At first, this line of analysis was characterized by a simplified view of the “attitude–behavior gap” between publics who supported the idea of wind energy but opposed local wind farms. Over time, however, it evolved into empirical studies - often qualitative - that explored multiple perspectives, including the complexity of public attitudes, revealing some of the rational concerns behind protests against wind farms, particularly with regard to environmental impacts. Moreover, the research examined community engagement processes in wind farm decision-making, highlighting the essential role of trust among communities, authorities, and developers in this context (Stewart & Aitken, 2015).

Between 2016 and 2018, publications emerged that effectively analyzed societal perceptions in the wind farm installation process through the use of semi-structured questionnaires. In this vein, emphasis is placed on the article “Factors influencing the acceptance and non-acceptance of wind energy by citizens in Germany”, which compiled approximately 1,400 responses and employed multinomial logistic regression as the method for data analysis. In general, the factors affecting the acceptance of wind energy can be grouped into procedural factors, individual attributes, perceived secondary effects, and technical and geographical considerations. Furthermore, certain changes in the legal

framework regulating new wind energy developments - particularly in Germany - are inconsistent with recommendations, suggesting that public will is often disregarded in several situations (Langer et al., 2018).

Regarding 2020, the most cited article is “Factors affecting community acceptance of onshore wind farms: a case study of the Zhongying wind farm in eastern China”, which investigated the aspects contributing to the acceptance of wind farm installations in 17 villages in China. It is observed that the dimensions analyzed presented a higher level of complexity compared to previous studies, addressing factors ranging from location, demographic characteristics, and environmental impact to genuine community involvement (Guan & Zepp, 2020).

In 2022, emphasis is given to the study “Once leases are signed, the deal is done”: exploring procedural injustices in utility-scale wind energy planning in the United States. This work addresses the problems - particularly arbitrariness - associated with the implementation of these energy production projects. A relevant and innovative contribution lies in analyzing not only the nuances surrounding “yes” or “no” decisions, but also issues related to procedural justice, such as participation, access to information, decision-making processes, and local context (Elmallah & Rand, 2022).

Finally, in 2023, the study “Three wind farm developments, three different planning challenges: cases from Denmark” emerges as a comparative analysis aimed at evaluating discrepancies in the implementation of wind farms across different communities. In these contexts, social acceptance is examined from the perspective of conflict management theory, highlighting the singularities and multiple dimensions involved. The paper investigates how the structure of the planning system prioritizes only economically measurable concerns at the expense of intangible ones that nonetheless hold relevance for the population, resulting in intensified confrontations. In addition, policy recommendations are offered to mitigate these conflicts, emphasizing the importance of proactive

engagement with affected communities in collaboration with the public sector from the early stages of the process (Borch, Kirkegaard & Nyborg, 2023).

In light of the above, the importance of creating transparent mechanisms for community participation - along with the dissemination of information and decision-making procedures related to the construction, operation, and decommissioning of wind farms - becomes evident. These frameworks must encompass more than simply deciding where wind farms will be built, as most people are not aware of all the issues involved. Therefore, it is also essential to consider local contexts, including the history of energy generation in the region and residents' ties to the land.

It is further observed that such analytical methods, particularly those aimed at mapping the dimensions that effectively determine the integration of wind farms into communities, are fundamental to the development of effective policies and strategies in the renewable energy sector. The diversity of aspects considered in these studies - such as location, demographics, environmental impact, and public participation - reflects the complexity of the topic and the need for a holistic approach. Additionally, it is commonly noted that, regardless of the different contexts highlighted in the studies, community participation has consistently been a problematic aspect in the interaction between governments, companies, and communities.

Complementarily, an analysis of the five most cited articles is conducted, seeking to understand their distinctive characteristics and how public participation is incorporated as an object of study, as detailed in Chart 1. Initially, it is observed that the level of public satisfaction with the implementation of wind farms directly influences a harmonious process oriented toward sustainable development. Thus, in order to adequately address community demands and overcome potential challenges, it is essential to investigate concerns associated with wind energy, including its environmental and visual impacts. Likewise, the relevance

of promoting dialogue and collaboration among the wind energy industry, government, and residents is highlighted, with the aim of building trust and achieving consensus on the benefits of this form of energy.

CHART 1 – CO-AUTHORSHIP WITH THE MOST CITED NAMES IN THE WOS (2003-2024).

Article title and classification.	Authors.	Number of citations.	Year of publication.	Country.	Keywords.
1°: Public attitudes of wind energy in Texas: Local communities in close proximity to wind farms and their effect on decision-making.	SWOFFORD, J; SLATTERY, M.	268.	2010.	United States of America.	Wind energy; attitudes; Texas.
2°: Wind farms—Where and how to place them? A choice experiment approach to measure consumer preferences for characteristics of wind farm establishments in Sweden.	EK, K.; PERSSON, L	99.	2014.	Sweden.	Wind energy location; consumer preferences; choice experience; public opinion; non-market evaluation.
3°: Factors influencing citizens' acceptance and non-acceptance of wind energy in Germany.	LANGER, K. *et al.*	70.	2018.	Germany.	Acceptance; Wind energy; multinomial logistic regression; Germany.
4°: How wind became a four-letter word: Lessons for community engagement from a wind energy conflict in King Island, Australia.	COLVIN, R. M.; WITT, G. B.; LACEY, J.	58.	2016.	Australia.	Social identity; stakeholder participation; social acceptance; renewable energy; wind farm.
5°: Wind farm externalities and public preferences for community consultation in Ireland: A discrete choice experiments approach.	BRENNAN, N.; VAN RENSBURG, T. M.	58.	2016.	Ireland.	Discrete choice experiments; willingness to accept; wind farms; community representative; consultation.

Source: Research data

In this context, the first article, published in 2010 in the United States and cited 298 times, highlights that, in general, the population shows a good level of acceptance of wind farm development; however, those who live in areas close to such projects tend to have lower levels of acceptance. In addition, as previously mentioned, so-called NIMBYs play a role in resistance to these projects by rejecting their proximity. Nevertheless, it is important to emphasize that this movement is not the only explanatory factor for negative responses toward wind energy. Therefore, development plans need to emphasize public participation and education in order to address local concerns and environmental attitudes, thereby adequately dealing with the multiple elements involved in wind farm implementation (Swofford & Slattery, 2010).

The second study, “Wind farms—Where and how to place them? A choice experiment approach to measure consumer preferences for characteristics of wind farm establishments in Sweden”, published four years later and cited 99 times, explores the level of public acceptance of wind farm implementation based on three aspects: whether the development will not affect recreational areas; the type of ownership involved, and whether it will benefit the local community fully or partially; and whether residents are in fact included throughout the entire decision-making process (Ek & Persson, 2014).

In this scenario, consumers’ concern with the preservation of recreational spaces and their interest in promoting sustainable development that minimizes negative impacts on the environment and quality of life are evident. In addition, there is an effort to encourage the generation of direct benefits for the affected community, such as employment opportunities, increased income, and profit-sharing. This is accompanied by the promotion of transparency and open communication, allowing the community to feel included and part of the solution, which in turn increases the likelihood of acceptance of wind farm implementation.

The article “Factors influencing citizens’ acceptance and non-acceptance of wind energy in Germany”, cited 70 times, seeks to identify the elements that affect the issue under discussion. In this context, the following factors stand out: the planning process; the level of public participation, transparency, and communication; personal characteristics, values, beliefs, and attitudes toward wind energy; perceived side effects, environmental impacts, noise, and health concerns; and technical and geographical aspects, such as the location of wind turbines, their distance from residences, and aesthetic considerations (Langer et al., 2018). Although the study focuses on Germany, its conclusions can be extrapolated to a global context, as the aspects addressed are equally relevant in other parts of the world. Moreover, these principles can be adapted according to the specific characteristics of each context analyzed.

By comparison, the study “How wind became a four-letter word: Lessons for community engagement from a wind energy conflict in King Island, Australia”, with 58 citations, identified five main factors driving local conflicts associated with wind farm implementation: problematic engagement during the pre-feasibility phase, meaning that the community was not adequately consulted prior to construction, generating resentment and distrust; the absence of a neutral facilitator; a polarizing vote on the project, which divided the community and intensified conflicts; lack of space for opposition; and the minimization of the local context, particularly social and cultural aspects (Colvin, Witt & Lacey, 2016).

Thus, to improve engagement practices in wind energy projects - as well as in other sectors that involve land-use change - it is necessary to invest in more constructive dialogue, thereby reducing opposition and achieving broader and more assertive consensus within the community.

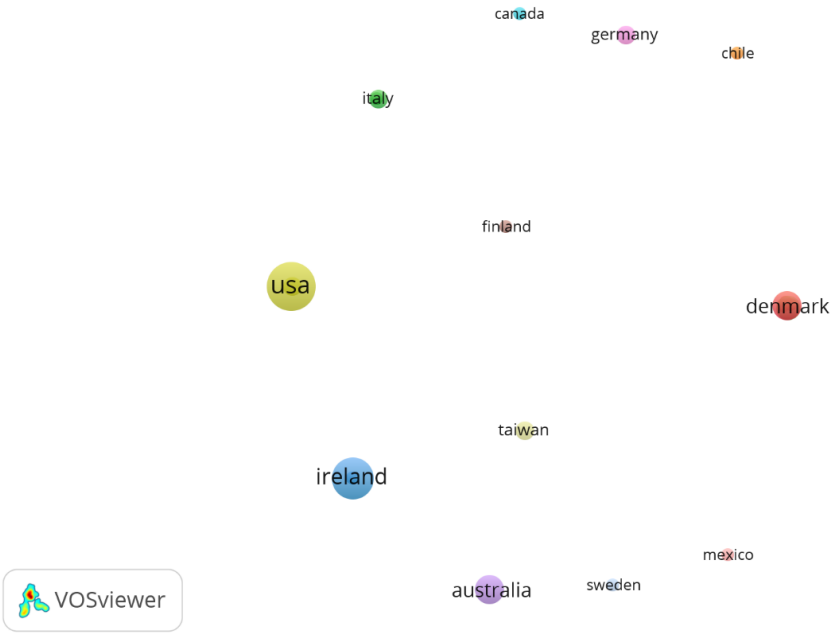
The fifth article, also cited 58 times and published in 2016, addresses the Irish context regarding the feasibility of wind farms. After consulting the local population, the study assessed the external effects of wind turbines and the

compensation required to enable their construction in the country. The results indicate that, with adequate compensation, most residents are willing to accept the installation of wind farms in their vicinity (Brennan & Van Rensburg, 2016). However, it is essential to consider long-term impacts and externalities that cannot be financially mitigated, such as landscape changes and quality of life. These findings have influenced wind energy planning policies in Ireland, ensuring that local concerns are addressed and that external impacts are kept to a minimum, while also weighing long-term implications.

In light of the above, to ensure social acceptance of wind energy in the United States, Sweden, Germany, Australia, Ireland, or even Brazil, it is essential to consider the various factors that influence public perceptions. Consequently, active and transparent public participation, open dialogue, and the mitigation of negative impacts are crucial to the success of the energy transition.

Furthermore, the scientific output of countries engaged in this topic shows similar patterns. Thus, Figure 2 presents the scientific production of 19 countries, ranked from the highest to the lowest number of published studies as follows: the United States, Ireland, Denmark, Australia, Scotland, Brazil, Italy, Germany, Taiwan, Austria, the Netherlands, Norway, Spain, Switzerland, Canada, Chile, Finland, and Sweden. However, collaborations are observed only among researchers from five specific countries: Denmark, Scotland, Norway, the Netherlands, and Austria.

FIGURE 2 – CO-AUTHORSHIP OF COUNTRIES WITH THE MOST PAPERS IN THE WOS (2003-2024).



Source: Research data via *VOSviewer*

With regard to the evaluation at the national level in Brazil, it is observed that the country is also engaged in research on this topic, especially concerning the scenario experienced in the state of Ceará, which has strong potential for the implementation of wind farms, including offshore projects, given its extensive coastline. However, numerous challenges are evident in achieving the implementation of such ventures, particularly those associated with maintaining sustainability across its multiple dimensions.

The first analysis indicates that the companies responsible tend to mask the real impacts of wind farms in their reports, while local communities suffer from environmental damage, land privatization, job losses, migration, and noise pollution. Previous research findings are confirmed, with new details regarding licensing documents and the scope of affected communities. To mitigate these obstacles, the need for more rigorous licensing processes is highlighted -

processes that combat corruption, enable community participation in decision-making, and effectively ensure the potential benefits of wind farms, including for the local population (Araújo et al., 2020).

Complementarily, it is noted that the lack of transparency and community participation in decision-making generates opposition to wind energy in Ceará, based on a study of three communities (Amarelas, Patos, and Maceió). In this context, the following aspects are associated with the lack of representativeness in decision-making processes: low participation in public hearings; distrust and dissatisfaction regarding access to information; lack of interaction among communities, companies, and the State; land-related conflicts; and the internal organization of communities (Leite, Brannstrom & Gorayeb, 2022).

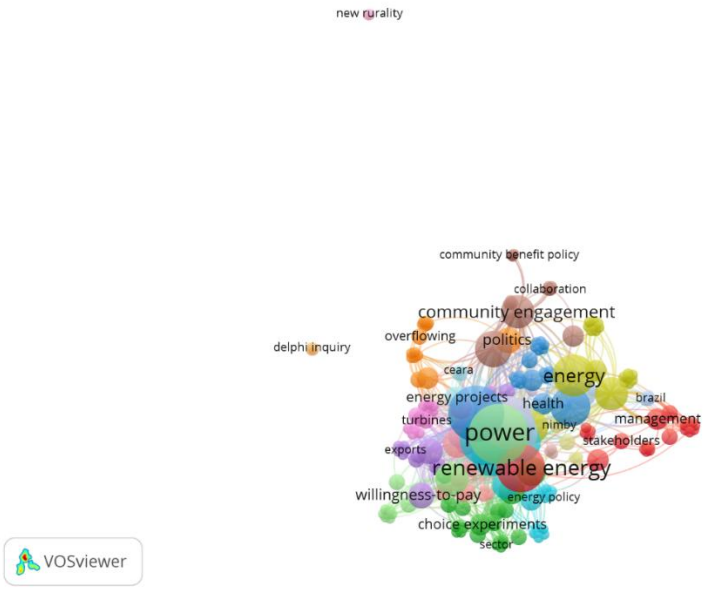
These elements underscore the critical importance of ensuring transparency and community engagement in decision-making processes related to wind energy. This means providing clear and accessible information about wind projects, as well as creating meaningful opportunities for community members to express their opinions and concerns. When the population feels genuinely included and informed, this helps build trust, reduce opposition, and promote broader and more sustainable acceptance of wind energy as a renewable energy source.

Conversely, a lack of representativeness can undermine the legitimacy of wind projects and provoke resistance among affected groups. Therefore, policies that encourage greater transparency - ensuring easier access to information and promoting active participation from the earliest stages of planning - are fundamental to fostering broader and more sustainable acceptance of wind energy, not only at the regional level but also globally.

Regarding the analysis of keywords, this approach facilitated the identification of affinities among the studies conducted. Moreover, it contributed to understanding the current academic landscape and the processes of

communication and collaboration among the researchers involved. In this regard, Figure 3 presents the 231 identified terms, with the most frequent being: power, wind energy, participation, social acceptance, and renewable energy.

FIGURE 3 – CO-AUTHORSHIP OF KEYWORDS WITH THE MOST CITATIONS IN WOS (2003-2024).



Source: Research data via *VOSviewer*

By conducting an overall analysis, it can be noted that these terms encompass aspects ranging from the capacity to generate electricity to the involvement of local communities in decision-making processes, reflecting the importance of social acceptance of wind energy projects, which is influenced by economic, environmental, and social factors. In addition, they highlight the role of renewable energy in the pursuit of a more sustainable and low–environmental-impact energy matrix. In summary, they provide a comprehensive view of the issues and challenges related to the topic, emphasizing the need for an integrated approach that takes into account not only technical and economic aspects but also social and environmental dimensions.

However, one identified gap is the lack of reference to specific aspects related to the mitigation of environmental impacts or the integration of wind

energy with other renewable sources. Although the identified keywords provide information on public perception, community participation, and the technical feasibility of wind energy, it is still necessary to understand how these elements are actually linked to popular decision-making capacity. Thus, a more comprehensive approach that also considers these dimensions could offer a fuller understanding of wind energy development.

Likewise, there is a need for more countries to engage in research on the interaction between wind energy and public participation, with the aim of ensuring the sustainable and inclusive development of this renewable source. As a result, it becomes possible to achieve a better understanding of its potential, along with the challenges and opportunities in different regional and socioeconomic contexts, helping to identify best practices and strategies to promote inclusion and equity in the development of renewable energy projects. This includes ensuring the active participation of local communities, especially those historically marginalized or disproportionately affected by environmental issues.

FINAL CONSIDERATIONS

It is undeniable that wind energy is becoming increasingly prominent as a viable option, considering its leading role in the transition to renewable energy sources in several countries. It contributes to electricity generation with a significant reduction in carbon emissions, aiming to meet current and future demands. Numerous studies highlight the importance of wind farms as a key strategy in the transition toward a low-carbon energy matrix. However, addressing the challenges associated with the installation of these projects is essential to achieving the desired objectives.

In this context, one of the central issues lies in mitigating negative externalities in the affected areas. Accordingly, community participation emerges

as an essential element to be fostered, ensuring that decisions related to wind energy are inclusive and reflect the needs and concerns of local communities.

Thus, this research emphasized the importance of understanding how community participation is integrated into the planning, development, and operation of wind farms in different geographic contexts. This was achieved through an analysis of scientific production, seeking to examine the relationship between community participation and wind farms since 1945. The period analyzed covered 14 years (from 2010 to 2024), coinciding with the beginning of the indexing of these themes in the database. In this way, it was possible to highlight several relevant considerations.

It is recurrently observed that, across the various contexts analyzed in the studies, community participation has consistently been a problematic point in the interaction between governments, companies, and communities. This occurs because the interests of private developers and governmental entities often prevail over the needs of local communities. As a result, popular participation in decision-making processes related to the implementation of wind farms is ignored or treated merely as a formality, rather than as a legitimate and effective practice.

The research also revealed that, to ensure social acceptance of wind energy in different countries, it is essential to consider the multiple factors that influence people’s perceptions and attitudes. Therefore, active and transparent public participation, open dialogue, and the mitigation of negative impacts on communities living near wind farms are fundamental to the success of the energy transition.

Thus, the study shows that, in general, community participation has been insufficiently incorporated into the planning, development, and operation processes of wind farms in several geographic contexts. This gap constitutes one of the main obstacles to the global advancement of wind energy. Accordingly, it is essential to adopt a more inclusive, transparent, and participatory approach, in

which the voices of affected communities are heard and taken into account from the early planning stages through implementation and operation. Only then will it be possible to achieve a truly sustainable and successful energy transition.

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