



Original research article

A quiet public? Procedural justice in Portuguese wind energy governance

Flávio G. Oliveira^{*} , Inês Campos , Filipe Moreira Alves 

CE3C – Centre for Ecology, Evolution and Environmental Changes & CHANGE – Global Change and Sustainability Institute, Portugal

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ABSTRACT

Historically, wind energy has been central in studies on the social acceptance of renewable energy technologies within European countries, apart from Portugal. Public participation in wind energy developments in Portugal has been residual, resulting in a frequently unopposed deployment of wind energy in the country. In the context of the proliferation of new investments in wind energy expansion and ambitious future targets, this analysis takes stock of the Portuguese case study to enquire whether new developments led to a fairer public participation in wind energy, and what new civic participation dynamics are emerging. The approach comprises a review of existing literature, expert stakeholder interviews, and quantitative research on public consultations. Key findings reiterate that public participation for onshore wind has remained low through time, particularly when compared with solar power projects. Conversely, offshore wind has received more public opposition, especially from local fishing communities and environmental organizations. Higher levels of community participation for wind, and other renewable energy technologies such as solar, require more extensive policy changes, including community engagement measures, to achieve true distributive and procedural justice.

1. Introduction

Wind energy is currently positioned to become the main renewable energy source in Europe. Eight European countries already get more than 20 % of their electricity from wind power [1], and more should follow, thanks to the REPowerEU Plan. In 2023, the EU installed 16.2 GW of new wind capacity, which is only half of the 33 GW/year required to meet the 2030 climate targets [1].

The growth of wind energy has brought associated challenges related to the social and environmental dimensions linked with the spatial conditions of power plant siting [2]. Wind power is stronger in environmentally rich and sparsely populated areas (i.e. rural areas), creating an uneven distribution of impacts where less energy-demanding communities bear the implementation costs [3]. This distributive unfairness has led to wind energy production being at the center of community contestation [4] and to the emergence of opposition towards wind energy throughout Europe [5,6] and in other continents [7,8]. Failure to address this increasing opposition can compromise climate targets at different regional levels [9].

Portugal has been an exception among European countries, where its current share of renewable electricity has grown alongside low levels of public participation and private ownership of wind power plants (WPPs) [10]. Research has shown that a policy framework that heavily favored

companies with a large financial capital was the key explanation for the sudden and nearly unopposed development of wind energy at the beginning of the century [10]. This created a centralized and managerial decision-making process, where local communities hardly participated in the design and siting of WPP projects [11]. This lack of civic engagement may be symptomatic of weak procedural justice since research has highlighted the relevance of localized protests for the democratic engagement of local populations [12].

Nevertheless, energy projects have become increasingly contested in recent years, as citizens have gained more awareness of the adjacent social and environmental impacts [11,13]. For example, future oil and gas prospects have been successfully stopped due to mass protests from climate activists [14]. Mining became another target of massive protests, particularly related to lithium extraction [15]. Large-scale solar energy faces increasing opposition from local communities and environmental organizations [13,16,17]. These developments may equally influence public participation in wind energy developments.

The Portuguese government created an online portal in 2015 (*Participa*: <https://participa.pt/>) to centralize information regarding environmental impact assessments and provide a platform for citizens to leave written comments during public consultations. The portal offers a centralized consultation process through which the government complies with European Law requirements. Despite allowing increased

^{*} Corresponding author at: Rua Antero de Quental, 52 B, Urbanização Colinas do Cruzeiro, 2675-690 Odivelas, Portugal.

E-mail address: fagoliveira@ciencias.ulisboa.pt (F.G. Oliveira).

accessibility and visibility to projects with associated environmental impacts, it lacks inclusionary practices and accessibility due to its online format and technical language, which does not necessarily improve the quality of participation. As *Participa* entails a non-binding, low level of participation, mainly corresponding to tokenism levels of participation (i.e., informing, consultation) [18], it is uncertain the extent to which the portal supports procedural just processes and can promote social acceptance of novel policies and projects [17,19]. Therefore, it becomes relevant to ask whether Portuguese citizens will remain a quiet public in wind energy developments or if participation will increase. The focus on wind energy is relevant as significant growth in wind energy investments is expected to meet the country's ambitious climate goals [20].

Thus, this work aims to investigate the dynamics of public participation in wind energy projects in Portugal in the last 20 years. Specifically, the study has sought to offer insights into the development of procedural justice through public participation processes in wind energy in Portugal over the years and its role in advancing energy-just wind governance. These findings are likely relevant to other European countries, particularly those in economically constrained contexts [21], who are rapidly advancing towards achieving ambitious energy targets yet may overlook critical procedural justice aspects.

This study hypothesizes that public participation in wind energy developments has increased in Portugal in the last 10 years. To verify this hypothesis, the study employed a multi-method approach, consisting of interviews with expert stakeholders, the analysis of public participation in wind energy projects, regulatory and policy documents, and scientific and newspaper articles about the topic.

In the following section, relevant concepts such as environmental and energy justice are outlined to provide the conceptual grounds for the analysis. In Section 3, the methods are presented, and in Section 4, the results are described. Sections 5 and 6, respectively, discuss the key findings and offer a synthesis of the conclusions and their relevance to future research.

2. Background

Energy justice has its origins in the principles of environmental justice [22], which seek to address the inequitable environmental burdens faced by marginalized and vulnerable communities [23]. Environmental justice emphasizes fair treatment and involvement of communities in environmental policies and practices, ensuring no group disproportionately bears negative impacts of new developments or is excluded from the benefits of protection measures [24]. This principle informs energy justice by framing it within the broader context of equitable resource distribution and participatory governance [25]. In the Portuguese context, for instance, recent research emphasized how prospects for lithium mining under a 'green transition' narrative are leading to significant environmental concerns, creating 'green sacrifice zones' characterized by extractive activities in rural territories and affecting vulnerable communities [11,26].

Indeed, two overarching narratives have been found to prevail in Portuguese energy transition policies [27]. The mainstream narrative is characterized by economic growth, large investments, and energy exports, including ambitious strategies for green hydrogen production [28]. Offshore wind plays a critical role in achieving national decarbonization targets while placing Portugal as a frontrunner in the growth of this sector [29]. The alternative narrative is characterized by a need to include local communities [30] directly affected by large-scale investments (not only wind but also large-scale solar plants) [31] in transparent decision-making processes, including through cooperative investments and community ownership [27] (p.164). These narratives mirror critical energy justice concerns, often conceptualized through the three pillars of distributive, procedural, and recognition justice [33,34]. Distributive justice focuses on the spatial distribution of energy infrastructures (e.g., wind power plants, solar power plants, high-voltage

power lines), as well as the associated environmental, social, and economic impacts. This spatial distribution entails questions of scale [32]. For instance, small to medium installations are likely to have fewer distributive concerns than large-scale wind or solar energy parks [35,36]. It also addresses the equitable allocation of costs and benefits across society [37]. These costs are not merely monetary but include economic externalities such as resource depletion and the destruction of local habitats and biodiversity [38,39]. Furthermore, disparities in cost and benefit allocation often reflect pre-existing social inequalities, potentially excluding communities already facing other vulnerabilities (e.g., climate change impacts), from partaking in the benefits of new investments [40]. Thus, recognition justice highlights the importance of addressing the exclusion of marginalized and vulnerable populations in energy-related decisions [41,42].

Of central relevance to this study, procedural justice emphasizes the relevance of involving local populations in decision-making processes related to energy projects. It underscores the need for transparency, ensuring access to clear and accurate information [43,44] and the empowerment of citizens to influence decisions impacting their lives. Thus, participation is central to procedural justice and should be conducted in a way that empowers citizens to influence decisions [44].

Furthermore, influencing decisions, trust, and transparency are important factors for the social acceptance of renewable energy technologies [45]. The concept was proposed by Wüstenhagen and colleagues to describe how society supports the implementation of renewable energy technologies [46]. The authors distinguished between sociopolitical, community, and market acceptance [46,47]. However, recent research has mainly focused on community acceptance, given the high sociopolitical and market acceptance of renewables over recent years [48]. Research has evidenced how citizens' opinions tend to be largely positive regarding renewables, despite increasing opposition at the local level [49,50].

Nevertheless, procedural injustices may also be characterized as instrumentally driven social acceptance [51], which does not consider the concerns and voices of local communities who may be called to participate through pro forma processes without the capacity to influence decisions made [52]. Public consultation processes may fit into this category if citizens' suggestions are not accounted for, and risk aggravating pre-existing structural injustices [51].

To tackle participation in the energy transition, Chivers and colleagues proposed the 'ecologies of participation framework', acknowledging the dynamic and interconnected nature of participatory processes [53]. This framework understands participation as a series of interrelated actions shaped by cultural, social, and institutional contexts. Participation is thus defined broadly to include formal mechanisms, such as public consultations and hearings, as well as informal practices such as grassroots community projects [52]. Participatory practices can be characterized based on their participation models (e.g., public hearings, general assemblies of energy cooperatives), engaging diverse subjects of participation (e.g., citizens, local communities, investors, policymakers) and objects of participation (e.g., wind energy installation) [52,53,55]. These practices are embedded in broader energy constitutions or established rules, policies, and governance and can emerge through top-down or bottom-up efforts [53]. Thus, participation should not only be procedurally fair but also transformative, fostering equity in energy governance.

The diversity of subjects of participation can span from citizens participating in public consultations to energy communities. Energy communities may include formal and informal groups and organizations, such as renewable energy cooperatives, renewable energy communities and citizen energy communities (as legally defined by the European Union's directives) [56], and other grassroots and informal communities working on alternative ways of producing and (self-) consuming energy from renewable sources but also offering services such as energy efficiency. A key characteristic is their local nature and their focus on activities with direct social, economic, and environmental

benefits to local communities, rather than being profit-driven.

Public consultation, in contrast, is a top-down engagement process (typically implemented by government bodies), which entails structured methods of engaging stakeholders and citizens to gather their input on policies or projects. Participation in public consultations can thus serve as a measurable indicator of procedural justice [57]. However, depending on how citizen inputs are integrated, public consultations can be either pro-forma participation processes or provide an instrument to enhance procedural justice [58,59].

3. Materials and methods

To verify the hypothesis that public participation in wind energy projects has increased in Portugal, in line with what has been observed in other European countries and their civil movements [60], the study takes stock of a multi-method approach, including qualitative and quantitative methods, namely a scoping review, expert interviews and the analysis of public participation statements. The triangulation of the results from the methods applied sought to offer interpretative insights into the dynamics of public participation and how procedural justice and interrelated issues of distributive and recognition justice have been enacted in Portuguese wind energy governance. Data collection took place between January and May 2024. The interactions between the methods applied are illustrated in Fig. 1.

3.1. Scoping review

The key focus of the review of research articles and policy documents has been to gain insight into questions of procedural justice in the Portuguese case, considering European Law as a critical driver of national legislation [61]. This review enabled gaining a historical perspective of public participation in wind energy in Portugal, framing the following research steps.

Databases of Google Scholar and Semantic Scholar were searched to identify primary sources of information such as scientific articles, books, and theses. Relevant documents were searched using the following keywords in both English and Portuguese when applicable: ‘wind energy’, ‘wind (park OR farm OR plant)’, ‘public OR community’, ‘participation OR engagement OR acceptance’, ‘Portugal OR Europe’. Abstracts and headlines of documents identified in our initial search were first prospected. When these sections were deemed pertinent to the study’s objectives, the full document was analyzed. Forward links and backlinks referenced in those documents were explored to gain a more comprehensive understanding of the events mentioned. This research was complemented with European case studies featured in the work of

Campos et al. [52].

Additionally, European regulation and legislation provide a critical contextual background for national policy. Most of these policies were referenced in the primary literature search described previously. To complement that search and obtain a broader scope for Portuguese policy regarding wind energy, we searched for national legislation on the *Diário da República* website (<https://diariodarepublica.pt/>) and the European Parliament website (<https://eur-lex.europa.eu/>) using the same expressions that we used for the primary literature search.

Additionally, TV broadcasts on popular national channels were covered, together with newspaper articles about wind energy in national newspapers and some local newspapers. These sources provided local and specialized information that was not readily available through other channels. Furthermore, we searched actors’ websites for reports, blog posts, and press releases referencing wind energy to understand actors’ aims and values and how they frame wind energy accordingly. Actors considered included citizen groups, environmental non-governmental organizations, researchers, public institutions, and project developers.

Searches through primary sources of information yielded a total of 12 scientific articles, two books, and six theses. Searches through local and national press bodies yielded a total of 18 newspaper articles and four TV broadcasts. Websites, blog posts, and press releases, mainly from citizen groups, environmental non-governmental organizations, researchers and their institutions, public institutions, and project developers, yielded a total of five reports and two blog posts. Finally, searches through *Diário da República* and the European Union website for legislation that referenced wind energy yielded a total of 16 statutes. In total, 61 documents were read and analyzed to create a historical perspective of public participation in wind energy in Portugal.

3.2. Interviews

Qualitative information on how experts perceived the enactment of procedural justice in wind energy was retrieved by conducting semi-structured interviews with stakeholders. Interviewees were selected based on their roles in and their involvement with wind energy, as well as through referrals from other interviewees. In total, nine individuals were interviewed (details in Table 1). Contacts were attempted with six additional entities for interviews: one environmental consultancy, three project developers, one electric grid manager, and one anthropologist. However, they either did not respond or were unavailable at the time. Interviews lasted an average of 1 h (range 43–97 min).

An interview guide was used with four question groups (Supplementary Material 1). The question topics were governance arrangements; governance processes and participatory practices; the role of

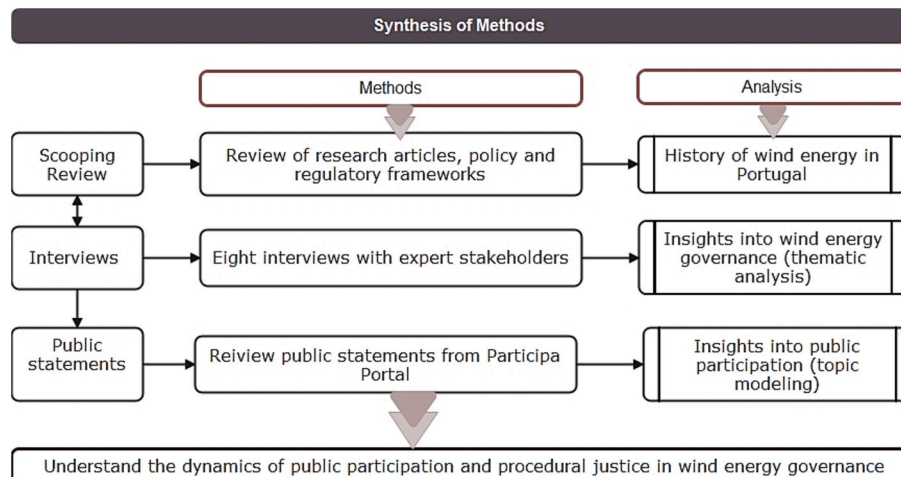


Fig. 1. Synthesis of methods and their interrelations.

Table 1

Characterization of interviewees based on stakeholder type and involvement in wind energy projects. Interview 3 was exceptionally conducted with two interviewees.

Interviews	Stakeholder type	Degree of direct involvement in wind energy projects (1-scarcely involved to 5-extremely involved)	Gender
Int1	Association of promoters, investors, and medium-sized energy companies	5	Female
Int2	Expert researcher	2	Female
Int3	Environmental non-governmental organization	5	Male and female
Int4	Energy cooperative	3	Female
Int5	Environmental non-governmental organization	4	Male
Int6	Governmental body	5	Female
Int7	Association of promoters, investors, and medium-sized energy companies	5	Male
Int8	Energy company	5	Male

European, national, regional, and local institutions; and issues of energy justice. Interview questions were formulated based on a background check on the interviewee's affiliation, as well as knowledge gaps raised while reviewing documents. Questions were deliberately broad to elicit information about actors, narratives, relevant legislation, procedural aspects, and interrelated distributive and recognition justice concerns. The questions also differed slightly due to the different roles, positions, and backgrounds of the interviewees.

All interviews were recorded with the consent of the interviewees, and the study received ethical approval from the authors' university. The analysis of interview data took stock of NVivo software, following a thematic analysis and interpretive approach [62] to identify the key codes and text elements that offered insight into the study's research questions, considering also repeated ideas and patterns within the data [63]. The thematic coding in NVivo returned 99 coded references and a total of 49 themes. These themes were analyzed and grouped into 19 key themes to analyze the development of procedural justice over the past two decades.

3.3. Public statements

This research step was directly informed by the interviews' results, leading the authors to seek additional information about public participation.

First, information on the number of statements left by citizens, either individually or representing specific organizations, at the national public participation portal (i.e. *Participa*) was collected through web scraping. Web scraping was done using the packages *rvest* [64], *Relenium* [65], *robotstxt* [66], *polite* [67], and *dplyr* [68]. Projects were selected by typing "wind" in the search bar. For each project consultation page, the phase of Environmental Impact Assessment, the location (district) of the project, the opening and closing dates to submit statements, and the number of statements left by individuals and collectives were scrapped. The results were collated into a table. Projects that did not concern wind energy were removed. The final database and accompanying analysis are available in a Zenodo repository [69].

The web scraping method yielded 79 energy projects from the portal *Participa*. Seven projects concerned hybrid installations of wind and solar energy and were not evaluated. One project referred to a permit to deploy a wind energy demonstration at sea and was also not evaluated. Thus, a total of 71 wind energy projects were analyzed concerning the period between 2015 and 2023. Of these, five were associated with

offshore wind, and the remaining 66 were associated with onshore wind. Only 59 wind energy projects received comments from citizens and organizations.

Second, due to highlights referred by interviewees concerning public opposition to large-scale solar plants, this research step equally investigated the number of public statements on large-scale solar power developments to compare findings with wind energy participation. Using the 'solar' search word, 142 projects were scrapped from the portal *Participa*. Of these, 132 concerned solar power plants, six concerned electric high-voltage lines that connected solar power plants, and four had no relationship with solar power. Thus, 132 solar power projects were analyzed to compare with the number of statements on wind energy.

Third, citizens' specific written statements were also analyzed. Given the study's focus on wind energy procedural justice, statements related to solar energy projects were not analyzed. Citizens' statements are only accessible at the Portal through the final PDF reports of the public consultation, sometimes containing comments reproduced as image files that could not be automatically or manually retrieved. Furthermore, reports were not always available, especially for consultations with a small number of participants (e.g., lower than 5). In these cases, reports were sometimes summaries of the comments received from citizens rather than the original commentaries. After excluding projects for which specific comments could not be retrieved or were incomplete, a total of 69 comments were analyzed, collected from 19 of the 59 wind energy projects that received comments.

The analysis of the statements from citizens and organizations applied topic modeling, which is a method to analyze unstructured text data by identifying key clusters of words and meanings [70,71]. The choice of method was due to the large amount of text data since each comment retrieved had one to two pages of text. The combination of thematic coding and topic modeling is increasingly used, as the two methods provide complementary insights, with topic modeling highlighting latent topics based on word frequency, which can be unnoticed in qualitative analysis of large text datasets [72]. The topic model was performed with the Gensim package – a Python library designed for the interactive visualization of Latent Dirichlet Allocation (LDA) [73,74], which is a popular topic modeling technique. The LDA algorithm helps identify keywords and construct a corpus of tokens, enabling the extraction of key topics within the corpus. The Gensim package integrates metrics such as topic coherence and perplexity metrics [73,74], which were used to help identify the ideal number of topics. Nevertheless, the final number of topics was set by the researcher, after several trial models, and interpreted according to content [75].

4. Results

In what follows, the summary results of the scoping review are provided, offering an overview of the national regulatory and policy framework of wind energy. Afterward, insights from the stakeholder interviews are complemented by the analysis of the public participation statements' data.

4.1. Historical review of wind energy in Portugal

4.1.1. Onshore wind

The first developmental step towards wind energy production in Portugal was an experimental turbine installed by LNETI, the National Laboratory for Engineering and Industrial Technology (today's LNEG, National Laboratory of Energy and Geology) [76]. The first wind power plant (WPP) was established in 1986 on the island of Porto Santo, Madeira, and the first mainland WPP was established in 1990 in Sines [77]. Subsequently, the sector experienced steady progress, marked by a consistent growth rate of approximately 40 % annually. This growth trajectory reached its zenith between 2004 and 2006, witnessing a remarkable increase of over 60 % in installed capacity each year.

After a period of scaling up, Portugal's wind energy sector entered a phase of substantial growth, propelled by the enactment of ambitious feed-in tariffs to meet energy targets imposed by the European Union. The publication of Directive 2001/77/EC of the European Parliament and of the Council, of September 27 (2001),¹ and in the same year, the Portuguese E4 Program (Energy Efficiency and Endogenous Energies, RCM n.º 154/2001, of October 19, 2001),² were critical milestones to diversify access to renewable energy available in the market and improve energy efficiency [61].

Decree-Law n.º 339-C/2001, of December 29,³ was a key piece of legislation that both attracted investment interest from project developers in constructing WPPs and, to some extent, dictated how public participation developed in the next few years. A new Decree-Law revised the previous tariff (Decree-Law n.º 168/99, of May 18)⁴ with a new formula that increased the received payment per electricity produced, averaging 0.085 €/kWh and ranging from 0.047 to 0.091 €/kWh [78]. Additionally, the policy mandated that companies operating WPPs paid municipalities a rent equal to 2.5 % of the monthly income from electricity produced. Many WPPs were sited in areas with low population density, and this rent was substantial for local municipalities, leading local mayors to endorse these projects [61].

The pace of wind energy development decelerated significantly after 2012, with a growth rate of less than 6 % per year [77]. The financial crisis that affected Europe in 2008 was the precursor to this deceleration. The International Monetary Fund was called in to supervise Portugal's budget spending and impose several austerity policy measures [79]. In 2011, a right-center party coalition came into power with a policy that prioritized energy efficiency rather than incentivizing new constructions. Decree-Law n.º 25/2012, of February 6 (2012),⁵ signaled this shift by suspending all new power generation allocation procedures indefinitely. Meanwhile, Decree-Law n.º 215-B/2012, of October 8,⁶ stopped the attribution of feed-in tariffs for new renewable energy facilities. These policy changes led many companies to rethink their national investments [80]. Furthermore, the development in the preceding decade exhausted optimal locations available for profitable wind energy projects, resulting in an unfavorable investment scenario for wind energy. From 2012 onwards, less than 10 WPPs were built every year, and 2017 marked the first year since 1998 in which no new wind energy projects were developed (Fig. 2).

The release of Portugal's National Energy and Climate Plan (NECP) in 2020 marked a turn in the country's energy and climate policies. Aligned with EU regulations and the Roadmap for Carbon Neutrality, the NECP set ambitious targets for the period 2021–2030. These include a 45–55 % reduction in greenhouse gas emissions, an increase in renewable electricity production to 80 %, and a reduction in energy dependency to 65 %. Notably, the plan emphasizes the development of solar and wind energy, aiming for 27 % and 31 % power output from these sources respectively by 2030. Offshore wind energy is introduced in the NECP with a target of 2 GW of installed capacity by 2030.

The urgency to enhance renewable energy production increased after the Russian invasion of Ukraine, prompting the EU to launch the REPowerEU Plan in 2022. This initiative aimed to significantly increase wind and solar energy production across Member States to reduce dependency on Russian oil and gas. Accordingly, the government enacted

Decree-Law n.º 30-A/2022, of April 18,⁷ allowing WPPs to inject all electricity produced into the grid without limit, thus encouraging maximum utilization of their capacity.

Decree-Law n.º 30-A/2022, of April 18, was the first legislation that mentioned community engagement for renewable energy projects (article 6.º). The article mandates developers to include measures of local community engagement for wind energy projects with more than 10 turbines or a capacity of 20 MW. It provides examples of measures that can be incorporated in the project, such as promoting traditional rural activities, hiring local citizens to operate and maintain the project, and co-investment. It remains to be seen how this measure will be practiced by project developers, particularly for the planned offshore WPPs.

4.1.2. Offshore wind

WindFloat 1 was the first floating offshore wind turbine in the world using a semi-submersible structure to support a multi-megawatt wind turbine rather than traditional piles fixed on the ocean floor. It was installed on the Portuguese coast, near Aguçadoura (Viana do Castelo), and connected to the grid at the end of December 2019 by EDP. Following its success, EDP expanded the project by installing two more turbines and reaching a total installed capacity of 25 MW. Thus, WindFloat Atlantic was the first floating offshore WPP in continental Europe, using the described floating technology [81].

In September 2022, the prime minister announced a tender to install 10 GW of offshore wind capacity. This ambitious proposal is almost double the current onshore wind capacity of 5.7 [77], and thus drew international attention [82]. The government created a working group in 2022 that identified five core areas for offshore wind deployment and suggested a phased approach to the tender. The first phase will allocate 3.5 GW of capacity in the regions with higher wind potential along the north shore, namely Viana do Castelo, Leixões, and Figueira da Foz, while subsequent phases will address areas to the south [83]. However, successive delays and project opposition caused the government to review this target downwards to 2 GW in the new draft of the NECP.

4.2. Insights from expert interviews

Wind energy promoters have been key actors since the early stages of development, including small-scale producers and large international corporations. Other actors included energy regulators, public administrators, and local authorities. Municipalities were important supporters of wind energy as they benefited from 2.5 % of energy production profits in their district. Together with landowners, they participated in siting discussions and had financial benefits from new projects.

According to interviewee 5 [84], at the onset of wind energy in Portugal, project developers organized public sessions to explain the projects, and local populations were involved. Initially, these populations were found to either support the project or be indifferent towards it. Nevertheless, interviewees highlighted that both opposition and support existed for the same projects. A researcher found that opposition cases were “very few and only in the first years of wind energy development” (Int. 5, researcher, [86]). However, over the past decades, the participation of local communities has been scarce. Some interviewees argue for historically low levels of public engagement and civil participation, considering it a “cultural problem” (Int. 3, association of producers, [87]), while others blame the lack of transparency and short engagement periods of the public consultation process as exclusionary practices. Non-governmental organizations (NGOs) and researchers are highly critical of procedural aspects and of the portal *Participa*, considering it is far from inclusive. Nevertheless, even if citizens' opposition had been higher, experts claim it would not have

¹ Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market: <http://data.europa.eu/eli/dir/2001/77/oj>

² <https://diariodarepublica.pt/dr/detalhe/resolucao-conselho-ministros/154-2001-584617>

³ <https://diariodarepublica.pt/dr/detalhe/decreto-lei/339-c-2001-201849>.

⁴ <https://diariodarepublica.pt/dr/detalhe/decreto-lei/168-1999-323075>.

⁵ <https://diariodarepublica.pt/dr/detalhe/decreto-lei/25-2012-543695>.

⁶ <https://diariodarepublica.pt/dr/detalhe/decreto-lei/215-b-2012-588861>.

⁷ <https://diariodarepublica.pt/dr/detalhe/decreto-lei/30-a-2022-182213906>.

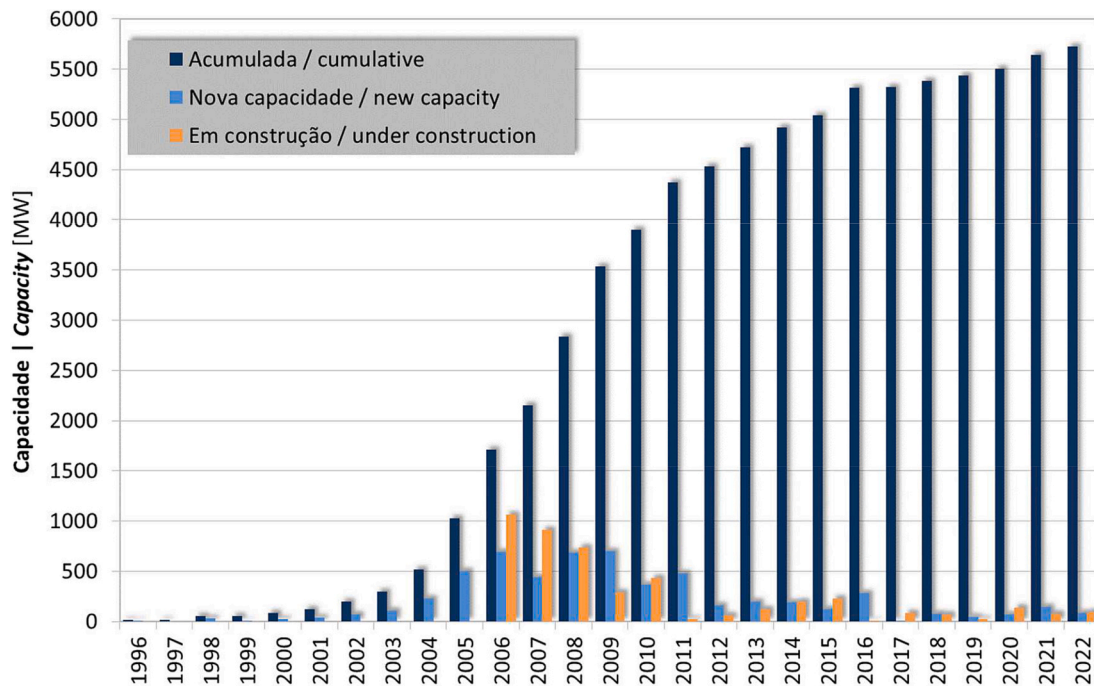


Fig. 2. Cumulative installed capacity of wind power in Portugal.

Source: e2p (2023).

influenced final decisions. Project approval or disapproval was perceived to be mainly dependent on central governmental bodies.

Interviewees emphasized some positive economic impacts of onshore wind, namely new knowledge and new wind turbine manufacturing industries entering the country, creating new jobs in less populated districts. These industries remain active today, mainly as export industries. There were also economic returns for municipalities and valorization of land due to the creation of a new source of income in lands at mountain tops, which were not suitable for farming but could be rented to wind energy promoters (Int. 3, association of producers, [87]). Nevertheless, communities sometimes expected specific benefits, which did not materialize, such as lower energy bills, leading to higher initial support for projects.

Non-governmental environmental organizations have been the main source of opposition to wind energy projects. Despite recognizing the benefits of achieving decarbonization goals, environmental activists were opposed to impacts caused by controversial siting decisions. Environmental organizations also consider the *Participa* portal as a proforma instrument for participation. Developers recognized that the construction stage was the most complex regarding opposition. After becoming operational, “people adapted, and there wasn’t much contestation” to the project (Int. 8, developer, [82]). A shared concern from environmentalists and promoters regards the end of life of wind turbines and the possibility to reuse and recycle these materials.

The opening of new access roads was mentioned as one of the strongest indirect impacts of onshore WPP construction. One interviewee mentioned that these roads can have a positive impact in fighting wildfires since they often “serve as a barrier to the progression of fires and as paths for firefighters to pass” (Int. 3, association of producers, [87]). However, the remaining opinions were largely negative due to their impact on previously isolated ecosystems.

Considering the future, interviewees perceive that the Ukraine-Russian war and the economic crisis have shifted political ambitions towards renewable energy. The announcement of a “gigantic target of 10 GW (of offshore wind) until 2030” (Int. 2, NGO, [88]) is perceived to be a consequence of this new political landscape. Nevertheless, wind energy siting is a critical challenge. Many interviewees pointed out that

optimal locations are currently sold out. Although there are some plans for small wind energy production, one developer added that “now the interest is in solar, possibly wind-solar combined, and offshore wind” (Int. 8, developer, [82]).

Environmental organizations are largely supportive of repowering older WPPs, which entails an opportunity to double the installed capacity in areas already explored due to improvements in technology while minimizing environmental impacts. Promoters, however, are prioritizing offshore wind and solar energy, with repowering having a secondary role in investment plans. Key themes and quotes from expert interviewees to illustrate these findings can be found in the Supplementary Materials, Table 1.

4.3. Public statements

The number of submitted public statements revealed that public participation in onshore wind energy remained low over time (Fig. 3). In a previous study, Delicado et al. [61] analyzed 76 wind energy projects between 2002 and 2012 and counted 105 statements from non-administrative entities. In this study, 66 onshore projects between 2015 and 2023 were analyzed, with 93 statements (Fig. 1). This gives a mean of 1.38 statements/project before *Participa* was created and a mean of 1.41 statements/project after *Participa* was created. The maximum number of statements was nine, suggesting that *Participa* had no discerning impact in changing public participation for onshore wind energy projects. The WPP with nine statements in Serra do Marão in 2019 was rejected. Opposition to this project was expressed mainly by two environmental associations and a local wolf protection association, but also by a competing wind company, which claimed the new WPP would be too close to a pre-existing WPP.

In contrast to onshore wind, there was a visibly larger number of statements for offshore wind projects (Wilcoxon rank sum test, $W = 266$, $p\text{-value} = 0.018$), which outclassed the number of statements for onshore wind by nearly nine times (mean, onshore = 1.41 ± 0.22 , offshore = 12.80 ± 4.96). The WindFloat Atlantic project only had one statement on both phases – Environmental Impact Assessment and Environmental Conformity Report of the Execution Project. In 2023,

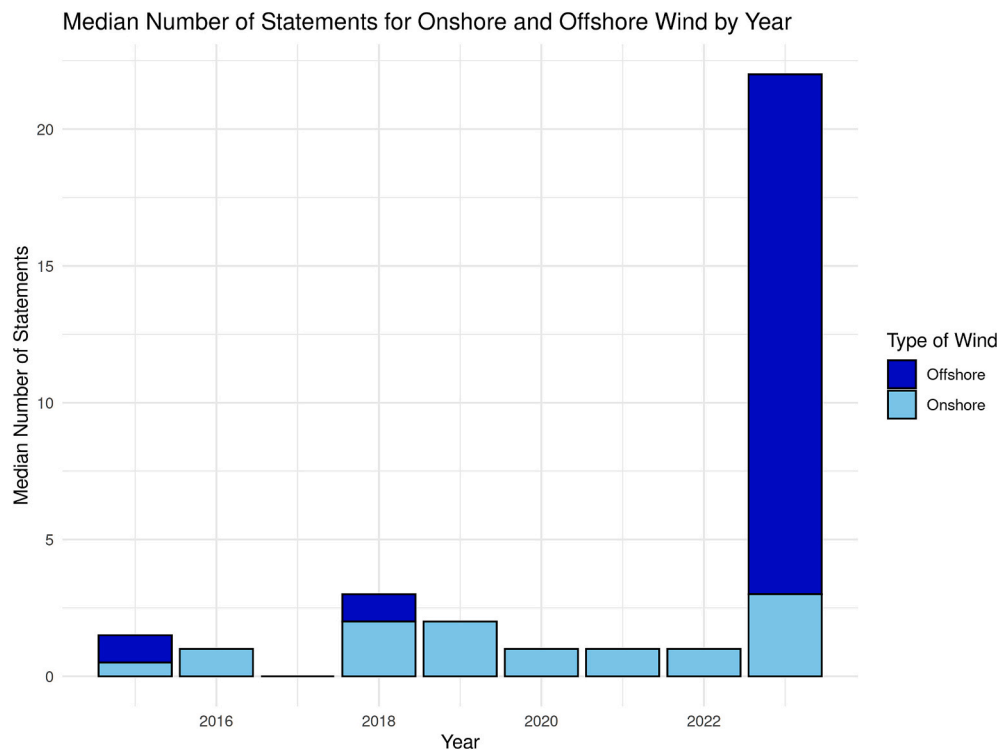


Fig. 3. Barplot with the median number of public statements per year on wind energy projects that were launched in the portal *Participa*. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

three *scope definition proposals* for offshore wind were launched, one for Âncora (Porto, north), another for Figueira da Foz (Leiria, center), and another for Caravela (Viana do Castelo, north). These proposals followed the Government's announcement for a future offshore wind public tender. Scope definition proposals are aimed at informing the project developer of aspects that need consideration during the environmental impact assessment and are not mandatory. Nonetheless, they attracted public attention (Fig. 3). The majority (79 %) of statements were against the proposals, and the remaining statements were reclamations or suggestions. Some participants were similar among the three proposals and consisted of ENGOS, fishermen's associations, two companies, and one individual. Distinct actors consisted of local municipalities, parishes, and residents.

By comparison with wind energy, the number of solar power plant projects in the portal *Participa* was nearly double (71 vs. 132), showing the recent transition from onshore wind to solar investment.

Contrary to wind energy, the number of statements in solar power projects increased visibly after 2020 (Fig. 4). Before this year, the maximum number of statements in a single project was 14 (one project in 2015, and another in 2019), but the mean number of statements was not significantly different from wind energy projects. Starting in 2020, 12 solar power plant projects received more than 15 statements, and five of them overshot the one-hundred mark. In this year, the proposal for the first large-scale solar installations in the south of Portugal was submitted [13], thus marking 2020 as a key turning point in public participation in solar power projects.

4.3.1. Insights from topic analysis of comments

The topic analysis of 66 collected statements resulted in four key topics that illustrate the key concerns crosscutting to the provided comments (Table 2).

4.3.1.1. Topic 1: environmental protection. This topic concerns 33 comments provided to three offshore wind projects that received the highest number of statements (in total 62 comments). The statements under this

topic were provided by 13 individual citizens, two municipalities, and one company, followed by environmental organizations. The comments claim to be against offshore wind energy projects. Citizens and organizations cite diverse studies on the potential negative environmental impacts of offshore wind on local species and ecosystems, asking for new measures to mitigate these impacts. One participating company is a crowdfunding platform, whose name appears in several consultations, with the same comment – to “open up part of the financing of the operation to crowdfunding”.

4.3.1.2. Topic 2: integrative approach. This topic refers to 14 comments opposing onshore wind projects, with one comment related to offshore wind. Participants argue for an integrative approach to the energy transition that considers critical targets but also weighs environmental, social, and economic impacts. These comments were posted by two municipalities (from different regions in the country), one parish administration, one local association, one political party, four local environmental organizations, and two individual citizens.

4.3.1.3. Topic 3: due process. This topic refers to eight comments provided by one governmental organization, four local organizations, two individual citizens, and one company. Except for the governmental organization, statements were not supportive of the projects, with a focus on offshore wind installations in three northern regions. The key argument is, however, related to a lack of procedural aspects, such as accusations of lack of transparency in licensing processes and concerns with local fishing associations and communities being disregarded by project promoters.

4.3.1.4. Topic 4: economic cost. This topic refers to 14 comments related to offshore wind installations. All comments are against the installation and highlight the lack of attention to the economic costs that fishing communities will suffer due to the projects for which they are not receiving compensation. For instance, as put by one fishing organization: “At no time is compatibility or incompatibility with fishing, namely

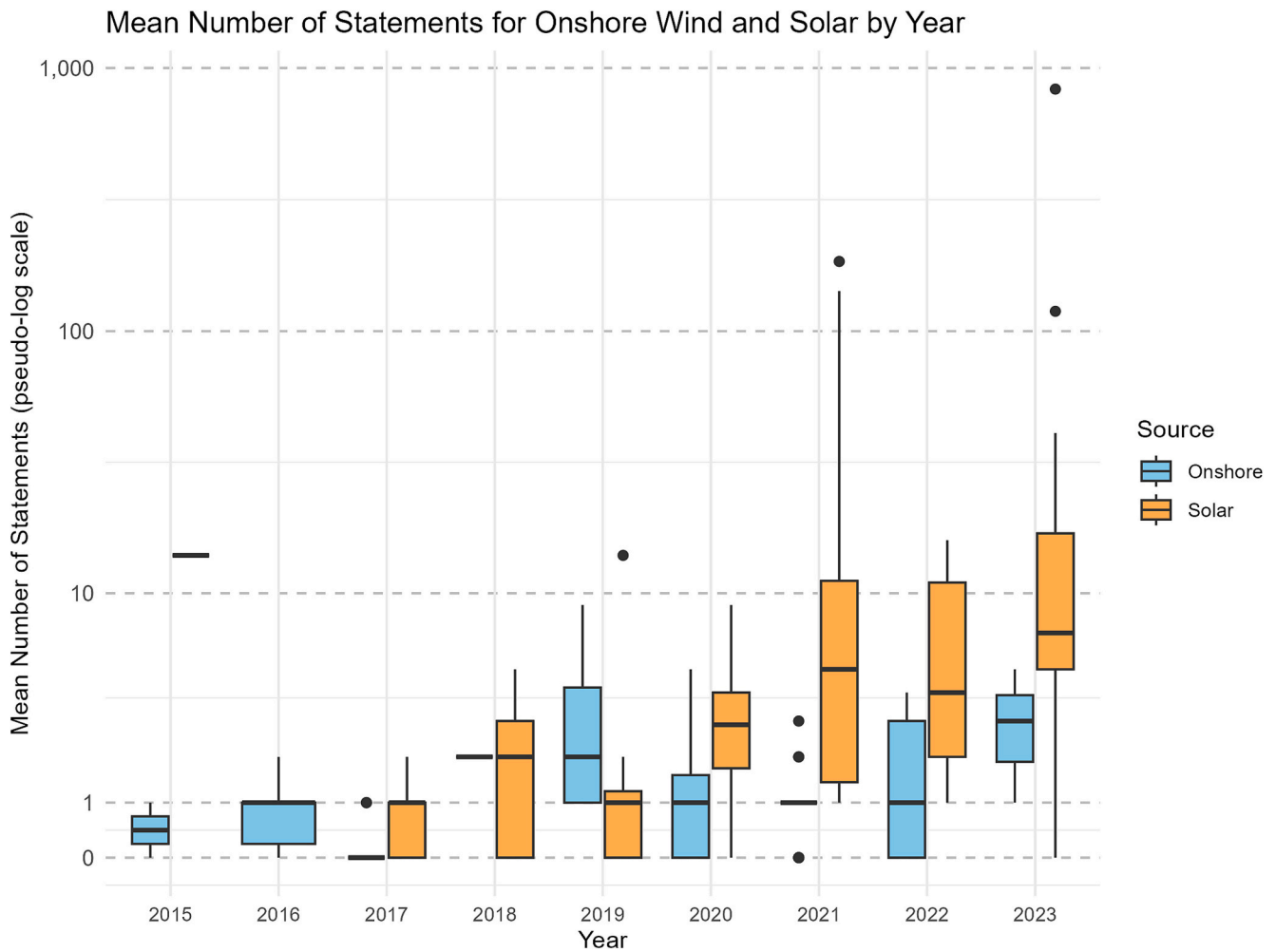


Fig. 4. Boxplots with the number of public statements for onshore and solar wind power plant projects each year. Data is shown in a transformed log scale to exhibit outliers in the number of public statements (particularly in the years 2021 and 2023 for solar power plants).

Table 2

Latent topics emerging from the 66 analyzed statements.

Topic number	Name and topic coverage (%)	Topic top frequency words
1	Environmental Protection (50 %)	'study', 'turbine', 'group', 'offshore', 'impact', 'species', 'farm', 'locate', 'environment', and 'include'
2	Integrative Approach (21.2 %)	'municipality', 'turbine', 'activity', 'impact', 'construction', 'coast', 'farm', 'population', 'species', and 'interest'
3	Due Process (12.1 %)	'offshore', 'impact', 'farm', 'installation', 'procedure', 'energy', 'use', 'allocation', 'capital', and 'environment'
4	Economic Cost (21.1 %)	'farm', 'energy', 'fishing', 'offshore', 'need', 'impact', 'fishery', 'renewable', 'account', and 'activity.'

fishing with trawl gear, safeguarded." Comments are provided by ten fishing organizations (including a Union, cooperatives, and companies), two citizens, and two environmental organizations.

The word cloud in Fig. 5 illustrates the keywords used by participants in the collected comments.

5. Discussion

When it comes to wind energy, Portugal presents low levels of community engagement [46,48]. We advanced a hypothesis that public



Fig. 5. Word cloud of the most common words provided by participants in the retrieved comments.

participation in wind energy projects has increased in the last decade in Portugal, as observed in other countries within the European Union [89]. The results did not confirm the hypothesis in the case of onshore wind, which has been consistently low. However, the number of statements in offshore wind and solar surpassed those in onshore wind after 2019. These results are in line with other observations indicating increasing opposition to specific renewable energy projects due to their size, their economic and production model, at times neglecting complex socio-environmental impacts and creating energy injustices [11,13].

This study revealed that the rapid development of onshore wind

benefited from a general social indifference, or perceived balance, between positive and negative impacts on local communities. Economic incentives to municipalities and landowners were substantial in rural areas, where WPPs were more frequently deployed, and the negative environmental impacts were mostly protested by environmental organizations and a few local individuals. However, this balance tipped negatively for offshore wind and solar. In the case of offshore wind, fishermen have been protesting heavily against both the environmental and economic impacts caused by turbine deployment. In the case of solar, the cumulative environmental and visual impacts caused by very large solar power plants reached a tipping point by local communities to find some projects unacceptable [13]. Overall, the *Participa* Portal has played a pro-forma role [90,91] in a country where other meaningful forms of community engagement, such as co-decision and financial participation opportunities, remain absent [52,92].

The lack of procedural justice also reflects distributive concerns [37]. One critical aspect is the marked absence of community energy initiatives in Portugal when compared with other European countries [93–95]. Energy cooperatives and grassroots initiatives have been important instruments for community participation in wind energy in, for instance, Denmark, the Netherlands, Germany, and Spain [62,96]. Their public opposition and pressure against corporate control of access to energy have led to policy changes that incentivized (in some countries mandated) project developers to engage with citizens [97,98]. Nevertheless, there are opportunities to increase community participation in wind energy projects, be it through the announced offshore wind tenders or other mechanisms to increase distributive justice, such as local energy cooperatives [62] or as co-investors and/or co-owners of the new project [99]. Additionally, engaging communities during the repowering process increases social acceptance of the project, as has been demonstrated in European case studies [100]. Nevertheless, it is critical that public engagement in this context effectively contributes to higher procedural justice.

A further challenge to overcome is the unwillingness of local decision makers to get communities involved [17]. Historically, renewable energy in Portugal has relied on a top-down governance model that assumes community acceptance is a given [16]. The participation of local communities and civil society in decisions about projects with significant environmental impacts is featured in international conventions, such as the Aarhus Convention of the United Nations Economic Commission for Europe (UNECE) (1998). However, like other countries, such as Spain, Germany, and Italy [101], the only opportunity for public engagement is the mandatory consultation process carried out during the Environmental Impact Assessment. Additional informal measures, such as information events or discussion groups, have rarely been organized by developers and/or municipalities. In the early days of wind energy, project developers promoted such events, including door-to-door contacts in rural areas [84]. However, these events subsided when WPP projects took off, and the engagement gap between decision-makers and local communities widened.

Therefore, one can argue there is a procedural blind spot in Portugal and a lack of distributional and recognition justice as rural communities are seldom recognized as important stakeholders by promoters and policymakers [26,102]. These communities currently take most of the burden from renewable energy installations and almost no social or economic benefits. Consequently, Portugal is now on track to reach similar levels of opposition towards large renewable energy projects seen in other European countries. While the latter have begun to implement policies that strengthened community participation [90,91], Portugal's legislation is lagging.

These findings indicate that the costs of projects alone cannot be resumed to the technological infrastructures, and should account for the additional perceived, but also evidenced, social and environmental costs, such as compensation costs [92], cost allocated to community engagement processes [103] and the possibility of community shares in investments [104]. The rapid development of renewable energy

technologies requires novel and fair governance approaches, as well as market and political acceptance of the need for meaningful community participation.

6. Conclusion

Portugal's development of wind energy was achieved thanks to high levels of socio-political and market acceptance, but at the cost of distributional and procedural justice for communities that mostly felt the associated social and environmental impacts. The first legislation to mention community engagement for renewable energy projects was issued in 2022 and does not apply to repowering and overpowering existing WPPs, which will severely limit its application. It would be important to expand this policy to all wind energy-related projects, regardless of typology (repowering, overpowering, or new power plants) and capacity limits, thus contributing to both procedural and distributive justice. As for offshore wind, the announced public tenders are equally an opportunity to condition proposals to introduce mandatory public engagement measures. For example, only proposals that include the participation of local communities and environmental organizations during the process of design, construction, operation, and decommissioning of the project would be accepted.

This study is limited by the available literature on public participation in renewable energy projects in Portugal. In future research, interviewing more stakeholders related to decision-making could clarify their reasoning for not seeking active engagement from local communities. Furthermore, the difficulty in accessing the complete statements of all citizens and stakeholders at the Portal *Participa* resulted in a limited number of public statements analyzed in this study and indicates a significant gap in open data and transparency. Public participation platforms should entail easy access to all data in open and easily accessible formats. Thus, this study suggests that open data is considered a critical indicator for procedural justice in renewable energy governance.

CRediT authorship contribution statement

Flávio G. Oliveira: Writing – original draft, Visualization, Investigation, Formal analysis, Data curation, Conceptualization. **Inês Campos:** Writing – review & editing, Validation, Supervision, Methodology, Funding acquisition, Formal analysis, Conceptualization, Writing – original draft, Visualization. **Filipe Moreira Alves:** Writing – review & editing, Visualization, Resources, Conceptualization.

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Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Flávio G. Oliveira, the corresponding author, is currently employed as a project manager at Bioinsight & Ecoa, an environmental consultancy

company specialized in wind and solar energy projects. The original draft of the manuscript was written before becoming employed. The company was not involved with the study and no changes were done to the article's content after being employed that could have been influenced by the company's aims and scope. The other co-authors have no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.erss.2025.104147>.

Data availability

The final database and accompanying analysis can be found in the Zenodo repository. Available from: <https://zenodo.org/records/13208478>

Dataset from: What lies in the future of renewable energy and public participation? Rethinking public engagement in Portugal (Original data) (Zenodo)

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