D3.1 DATABASE OF GOOD PARTICIPATORY PRACTICES AND SOCIAL INNOVATIONS IN ON- AND OFFSHORE WIND ENERGY DEVELOPMENTS

Version: 01
Work package: WP3
Authors: Inês Campos and Flávio Oliveira

Funded by
the European Union

JustWind4All is funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them (Grant Agreement 101083936).

Dissemination Level	Public
Due Date of Deliverable	31 October 2023
Actual Submission Date	31 October 2023
Work Package	WP3 Wind Energy Citizenship and Appraisal
Deliverable	Task 3.1 Rapid evidence assessment of participatory practices and social innovations in wind energy
Type	Deliverable
Number of Pages	57
Author names and affiliations	Inês Campos, Fciencias.ID (FC.ID) Flávio Oliveira, Fciencias.ID (FC.ID)
Reviewer names and affiliations	Mariya Trifonova, ARC Fund Amanda Schibline, RGI Julia Wittmayer, DRIFT
Contributors	The following researchers have contributed to developing the database: Luís Fazendeiro, Fciencias.ID (FC.ID) Filipe Moreira Alves, Fciencias.ID (FC.ID) Sophie Progscha (IOW) Audrey Wientjes (DRIFT) Konstatin Uzunov (ARC)
Description	This deliverable presents a systematic review and database of participatory practices, including those of social innovations in wind energy developments (both on- and offshore). The review conducted took stock of 570 documents, from different sources and types of publications, which described participatory processes in the context of wind energy developments. The database (larger dataset of 396 entries, and smaller dataset of 314 entries) is presented, along with a summary encompassing descriptive statistics of the key findings.

Contents

Executive summary 4
1. Introduction – Participation in wind Energy Development 5
2. Key Concepts – Levels and Models of PArticipation 7
2.1 Levels of participation 8
2.2 Models of participation 10
3. Methodology 10
3.1 identifying key research questions 11
3.2 Inclusion and Exclusion Criteria 11
3.3 Data Search Strategy and Search Databases 12
3.4 Registering the search protocol 13
3.5 Managing results 15
3.6 Selecting cases for Full Review 15
3.7 Extract Relevant Data 16
3.8 Quality Assessment 25
3.9 Data checking and cleaning 25
3.10 Statistical Analysis 26
3.11 Limitations 26
4. Database 26
5. Results: Participatory practices in Wind Energy 27
5.1 Overview of Data Distribution 27
5.2 Levels of participation 31
5.3 Models of participation 37
5.3.1 No participation and Alibi Participation 37
5.3.2 Resistance 38
5.3.3 Information 40
5.3.4 Consultation 41
5.3.5 Financial Participation 42
5.3.6 Cooperation 44
5.4 Perceived social, environmental, and economic impacts 45
6. Conclusion and Future Research 50
References 51
Appendix 1: EC summary requirements 55

Tables

Table 1 Data repositories and sources used, per type of documentation, and means to retrieve links 12
Table 2 Search protocol applied to each data source and repository. 13
Table 3 Variables included in the database 16
Table 4 Regions of the examples collected. 29

Figures

Figure 1 Levels of Participation in Wind Energy Developments 9
Figure 2 Snapshot of Tableau's dynamic visualization of countries, levels, and opportunities for participation 27
Figure 3 Year of publications reviewed 28
Figure 4 Source of documents reviewed 28
Figure 5 Entries to database by technology 29
Figure 6 Entries to the database by the scale of governance 30
Figure 7 Year of projects reviewed. 30
Figure 8 Main levels of participation 31
Figure 9 Turbine number and installed capacity (MW). 32
Figure 10 Main subjects of participation 32
Figure 11 Main objects of participation 33
Figure 12 Opportunities for participation 34
Figure 13 Timing of participation 35
Figure 14 Timing of participation and opportunities 36
Figure 15 Type of social innovation, based on organisational form 37
Figure 16 Models for alibi participation 38
Figure 17 Models for resistance 39
Figure 18 Models for information 41
Figure 19 Models of consultation 42
Figure 20 Models of financial participation 44
Figure 21 Models of cooperation 45
Figure 22 Main social impacts of projects reviewed. 46
Figure 23 Main environmental impacts of projects reviewed. 47
Figure 24 Main economic impacts of projects reviewed. 48
Figure 25 Perceived impacts of projects, based on reviewed documents. 48
Figure 26 Perceived impacts of projects and the level of participation 49
Figure 27 Perceived impacts and a mandate for participation 49

EXECUTIVE SUMMARY

This deliverable reports on the development of a database of participatory practices and social innovations, in the context of onshore and offshore wind energy developments, through a systematic review of 570 documents. The key concepts for structuring the database are presented, based on current research into participation and social innovation in the context of the energy transition. The methodology for developing the database is detailed. The database structure is explained and key descriptive statistics on the findings are reported. A set of good participatory practices is identified, as well as examples of practices by social innovation initiatives (e.g., wind energy cooperatives, wind energy community funds), and insights into how to classify practices in terms of the level of participation, the subjects and objects involved in the process, opportunities and timings for participation, and the social, environmental, and economic impacts of wind energy projects. Thus, the deliverable presents the database of wind energy participatory practices, including the data sources, concepts and methodology applied. The work concludes with proposals for key avenues for future research.

1. INTRODUCTION – PARTICIPATION IN WIND ENERGY DEVELOPMENT

The overall aim of this deliverable is to characterise the diversity of participatory practices, including those put forward by social innovations, that are emerging alongside wind energy projects, thus laying the ground for producing effective guidelines and recommendations for policies and best practices that support higher levels of energy citizenship in wind energy development.

In Europe, the wind energy sector experienced remarkable growth in the last decades. Wind energy now meets 15% of Europe's electricity demand, with countries such as Denmark reaching 44%; Ireland 31%; Portugal 26%; Spain 24%; and Germany 23%, and IEA expects wind to be the number one power source in Europe by 2027 (IEA, 2022). Current onshore wind energy projects represent 76% of this capacity, with offshore projects increasing, and wind capacity in Europe being around 190 GW. However, this capacity needs to increase by nearly tenfold to deliver the goals stated in EU initiatives such as REPowerEU[1] and the European Green Deal (European Commission, 2020).

In this context, the increased production of wind energy is likely to have significant implications for people's relationships with wind energy production. With more and more communities hosting wind energy projects throughout Europe, understanding the social acceptance of such projects has become increasingly important. Although an earlier survey (European Commission, 2015) suggested 71% of people were in favour of wind energy, recent studies suggest that social acceptance has been dwindling (Batel, 2020; Cousse et al., 2020; Ellis et al., 2023). This has led to an increase in the number of projects investigating social acceptance of renewable energy technologies (RET) (European Commission et al., 2017).

While community participation has been found to positively influence social acceptance of wind energy (Enserink et al., 2022), there are broader considerations, including other justice aspects, such as distributional, recognition and procedural justice aspects, which can benefit from an understanding of 'good' participatory practices in the context of wind energy development.

However, to provide a generic evaluation of the extent to which a participatory practice is deemed as 'good' is arguable, as this is inevitably a context-specific classification, which depends on the weight of different social, economic, political, and even environmental criteria. Instead, this work has focussed on showcasing a whole breath of diverse participatory practices to then inform a discussion and further work on what constitutes a 'good' practice.

By taking stock of core concepts (detailed in section 2) from social acceptance research, energy citizenship and social innovation literature (Batel, 2020; Pel et al., 2020; Silvast and Valkenburg, 2023), this work aimed to collect specific structured information on wind energy-related participatory practices. The goal has been to **capture a diverse range of participatory practices, including practices characteristic of social innovations**, such as renewable energy cooperatives. Therefore, rather than producing an extensive database

[1] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/repowereu-affordable-secure-and-sustainable-energy-europe_en

with examples of wind energy projects, the purpose has been to take stock of the diversity of existing participatory practices.

The final database comprises of a **dataset with 397 entries, subset into 314 entries of case studies, which are then subset into 222 entries of social innovation cases.** Diverse datasets with sampled links to the documents reviewed were the basis for the review. The data sources used and searched, the systematic search protocol based on keywords and the various databases reviewed are detailed in section 3.

In the larger 397-entries dataset, each entry is an example of a participatory process, also including examples in which participation takes in the form of resistance (i.e., when communities oppose wind energy projects). The entries from this dataset include information collected from documents reporting on practices of participation, although not always referring to a specific case study. Examples may include general assessments of a set of participatory processes, and/or recommendations based on a broad range of experiences. Nevertheless, these entries were included as they offer important instances of possible participatory practices for both onshore and offshore wind energy development. The smaller dataset of 314 entries provides examples of only specific case studies, which include 221 examples of organisational forms characteristic of social innovations.

The database encompasses **69 variables** (or dimensions), and its dimensionality enables varied filtering options based on the topics of interest (e.g., participation levels, source of publication, technology, etc.).

Thus, the full dataset, although not extensive in entries, carries detailed information on specific participation practices as a basis to address critical questions on the role of participation, energy citizenship (citizens being consumers, users, protestors, supporters and/or prosumers) and social innovations in wind energy development. These research questions detailed in section 3.1.

Thus, the deliverable is structured as follows:

- Section 2 presents the key concepts from literature leading to the identification of the participation levels and models, which offered the basis for determining the database variables.
- Section 3 presents the methodology for the review and database development, including the data sources used and a data dictionary of the variables collected.
- Section 4 describes the final datasets produced and their availability in ZENODO, as well as the availability of the Jupyter notebooks used for the analysis at GitHub.
- Section 5 provides descriptive statistics of the types of participatory practices (i.e., the participatory models recognised for each participation level), which were inductively identified through the systematic review and database development.
- Section 6 concludes by identifying key directions for future research, including further data analysis to be considered.

The complete datasets resulting from this review are available for download in ZENODO (Campos and Oliveira, 2023) after November 1st, 2024.

2. KEY CONCEPTS – LEVELS AND MODELS OF PARTICIPATION

In this section, the main concepts of participation, social innovation, social acceptance of renewable energy technologies and energy citizenship are explained, leading up to the core variables guiding the database development.

First, the **definition of participation** guiding this study is taken from Chilvers and colleagues (Chilvers et al., 2018), and builds on a relational framework and on a systemic perspective of participation, to propose an understanding of participation as an **"ecology"**. This framework combines a systemic, relational (i.e., understanding systems of participation as being shaped by political cultures and institutional settings) and a practice-oriented approach (i.e., understanding how multiple practices of participation are embedded in wider socio-technical systems) (Chilvers et al., 2018). By drawing on a relational and critical approach to participation as the backbone to develop a database in the context of wind energy development, wind energy participation is here understood as socially constructed and interrelated to other participatory practices, embedded in cultural and socio-political contexts which may (dis)encourage citizens and community participation and engagement. Within this framework the **subjects of participation** (i.e., the participating collectives), the **objects** (the materials, products, etc.) and the **models** (through which participation takes place, for example, a general assembly), are "co-produced" through citizens collectively enacting their participation. By drawing on this framework, Chilvers and colleagues propose the following definition (adopted here) of "*public participation as: heterogeneous collective practices through which publics engage in addressing collective public issues (in this case 'energy-related' issues), whether deliberately or tacitly, which actively produce meanings, knowings, doings and/or forms of social organisation*". (Chilvers et al., 2018) (p. 202).

Second, our application of the **concept of social innovation** takes stock of the review by Hewitt and colleagues on social innovation in the scope of community energy (Hewitt et al., 2019). These authors take stock of a definition of social innovations as news ways of doing, thinking and organising (Hoppe and Vries, 2018; Pel et al., 2020) to approach the development of community energy initiatives as social innovations which "reconfigure social relations" (p.3). They identify different **organisational types** that characterise community energy initiatives as social innovations, namely: Rescoops (renewable energy cooperatives); Community Development Trusts (more prevalent in the United Kingdom); Local Government Projects with Citizens Participation; Public-Private Partnerships; Private Companies and other Grassroots innovations (p. 14-15). Therefore, when approaching good participatory practices in wind energy developments, these organisational types were directly the focus of the review and database development.

Third, this study draws on the concept of **social acceptance** of renewable energy technologies, based on recent proposals for considering the dynamics of social acceptance (e.g., accounting for factors such as time and shifting power relations)(Ellis et al., 2023). Social acceptance was first proposed by (Wüstenhagen et al., 2007) as integrating sociopolitical, market and community acceptance. The concept brought attention to the unavoidable contestation and opposition arising in the context of the energy transition. Social acceptance meets a desired outcome but does not explicitly offer insights into the wider and relational factors that come into play. Thus, Ellis and colleagues argue that social

acceptance can be dynamic, and change across time (e.g., between the early planning and final construction stages of a wind project), and can be equally conditioned by issues of participation, including distributional concerns and financial participation in wind energy projects.

Lastly, the definition of **energy citizenship** guiding this work is taken from (Campos et al., 2023) and defined as the democratic participation of citizens in sustainable energy transitions: "*Citizens are participating in the energy transition by engaging politically and taking part in various types of collective energy-related projects as users, consumers, prosumers, supporters, and/or protesters (Ryghaug et al., 2018). From an EC perspective, citizens shift from passive to active actors in the energy transition, through participation in energy investments, consumption choices, and in supporting or protesting in view of effective policies for advancing the energy transition (Lennon et al., 2020)*." (Campos et al., 2023) (p.2). This concept is relevant and an overarching guidance for approaching participation, as participation is a condition for energy citizenship to be enacted, even when citizens act in opposition or 'resistance' to wind energy projects.

2.1 LEVELS OF PARTICIPATION

While opportunities for public participation are crucial for facilitating social acceptance of renewable energy technologies, their effectiveness is dependent on several variables, such as the social, environmental, and economic context of the project location (Pasqualetti 2011). To inform stakeholders about best practices for their project context, it is essential to analyse the variables that determine the success of participatory practices.

Thus, as a starting point in developing a database on participatory practices, the first stage of the systematic review aimed to (1) provide an **overview of the diverse levels** of participation documented in wind energy projects, in which citizens take up an active role, whether as **supporters or opponents**, and (2) identify the **key models of wind energy participation** that offer the grounds to develop a new database on wind energy participatory practices.

Regarding the **levels of participation**, the document takes stock of the participation levels proposed by Langer (Langer et al. 2017), who defined six levels of public participation specific to wind energy projects, based on previous definitions (Sovacool and Ratan, 2012), namely:

1. **No participation**: citizens have no experience participating in wind energy projects.

2. **Alibi participation**: citizens express interest in being involved in wind energy projects but their participation is ineffectual because their opinions are suppressed in some way.

3. **Information:** passive participation in the form of visits to webpages, reading material or watching television programs about wind energy, mainly promoted by project developers.

4. **Consultation**: active participation and expression of opinion through dialogue events, discussions in internet forums, hearings, or surveys.

5. **Cooperation:** active participation by co-deciding on wind energy plans through round tables, planning cells or working groups.

6. **Financial participation:** active participation through financial investment or financial benefits from wind energy projects.

By departing from Langer's definition of levels, the systematic review nevertheless introduced **two changes to these levels**. First, cooperation was considered a higher level than financial participation, as the latter may imply models of participation limited to a very small group of stakeholders (e.g., land lease payments, payments in-kind, tax benefits). In addition, some studies have pointed out that financial participation may be perceived as a "bribe", and does not always imply an active participation of community members (Bidwell, 2016; Chilvers et al., 2021). For instance, payments in-kind (e.g., building a new park or road), may be provided by an energy company without prior consultation with community members. Conversely, cooperation includes diverse methods that are generally perceived as being more inclusive.

Second, wind energy social sciences' literature equally acknowledges the role of **resistance** networks in relation to citizens' participation. Here, citizens assume the role of 'opponents', which is equally a form of energy citizenship (Ryghaug et al., 2018). Opposition may consist of petitions and legal processes, or it may take the form of online discussions through social media applications. Less commonly, resistance may consist of demonstrations and even vandalism, boycotting local entrepreneurs and spreading false information. Nevertheless, the causes of resistance may relate to issues of social (in)justice and environmental protection (such as landscape or wildlife conservation), requiring not only a comprehensive understanding of participation dynamics, but also of energy justice aspects. By including resistance as one of the levels of participation, the data collected enabled us to gain insight into how diverse opportunities and practices for participation work in tandem, and how resistance networks emerge in different contexts. Additionally, resistance was considered a more active form of participation than 'alibi' participation and was ranked number three on the scale of levels of participation. Therefore, the levels of participation applied in the systematic review and database development are the represented in Figure 1.

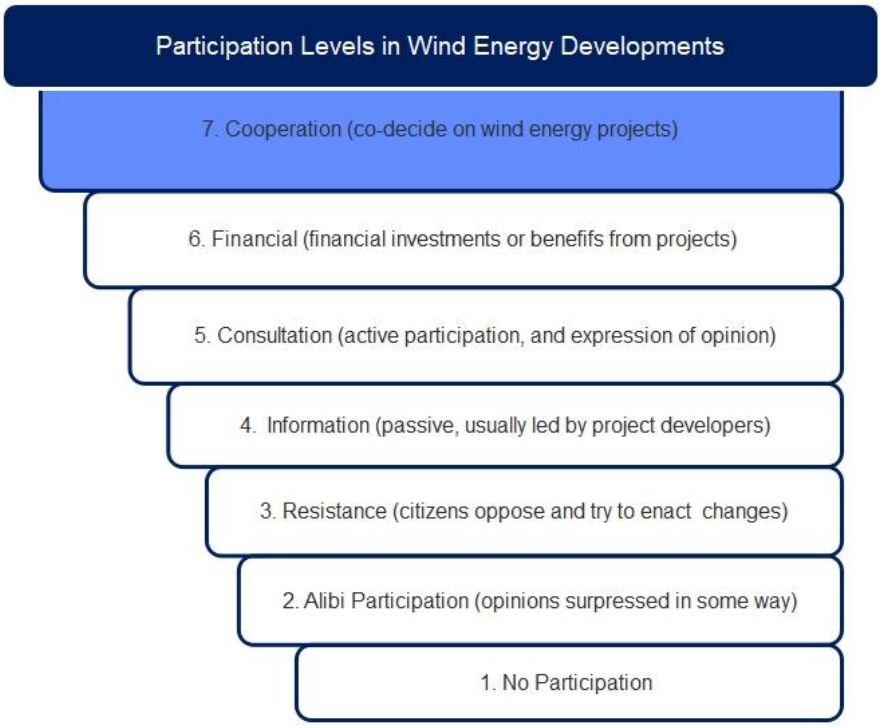

Figure 1 Levels of Participation in Wind Energy Developments

2.2 MODELS OF PARTICIPATION

As the concept of participation has built on the "ecologies of participation" framework proposed by Chilvers and colleagues (Chilvers et al., 2018) (see also section 1), the database development included also a set of variables distilled from the concept of **subjects, objects, and models of participation**.

Thus, participation is first characterised according the **levels** (e.g., cooperation), but will also involve diverse **objects** of participation (e.g., wind energy installations, type of technology, etc.); through applying diverse **models** or methods of engagement, (e.g., public hearings, workshops, general assemblies, etc.), and engaging diverse **publics**, either confined to a local initiative, or involving a wider range of actors from the policy, market and civil society spheres (Pallett et al. 2019).

Thus, the database is grounded on the identification of levels, which are then characterised in detail, regarding the technology used, the country and region of the project described by the document, the subjects of participation, the objects of participation, and the models of participation for each level. Participation levels are also scored regarding the opportunities presented for participation and categorised according to the timing at which participation took place during the project development. Next, each entry in the database is characterised according to the list of the impacts mentioned in each of the reviewed documents. These impacts encompass social, environmental, and economic aspects, and a perceived impact score is assigned based on the content of the documents.

In the following section, the methodology provides an overview of the data sources and the data collection process leading to the creation of the database.

3. METHODOLOGY

To produce a database grounded on information retrieved from published documents on wind energy projects and participatory processes, the methodology is described as a document review, which integrates (1) a narrative literature review (Ferrari, 2015) and (2) a systematic review (Munn et al., 2018) of relevant documents from different sources.

As a first step, the narrative literature review aimed at identifying key variables to be included in the database, as well as refining the research questions which would guide the following systematic review.

Next, by applying a systematic literature review methodology (Tawfik et al., 2019), the documents reviewed created the basis for the data collection and the development of the database.

Systematic reviews are frequently used across several disciplines and mainly focus on peer-reviewed literature. This type of rigorous analytical methodology has been described as "a review using a systematic method to summarise evidence on questions with a detailed and comprehensive plan of study" (Tawfik et al., 2019)(p.1).

In this study, however, other sources aside from peer-reviewed articles were also the object of a full-text screening for manually retrieving relevant data. Aside from peer-reviewed research articles, the types of document sources included published deliverables and reports of European-funded research, articles from news media, as well as community energy websites and blogs, wikis, Master or PhD thesis, and other reports (e.g., from NGOs and public organisations) published online. The broader scope of the documents reviewed

is due to the need for a database that captures innovative practices, which may not have yet reached academic research, but are being implemented by communities in Europe and across the globe. News media articles (with a preference for investigative journalism pieces) that reported events related to participation and wind energy production were also included for the same reason, as the database aimed at providing as much as possible an updated picture of the diversity of practices being implemented.

In total, a set of 570 documents (published between 2000 and 2003), with examples of participatory practices, mainly from Europe (265), but also with examples from North America (53), South America (20), Asia (17), Africa (9) and Australia (11), was systematically reviewed to extract relevant data for producing a database on participatory practices and social innovation in the context of onshore and offshore wind energy development. In addition, 22 entries were not categorised in any region, since they referred to best practices more generally.

Overall, the systematic review followed a strict protocol, based on the methodological steps of systematic literature reviews (Munn et al., 2018; Tawfik et al., 2019). In what follows, these methodological steps are described.

3.1 IDENTIFYING KEY RESEARCH QUESTIONS

The development of the database was guided by clear research questions which were identified based on the results of the initial narrative literature review. The questions are:

1. How are participatory practices integrated in the context of wind energy deployment?

    - Who is most often involved?
    - What levels of participation predominate?
    - What models (or methods) of participation have been implemented?
    - How are the opportunities for participation described?
    - Are there regional differences in Europe and elsewhere?
    - Are there differences between mandatory and voluntary processes?

2. What are the perceived social, environmental, and economic impacts of wind energy projects for the communities and stakeholders involved?

3.2 INCLUSION AND EXCLUSION CRITERIA

The review and database development process required the guidance of specific inclusion and exclusion criteria to determine which documents to review. Thus, the reviewed documents were included or excluded when at least one of the following criteria was present:

Inclusion criteria:

- Documents describing in a clear, detailed, and accurate manner one or more case studies of participation in the context of onshore and/or offshore wind energy development.

- Documents describing in a clear, detailed, and accurate manner sets of events or findings based on different case studies and previous research, that draw conclusions on best practices for participation in wind energy development.
- Documents describing in a clear, detailed, and accurate manner stakeholder and citizens' preferences regarding participation and social innovations in wind energy projects.
- Documents relating in a clear, detailed, and accurate manner to social innovation initiatives in the context of wind energy development.

Exclusion criteria:

- Documents which were not sufficiently clear in the information related or did not refer to additional documents from which detailed and accurate information could be retrieved.
- Documents which were not directly referring to wind energy, but more broadly to renewable energy sources.
- Documents which were neither accessible via institutional repositories available, nor via public data archives.
- Documents about wind energy which were not related to any form of participation.
- Documents focusing only on a specific methodology or technology in wind energy development, not discussing specific aspects related to participation.

3.3 DATA SEARCH STRATEGY AND SEARCH DATABASES

The data search strategy started by mapping the data sources from which to extract and select the documents for the review. The sources identified are summarised in Table 1.

Table 1 Data repositories and sources used, per type of documentation, and means to retrieve links

Data Repository/Source	Type of Documents to Retrieve	Means of Retrieving Links to Documents
Cordis Europe	Reports of European Research Projects	Search engine
Google Scholar	Research Articles	Search engine/Web scrape
SCOPUS	Research Articles	Search engine
RESCOOP.EU	Energy Communities and Cooperatives Websites	Web scraper
Community Energy England	Energy Communities and Cooperatives Websites	Web scraper
European Energy Communities Repository	Energy Communities and Cooperatives Websites	Data is available at the Dataverse repository
Global Wind Power Tracker	Wind Energy Installations Case Studies	Open data file downloaded here

Once a set of data sources is mapped, the following stage involved retrieving a sample of links from these sources, which lead to collecting potential documents to be included in the review.

The means for retrieving links for accessing documents included using search engines and already available published databases (e.g., the Global Wind Power Tracker), as well as using web scraping. Web scrap was done through the "Beautiful Soup" code ("Beautiful Soup Documentation — Beautiful Soup 4.4.0 documentation," n.d.), which is a Python open source library for web scraping. Web scrape was used, for example, to extract several links from community energy websites, after filtering for wind energy. The different means for retrieving data are also summarised in Table 1.

3.4 REGISTERING THE SEARCH PROTOCOL

To keep track of each step of searching and filtering for each type of document, a data search protocol was registered. The geographical scope for the entries to the database was focused on Europe (since the database aims to inform additional tasks of JUSTWINDALL, such as the development of Wind Energy Labs in European Regions), and therefore took stock of European data repositories (e.g., RESCOOP.EU and the European Energy Communities Repository). However, it became relevant to include also examples of wind energy developments from other world regions, while searching for the most diverse set of practices. Research articles and the "Global Wind Power Tracker" database were a key source for procuring examples from other regions. In particular, the "Global Wind Power Tracker" was used to search for examples in North America and Australia, while research articles provided some examples from Asia and Africa.

Thus, the search protocol was adapted to each of the data sources and is summarised in table 2.

Table 2 Search protocol applied to each data source and repository.

Data Sources and Repositories	Date of Search Conducted	Search Protocol
Google Scholar	Accessed 10-11 April 2023	Three rounds of searches: Round 1: Key words "wind energy"; "wind energy AND participation"; "case studies"; "wind energy AND community" (using " " will return the exact words on google searches) (18500 results). Round 2: added filter for articles published after 2019 (7020 results) Round 3: screened for relevance (430 articles)
SCOPUS	Accessed 19-20 April 2023	Three rounds of searches:

		Round 1: key words "wind energy AND community", "wind energy AND participation", "case studies", "practices" (1525 results) Round 2: added filter for 'open access' (283 results) The results of the Google Scholar and Scopus searches were merged, and after eliminating duplicates, a long list of 615 was sampled for screening.
Cordis Europe	Accessed 24-25 April 2023	Three rounds of searches, filtering with key words, by order of relevance: Round1: Key words "wind energy" and "social" (1341 results) Round2: Added Key words "participation", "community" (624 results). Round3: Added key word "case studies" (177 results)
RESCOOP.EU	Accessed 8-9 April, 2023	RESCOOP.EU's database of energy cooperatives in Europe was filtered for those who produce "wind energy" (78 results). This search assumed that an energy cooperative will include some form of participatory practice. Web scrape was used to retrieve the links and names of the cooperatives for further exploration.
Community Energy England	Accessed 8-9 April, 2023	Similarly, to RESCOOP, the Community Energy England's search engine was used to filter for communities listed who produce wind energy (26 results). Web scrape was used to retrieve the links and names of the communities for further exploration.
European Energy Communities Repository	Accessed 10-16 May 2023	Data is provided in a TTL format. To compile the data into a structured and tabular format it was necessary to retrieve a csv file from the TTL file with the help of the SPARQL commands which are provided in the supplementary material. This posed an additional technical effort in retrieving the data. After removing duplicates of results from RESCOOP.EU and Community Energy Searches , a set of 19 initiatives remained.

Global Wind Power Tracker	Accessed 17 May, 2023	The site provides a CSV downloadable file through a creative commons license. It includes detailed data on utility scale wind energy, both on and offshore from across the world. However, it is not possible to know whether the initiatives mapped included any form of participatory practice. Thus, a sample of (10%) was randomly selected with initiatives from Australia, United States and Canada, to complete our systematic collection of data from Europe. Wiki entries provided only technical details and for each wiki entry additional searches were done on the initiatives to collect information from other sources (e.g., websites, news media articles).

3.5 MANAGING RESULTS

A first full sample of 1145 links to documents was retrieved from the sources listed in Table 1, these links included:

- 615 research articles.
- 177 reports or deliverables from EU projects.
- 123 community energy case studies (taken from websites, other types of reports and news media articles).
- 230 other cases studies (corresponding to 10% of the total case studies for the United States, Canada, and Australia, which were randomly selected from the Global Wind Power Tracker).

To manage these results and select documents for a full review, the links to documents were initially screened by the research team, based on the title, abstract (in the case of peer-reviewed research articles), or first summary paragraphs (for other types of documents). This early screening led to eliminating documents which did not comply with the inclusion criteria.

3.6 SELECTING CASES FOR FULL REVIEW

After initial screening, a second sample of 700 links was distributed among the research team to review the validity of the sample and exclude/include a set of final documents to be reviewed. This resulted into a final sample of 570 documents, which were then fully reviewed, after excluding documents that did not comply with the inclusion criteria.

There is a discrepancy between the number of documents reviewed and the entries to the database, because some entries required the full review of more than one document, while other entries were extracted from the same document when it described more than one case study. For each entry into the database, however, only the main document reviewed was included in the “link” column, although other documents may have also been reviewed.

In total, this resulted in a sample of 397 valid entries to the database, which describe diverse practices of participation in the context of wind energy developments, including case studies and social innovations.

3.7 EXTRACT RELEVANT DATA

The data extraction process required a concerted effort of the research team and took place between March and August 2023.

Relevant data was extracted by filling in a set of variables which was created based on the topics identified early on after a first narrative review of academic research (see section 3.1). These variables were inductively refined based on the first 90 results of the review. For instance, the variable 'levels of participation' was introduced early on because of the first narrative review of published research. However, the diverse 'models of participation' (e.g., public hearing, citizen juries, cooperative general assembly, etc.) identified and registered for each of the levels resulted from the review process and were added based on the first set of findings. This process enabled a meaningful collection of the different models of participation that may come with each practice, therefore enriching the results. This deductive-inductive process eventually stopped, as each new entry did not bring new models of participation.

The same inductive process was applied in the case of the variables related to the subjects and objects of participation, as well as variables related to specific social, environmental, and economic impacts of wind energy projects that were explicitly referred to in the documents reviewed. The process allowed for a comprehensive collection of the different models, subjects, and objects of participatory practices (Chilvers et al., 2018) in the context of wind energy developments, ensuring the variety of models of participation was captured through the reviewed documents.

Since each researcher had to manually extract relevant data after fully reviewing each valid document source, the database development took its time and all researchers engaged played a critical role in the process. The leading author was responsible for collecting about 250 entries to the database, while carefully reviewing and validating entries collected by other researchers.

Table 3 below lists the final database structure used to register the data extracted from the documents reviewed. The variables are thematically grouped, namely: variables providing the ID and the source of publications; location-related variables; variables describing technological aspects; variables on the subjects of participation; variables on the objects of participation; variables describing the participatory process; variables on the social, environmental and economic impacts; and a final set of variables summarising all the impacts.

Table 3 Variables included in the database

Variable Number	Columns/Field name	Description	Data Type
ID and source publication description			
v1	id	Unique identifier for each entry	Serial

v2	title	Title of publication	Nominal
v3	source	Options for publication source: Journal article Report – EU project deliverable Report – other Thesis Blog post Newspaper article Community website Wiki or Other	Nominal (categories)
v4a (larger dataset only)	cs	Is the entry reporting a case study? Yes, No	Boolean
v4b (smaller dataset only)	social_innovation	Is the case a social innovation (based on its organisational type) Rescoop Community Development Trust Local Government Project with Citizens Public-Private Private Company Other Grassroots Not Social Innovation	Nominal (categories)
v5	year_pub	Year document was published	Discrete
v6	year_pro	Year project/case study started (if applicable)	Discrete
v7	publisher	Name of publisher	Nominal
v8	link	Link to document	
Location variables			
V9	province_state	Province or state of case/installation referred in document	Nominal
v10	country	Country's full name, no abbreviations	Nominal
V11	region	(Regions covered by the data) Africa Asia Australia Central Europe Eastern Europe Northern Europe Southern Europe Western Europe	Nominal

		North America South America	
Technology variables			
V12	technology	Type of wind energy technology: Onshore Wind Offshore Wind Small Wind (less than 1000KW) On and Offshore Wind Not applicable	Nominal (Categories)
v13	n_turbine	Number of turbines	Discrete
v14	capacity	Installed capacity in MW	Continuous
Variables on the subjects of participation			
v15	local_community	Refers to the local community. 1 (True) 0 (False)	Boolean
v16	communities_interest	Refers to communities of interest such as fishermen, farmers, or indigenous communities. 1 (True) 0 (False)	Boolean
v17	public	Refers to the general public. 1 (True) 0 (False)	Boolean
v18	small_investors	Refers to small local investors. 1 (True) 0 (False)	Boolean
v19	cooperative	Refers to cooperative members. 1 (True) 0 (False)	Boolean
v20	NGO	Refers to non-profit NGOs. 1 (True) 0 (False)	Boolean
v21	public_org	Refers to public organisations such as schools, hospitals, etc. 1 (True) 0 (False)	Boolean
v22	ministry_gov	Refers to a ministry and regional or national government.	Boolean

		1 (True) 0 (False)	
v23	municipality	Refers to a municipality and/or other local administration bodies. 1 (True) 0 (False)	Boolean
v24	experts	Refers to academics and experts. 1 (True) 0 (False)	Boolean
v25	investors	Refers to project planners, developers, and large investors. 1 (True) 0 (False)	Boolean
Variables on the objects of participation			
v26	turbines	Refers to turbines, especially when the discussion is focused on one or more turbines rather than a larger installation. 1 (True) 0 (False)	Boolean
v27	onshore_farm	Refers to an onshore wind farm. 1 (True) 0 (False)	Boolean
v28	offshore_farm	Refers to an offshore wind farm. 1 (True) 0 (False)	Boolean
v29	company	Refers to the (often large) energy company involved. 1 (True) 0 (False)	Boolean
v30	policy	Refers to a specific policy or regulation. 1 (True) 0 (False)	Boolean
v31	community	Refers to the specific action of a community. 1 (True) 0 (False)	Boolean
v32	repowering	Refers to repowering old wind installations. 1 (True) 0 (False)	Boolean

v33	other	Refers to other possible objects of participation. 1 (True) 0 (False)	Boolean
Variables describing the participatory process			
v34	mandate	Is the participatory process voluntary or a legal obligation? Voluntary Legal Obligation Not Applicable	Nominal (categories)
v35	main_level	This is the main level of participation: No participation Alibi Resistance Information Consultation Financial Cooperation	Ordinal (categories)
v36	level_score	0, 1, 2, 3, 4,5,6 No participation Alibi Resistance Information Consultation Financial Cooperation	Ordinal
v37	other_level	This is the other levels, if applicable: No participation Resistance Alibi participation Information Consultation Financial Cooperation	Ordinal (categories)
v38	alibi	model or method used for alibi participation: Citizen advisory committees Community action agencies No Participation Pro forma	Nominal (categories)
v39	resistance	model or method used for resistance: Legal challenges Online resistance Petition Protests	Nominal (categories)

		Public campaigns Sabotage or vandalism	
v40	information	model or method used for information: Education Knowledge dissemination News media Personal communication Promotional material Public inquiries Public presentation Quality label Website	Nominal (categories)
v41	consultation	model or method used for consultation: Citizen Juries Community Committee Focus groups Formal participation Informal dialogue Interviews Online forums and social media Public hearing Referendum Surveys Workshops	Nominal (categories)
v42	financial	model or method used for financial participation: Bonus payments Citizens as investors Community fund Community ownership Compensation payments Donations to community groups Energy discounts In-kind benefits Land lease payments Municipality co-ownership Tax revenues	Nominal (categories)
v43	cooperation	model or method used for cooperation: Cooperative general assembly Personal invite Public agreements Transdisciplinary committees	Nominal (categories)

		Trusted third party Working groups	
v44	scale	Geographical/governance scale: Local Regional National Transnational and/or virtual	Nominal (categories)
v45	timing	When did participation occurred? Construction or development Decommission Design/Exploration Exploitation or operational maintenance More than one stage Planning Throughout the project Not applicable or no information provided	Nominal (categories)
v46	opportunities	Ranking opportunities for participation: Not applicable No opportunities were provided Opportunities were insufficient Opportunities were moderate Opportunities were excellent	Ordinal (categories)
v47	opportunities_score	0, 1, 2, 3, 4 Not applicable No opportunities were provided Opportunities were insufficient Opportunities were moderate Opportunities were excellent	Ordinal
Variables on the social impacts documented for the project			
v48	Noise	1 (True) 0 (False)	Boolean
v49	shadow-flicker	(Movements of turbines may cause a shadow-flicker which is reported as a negative local impact) 1 (True) 0 (False)	Boolean

v50	safety	(Local citizens may perceive their safety has been compromised by the project) 1 (True) 0 (False)	Boolean
v51	health	(both physical and mental health) 1 (True) 0 (False)	Boolean
v52	Land_use	(Changes in land use can be negative or positive for local communities) 1 (True) 0 (False)	Boolean
v53	access_energy	1 (True) 0 (False)	Boolean
v54	awareness	(Increased awareness of climate change and the need for decarbonization as a positive impact) 1 (True) 0 (False)	Boolean
v55	community_fund/services	(New funds and services provided to the community as a result of the wind project) 1 (True) 0 (False)	Boolean
v56	soc_imp	Sum of the social impacts registered	Discrete
Variables on the environmental impacts documented for the project			
v57	emissions	(In principle renewables will contribute to reduce emissions, this impact is registered when the document reviewed emphasises reduced emissions due to the project) 1 (True) 0 (False)	Boolean
v58	biodiversity	1 (True) 0 (False)	Boolean
v59	landscape	1 (True) 0 (False)	Boolean
	env_imp	Sum of the environmental impacts registered	Discrete
Variables on the economic impacts documented for the project			

v60	innovation	(New technology infrastructures are tested and demonstrated) 1 (True) 0 (False)	Boolean
v61	tax	(Tax benefits for the region/community) 1 (True) 0 (False)	Boolean
v62	new_jobs	(New jobs created) 1 (True) 0 (False)	Boolean
v63	tourism	(Tourism may be negatively or positively affected) 1 (True) 0 (False)	Boolean
v64	energy_price	(Reduced energy price) 1 (True) 0 (False)	Boolean
v65	property_price	(Property prices may decrease, although they may also increase) 1 (True) 0 (False)	Boolean
v66	livelihoods	(Impact reported can be positive or negative for local livelihoods) 1 (True) 0 (False)	Boolean
v67	eco_imp	Sum of the economic impacts registered	Discrete
Variables summarising all impacts			
v68	imp_score	Sum of the number of social, environmental, and economic impacts registered for each entry	Discrete
v69	perceived_imp	(Based on the document/s reviewed what is the perception regarding the quality of the impacts?) Many negative impacts Moderate negative impacts Neutral Moderate positive impacts Many positive impacts	Ordinal

In addition to the list of variables that make up the final database (listed in Table 3), some text data was also collected from each of the documents reviewed. This text data was retrieved based on four deductive themes:

- Role of citizens;
- Opportunities for participation;
- Social innovations;
- Impacts, results, and recommendations.

The unstructured text data was not included in the final database. It has been retrieved to support further analysis and inform other JustWind4All tasks, namely task 3.3 (Appraisal of effective and just implementation of wind energy in European regions).

3.8 QUALITY ASSESSMENT

To ensure data quality, each entry produced was reviewed by a second researcher who ensured the data had sufficient quality and was correctly inserted.

Each document was therefore reviewed at least twice by the research team. In some cases, more than one document was reviewed for a specific entry. For instance, in cases where energy community websites were the primary source of information for a particular case study, additional sources of information were sought by conducting keyword searches using the name of the specific wind park or case study mentioned on the website. For validation purposes, the leading researcher revised each entry to the database, ensuring that information was clear and that all variables had been filled in.

In some instances, some variables were inevitably left with zero values, such as the number of turbines and the installed capacity, particularly in cases when the document/s reviewed were not directly referring to a specific case study, but, for instance, to a survey that had produced relevant findings on the impacts of consultation in wind energy development (Hoicka et al., 2021). Although not specifically related to a case study of participation, this type of document was still relevant as it provided information on a specific level of participation.

3.9 DATA CHECKING AND CLEANING

The data collected was the product of a collaborative effort by a team of researchers, each of whom was responsible for reviewing numerous documents. These documents underwent text screening to extract pertinent information and populate one or more entries in the database. Despite the collaborative nature of the effort, data cleaning remained a vital step in the process. This involved tasks such as eliminating duplicates (despite the distribution of links among researchers, duplications did occur), standardizing data entries, especially for numeric variables like the number of turbines and installed capacity and verifying that all links to the reviewed documents were up-to-date and accurate. In addition, removing duplicates included screening for duplicates in terms of content, which occurred when the same case study was being related through two or more different documents and therefore appeared twice or more in the database, although the document sources themselves were different. Duplication of content was most common when the documents reviewed were news media articles but was also found in the case of peer-reviewed research articles.

3.10 STATISTICAL ANALYSIS

Statistical analysis of the data retrieved was conducted using Python open-source code. Considering the dimensionality of the datasets, several analyses were found suitable, depending on the key research questions. The results of the descriptive analysis are summarised in this document. In a follow up step, the database could also be analysed in alternative ways, including inferential statistics, for example, focusing on a specific level of participation and analysing the relationship between variables. Python libraries used included "Pandas", "Numpy", "Scipy", and "Math" for statistical analysis("Package overview — pandas 2.1.2 documentation," n.d.), as well as "Matplotlib" and "Seaborn" (for data visualizations)(Hunter, 2007).

3.11 LIMITATIONS

The main limitation of the database lies in its geographical scope, which is primarily centred on Europe, with a selection of instances from North America and a very limited representation from other global regions. This limitation mirrors the availability of information retrieved from published sources, which are mainly focusing on Northern Hemisphere countries, with Europe, the United States and Canada leading as regions of study (see also section 5.1 with an overview of data distribution by country).

Unless participatory practices were described in literature and/or in other published sources, it was not possible to learn whether specific wind energy installations (i.e., as mapped through the "Global Wind Power Tracker") have included any form of participation. Nevertheless, the intent has been to create a database that would be primarily based on European cases, as this work offers important input for subsequent activities in JustWind4All.

Another important limitation is that all data was retrieved from indirect sources – i.e., a research article, a newspaper article, etc. – and not from those directly involved in the process, who likely would have additional information to provide, which cannot be captured by this work.

Lastly, not all documents reviewed, including research articles, had the necessary information to fill in every variable of the database, and therefore, additional sources were searched, for instance, for collecting information on the installed capacity or turbine number of a specific case study. Here, the "Global Wind Power Tracker" and "Wikipedia" were important sources.

4. DATABASE

The full database is available at the **JustWind4All ZENODO community** offering a detailed characterisation of participation practices, including information regarding the different variables used. These datasets can be further filtered by level of participation to enable a more thorough analysis of sub-sets of the data. The database is available here in ZENODO in both Excel and CSV format.

The spreadsheet includes the following pages:

a. Summary page: includes a summary of the database goals and key questions
b. Data structure page: provides a data dictionary for each variable in the database
c. Full dataset (397 entries)

d. Dataset with case studies only (314 entries)
e. Dataset with social innovation examples (222 entries)

Descriptive analysis in Jupyter notebooks on GitHub (includes all the statistical analysis and a data visualizations produced)
https://github.com/inezcampos/windenergyparticipation

To illustrate the data collected, an interactive visualization has been produced in Tableau to enable quick filtering of the participation level and opportunities for participation in the examples collected across the globe. The full visualization illustrated in Figure 1 can be assessed at Tableau here.

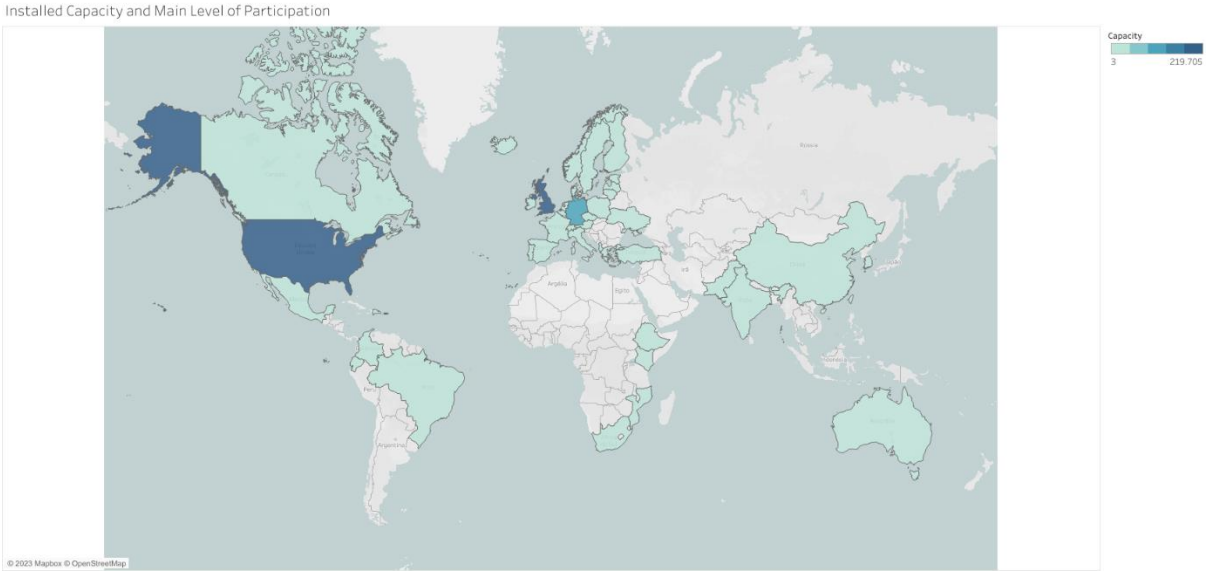

Figure 2 Snapshot of Tableau's dynamic visualization of countries, levels, and opportunities for participation

5. RESULTS: PARTICIPATORY PRACTICES IN WIND ENERGY

The results start by presenting an overview of the data distribution (i.e., country, type of documents reviewed, year of the project reviewed, etc.) in section 5.1. Next, section 5.2 describes the levels, the subjects, and objects of participation, as well as the opportunities of participation and the moments of the project's development when participation mostly occurred. Section 5.3 offers a specific overview of the models of participation identified for each level. Lastly section 5.4 presents an overview of the main social, environmental, and economic impacts identified and quantified.

5.1 OVERVIEW OF DATA DISTRIBUTION

The documents reviewed spanned between 2000 and 2023, with 50% of the documents reviewed published between 2021 and 2023 (see Figure 3).

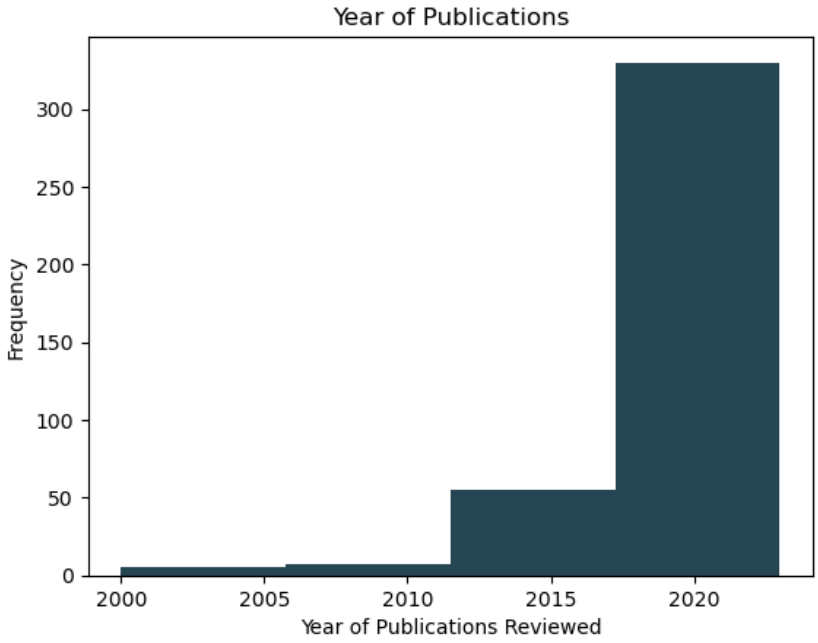

Figure 3 Year of publications reviewed

The sources of the 399 documents reviewed had the following distribution: journal article (36%) community energy website (16%), reports of EU project deliverables (16%), wiki or other sources (13%), news media article (6%), blog posts (5%), other types of reports (3%), and thesis (2%) (see also Figure 4).

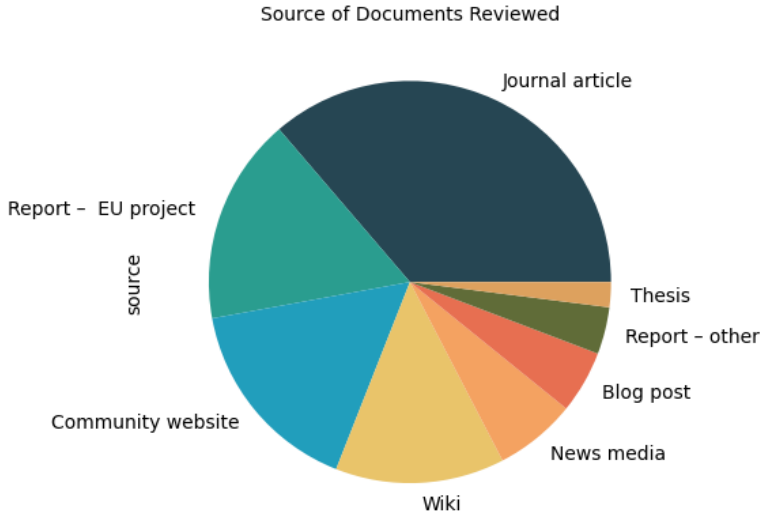

Figure 4 Source of documents reviewed

Regarding technology, most examples (71%) are related to onshore wind energy projects, followed by 14% examples of offshore wind energy projects, 3% that included both on-and offshore wind energy projects, 4% with a focus on very small wind turbines (with a capacity

lower than 1000 kW), as well as 6% of entries for which the technology was not applicable. These last set of entries are those in which the document reviewed is focused on overall participation without relating a specific case (see Figure 5).

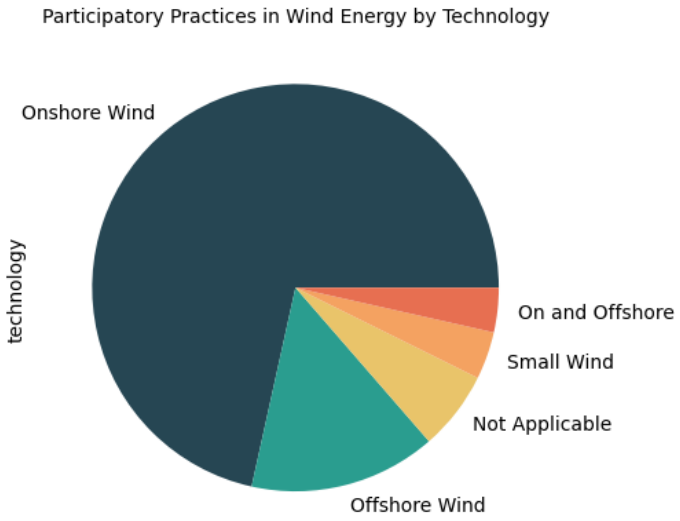

Figure 5 Entries to database by technology

Regarding regional distribution, most examples collected come from Europe, particularly from Northern Europe, followed by Western Europe and North America (see Table 4)

Table 4 Regions of the examples collected.

Regions of the examples collected	Count	Frequency
Africa	9	2%
Australia	11	3%
Asia	17	4%
South America	20	5%
Eastern Europe	25	6%
Southern Europe	43	11%
Central Europe	44	11%
North America	53	13%
Western Europe	65	16%
Northern Europe	88	22%
Not Applicable	22	5%

Across these regions, the scale of governance of the examples collected is mainly local (43%), followed by regional (29%) and national (21%), with a small percentage of transnational cases (5%) (see Figure 6)

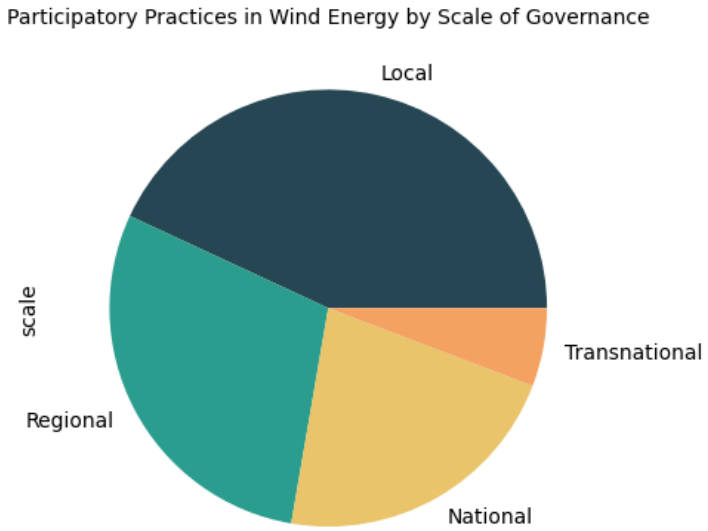

Figure 6 Entries to the database by the scale of governance

Regarding the years of the projects reviewed, they predominantly span the last two decades, with some examples as early as the 1980s. Some years are in the future and refer to projects for which discussions and participatory processes have already taken place, although the year of construction is planned for a data in the future (see Figure 7).

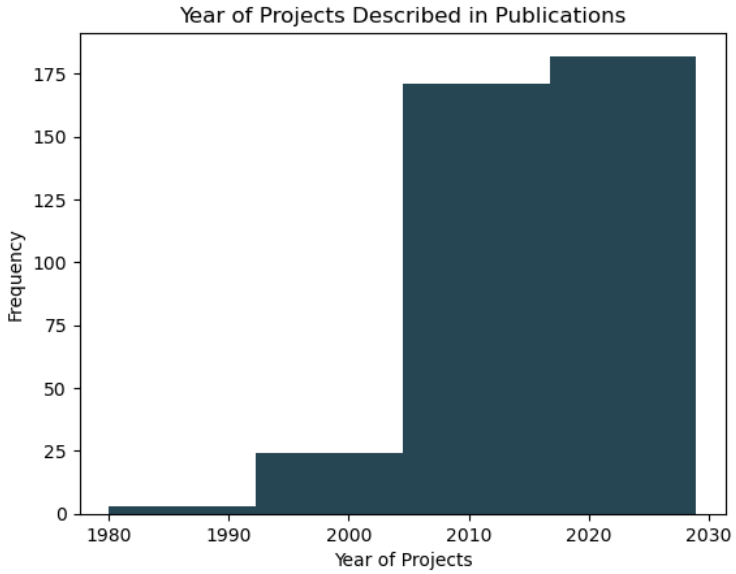

Figure 7 Year of projects reviewed.

5.2 LEVELS OF PARTICIPATION

Participatory practices in the context of onshore and offshore wind energy development take place at different levels of participation, namely: no participation/alibi participation, resistance, information, consultation, financial participation, and cooperation.

Furthermore, participation often occurs at more than one level. For instance, while the dominant level may be consultation, financial participation (e.g., compensation payments), may also take place.

The main levels of participation of the full set of examples retrieved (n=399) are consultation (n=123), followed by financial participation (n=87), cooperation (n=63) levels, and Information (n=54). Resistance (n=50), no participation (n=15) and alibi participation (n=5), are less present in the data. Figure 8 illustrates this distribution.

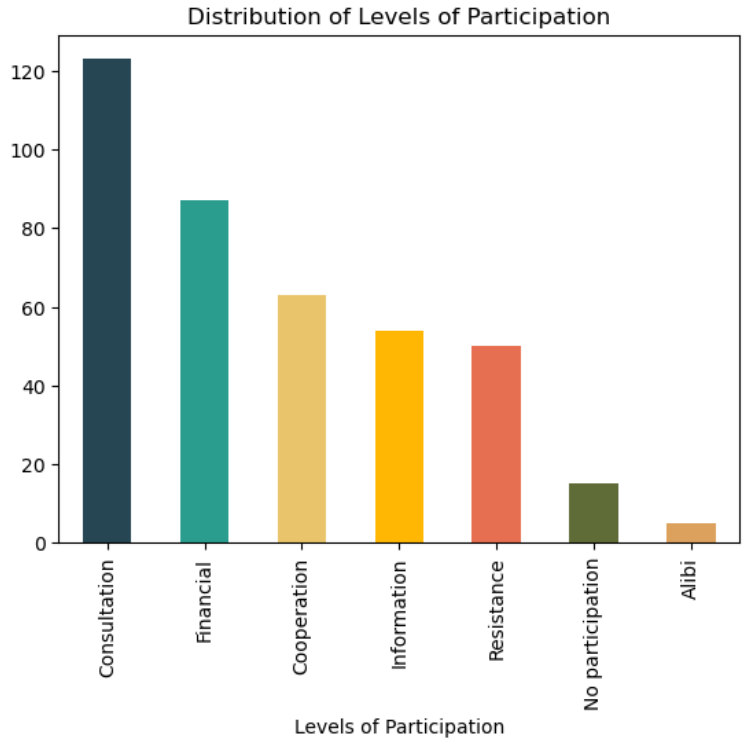

Figure 8 Main levels of participation

Installed capacity offers an indicator of the size of installations, however it varies considerably, with several outlier values, because the projects reviewed include national as well as local scale projects. For instance, an entry for Germany registers an installed capacity of 29788 MW in 2022, another entry for the United States registers a capacity of 141000 MW for the same year. On the other end of the spectrum, local small projects have a small capacity of 1 or 2 MW. Figure 9 shows the installed capacity and turbine number of the projects reviewed, which are highly correlated (as would be expected).

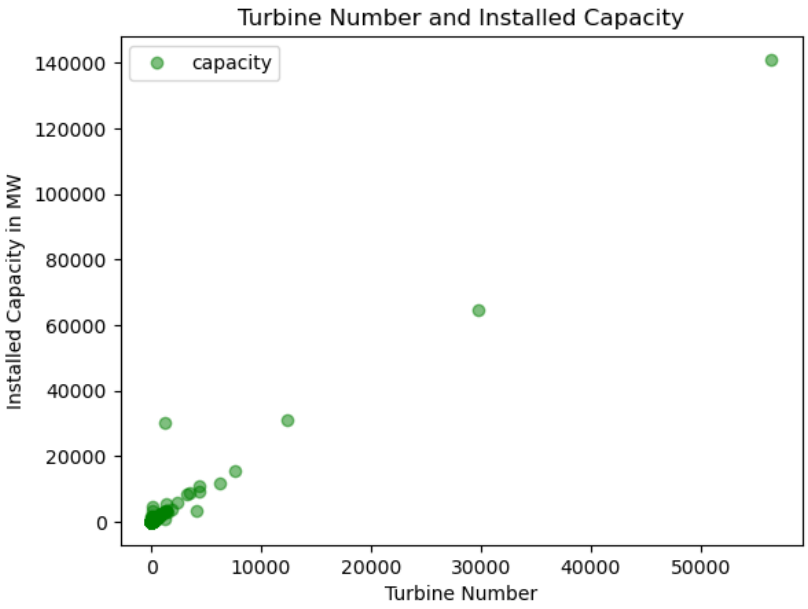

Figure 9 Turbine number and installed capacity (MW).

Considering the main subjects of participation across the examples collected, "local communities" (226 cases) and "communities of interest" (e.g., fishermen, farmers, indigenous communities, etc.) (44 cases), closely followed by the "general public" (41 cases), are those most often involved in participation. "Organisation" (6 cases) refers to a public organisation and is different from "NGO"/non-governmental organisation (6 cases) (see Figure 10).

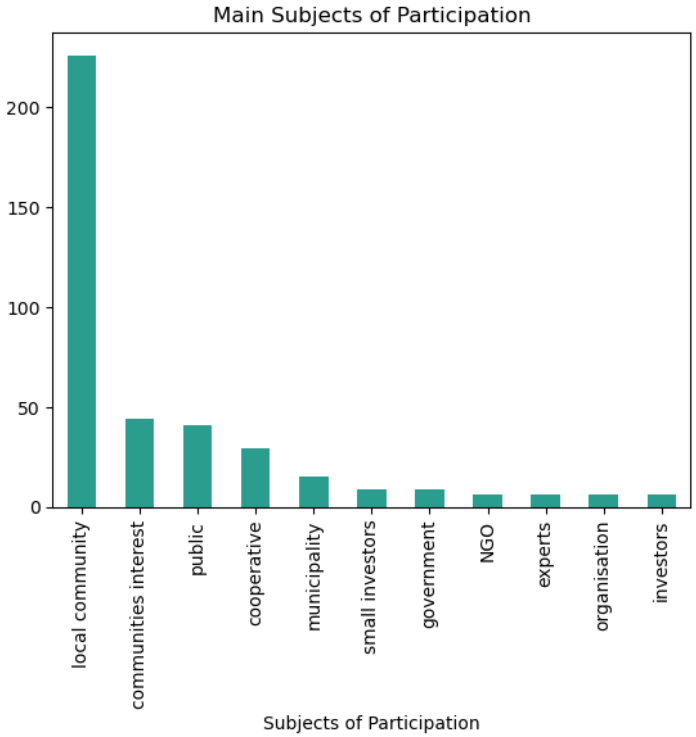

Figure 10 Main subjects of participation

As for the main objects for participation (see Figure 11), “onshore wind farms” (163 cases) are the most common object, followed by “turbines” (i.e., when the focus the participatory process is on specific sets of turbines) (120) and “offshore wind farms” (53). In addition, 36 cases focused on specific “policies” (for example, policies determining the distance between turbines and residential areas). There were very few examples of participatory practices with a focus on “repowering” (5), “community” engagement (7), “companies” (7), and “others” (6).

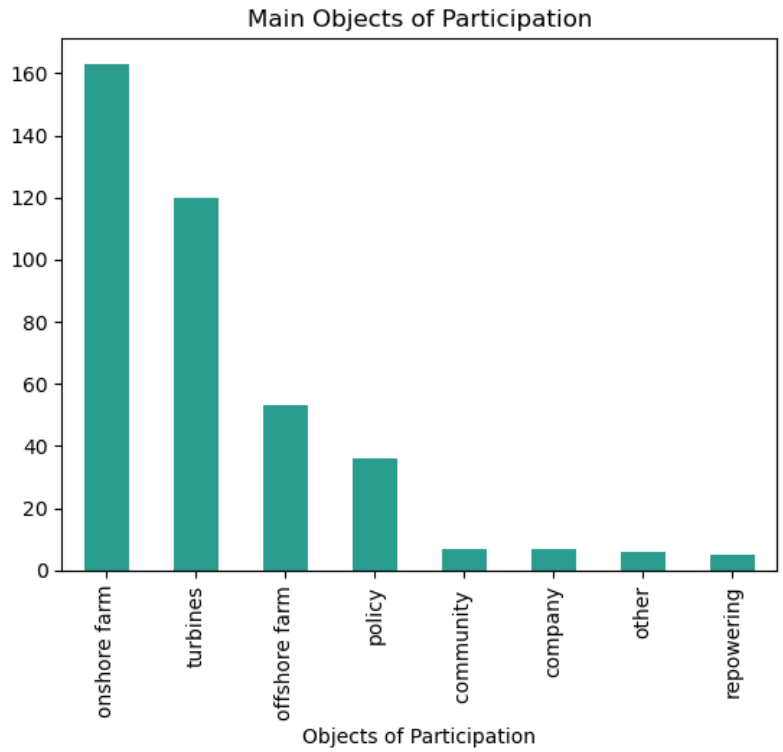

Figure 11 Main objects of participation

Opportunities for participation across the examples collected are “mostly moderate” (43%) or “insufficient” (23%), followed by 19% of examples for which opportunities are “excellent”, 8% for which it was “not applicable” to measure opportunities and 6% of examples for which information about opportunities was “not provided” (see Figure 12).

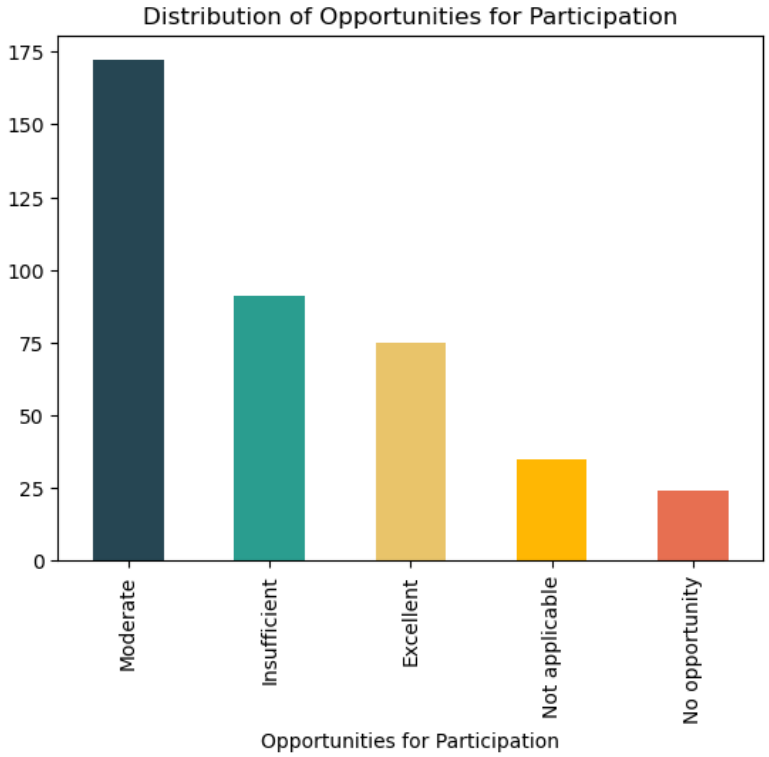

Figure 12 Opportunities for participation

The timing of participation occurred mainly during the "planning" stages (23%), with a significant number of examples for which participation occurred "throughout the project" (18%), and with 19% of the examples for which "no information" about the timing of participation is provided in the documentation. "Exploration" (i.e., when there is still no definite plan regarding a specific wind installation, but there is an interest and/or commitment to advancing with a wind project) is also an important stage for participation (13%). In addition, "maintenance" (9%) and participation that takes place "at more than one stage" (8%) are less common. Participation is rare during the "construction" stage (6%) and the "decommissioning" of wind energy projects (0.5%) (see Figure 13).

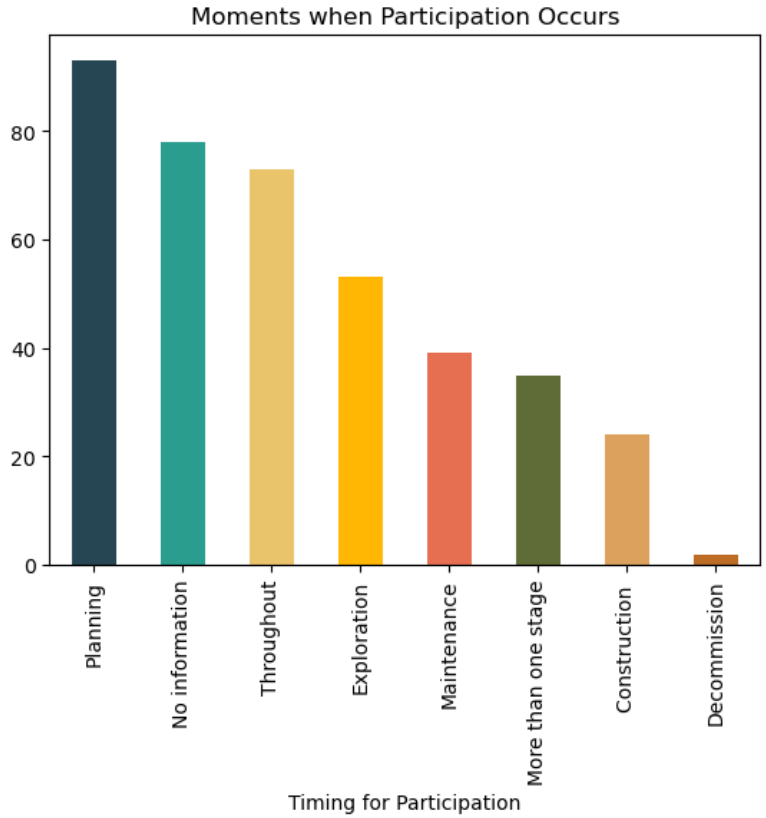

Figure 13 Timing of participation

Opportunities are also higher when the timing for participation happens throughout the project (mean=3.3) or at more than one stage (mean=2.8) and are lower in examples for which no information is provided regarding the specific timing when participation took place (mean=1.9) (see Figure 14).

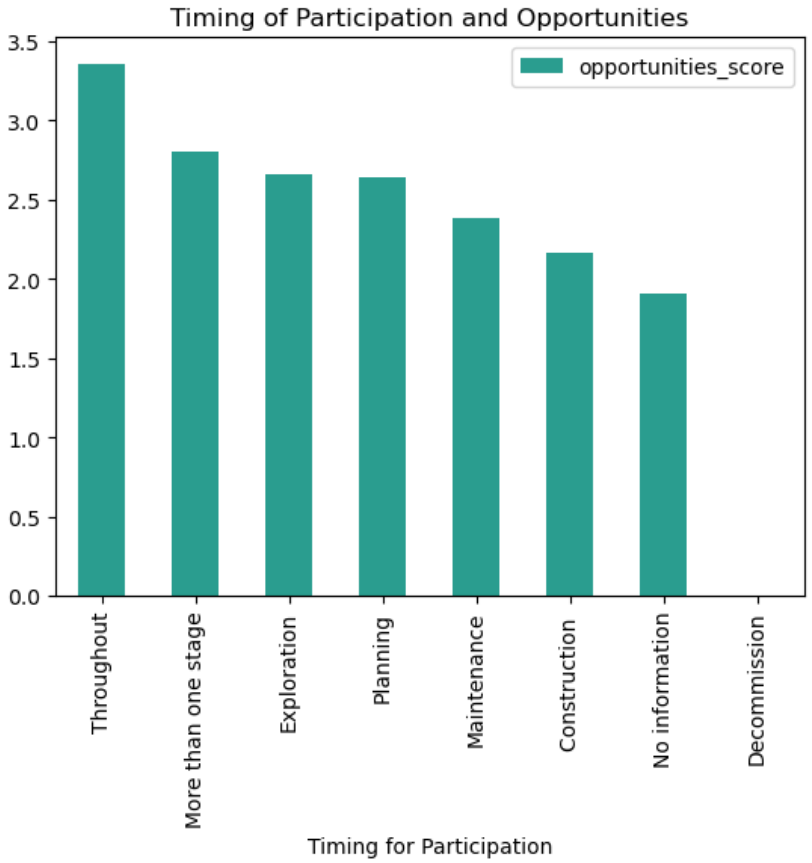

Figure 14 Timing of participation and opportunities

Within the smaller dataset of 221 entries classified as social innovations, these included "Rescoops" (82), "Public-Private organisations" (30), "Other Grassroots Innovations" (38), "Private Companies" (29), "Community Development Trust or Fund" (26) and "Local Government Projects with Citizens" (17) (see Figure 15)

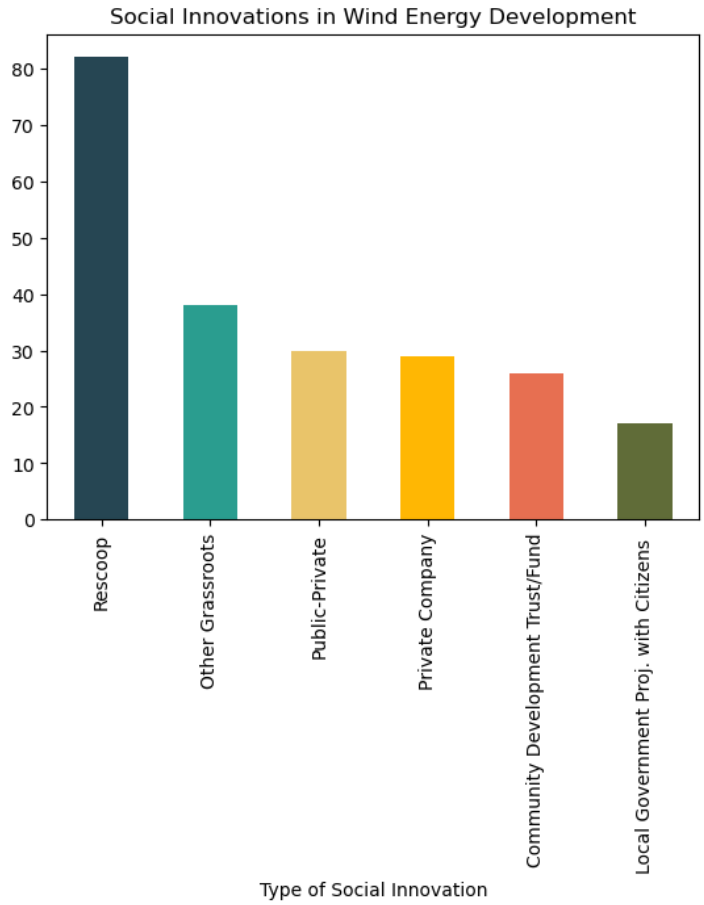

Figure 15 Type of social innovation, based on organisational form

5.3 MODELS OF PARTICIPATION

5.3.1 NO PARTICIPATION AND ALIBI PARTICIPATION

Although the focus of the database and the systematic review of documents was on participatory practices, some valid entries were included in the database which did not include a specific form of participation, and focused more broadly on the factors leading to local wind energy acceptance (Devine-Wright, 2009).

Examples of alibi participation equally shed light on situations where wind energy projects caused minimal conflicts, even in the absence of a formal participatory process. For instance, in Galicia, despite a significant wind energy development in the region, participation was limited to top-down pro forma sessions (Simón et al., 2019). Here the Spanish legal frameworks, which enabled land expropriation for wind energy projects considered as a 'Public Utility', resulted in a passive acceptance of wind energy developments. Moreover, in Brazil, investigative journalism articles ("Usinas eólicas exploram agricultores familiares e territórios tradicionais para gerar lucro," 2022) highlight how major corporations have made significant investments in large-scale wind energy installations in rural areas. These investments have occasionally impacted the traditional

livelihoods of farming communities, who were minimally engaged in the decision-making process and were approached through specific groups seeking expedited community consent. Three distinct models for alibi participation were identified in which 'no participation' is also included, namely: "citizen advisory committees" (Groups aimed at "educating" citizens about the project with no interest in obtaining feedback)(Dwyer and Bidwell, 2019); "community action agencies" (Groups aimed at obtaining official consent from citizens without providing participation opportunities) and Pro forma participation (other forms of pseudo-participation or 'as if participation')(Simón et al., 2019). Figure 16 shows the frequency for the different models of alibi participation.

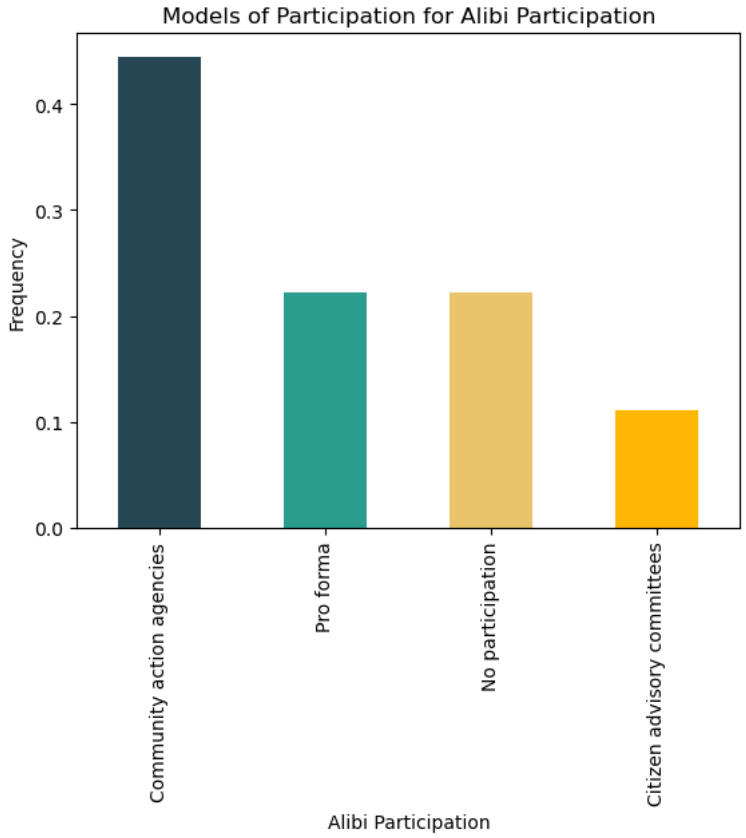

Figure 16 Models for alibi participation

5.3.2 RESISTANCE

Although wind energy is often touted as a sustainable and environmentally friendly source of power, the development of wind energy projects can be met with resistance and opposition from local communities. One of the main reasons for this opposition is the lack of meaningful participation of communities in the development process. Communities that feel left out of the decision-making process or that believe their concerns are not being taken seriously often mobilise and organise protests towards wind energy projects (Mason and Milbourne, 2014). Different forms of protest and resistance may arise from such participatory deficits and therefore it is critical to discuss some of the participatory practices that have been implemented to address these issues.

In South Korea, fishers in Tongyeong raised their voices in opposition to a wind farm in 2019 and formed the Offshore Wind Power Response Committee and Damage Countermeasures Committee (DCC)(Park et al., 2022). They argued the wind farm would severely harm their fishing business and that they were not consulted. Opposition was so fierce that not even when the local authorities decided to promote public participation did the fishermen back down.

Sweden has a rich history of environmental protests and opposition to renewable energy sources, including wind parks (Anshelm and Simon, 2016). Arguments against wind energy have been largely focused on the visual impact of turbines and the issue of distributive justice (i.e., communities where wind parks are built have little or no benefits from the parks). Unlike other sources of renewable energy, wind energy opponents in Sweden are not backed up by experts and scientific evidence, which severely diminishes their support when opposing wind parks.

Resistance can also occur virtually. In Ireland, opposition groups in rural areas were initially created using social media (Fleming, 2014). These groups opposed the construction of wind parks claiming they would ruin the landscape aesthetics and profits would not benefit local communities.

Increasing opposition to wind parks is the main reason why a growing number of studies on social acceptance of wind energy has been observed (European Commission et al. 2017; De Luca et al. 2020). The conclusions universally point out that increasing public participation reduces opposition, although which method of participation is better is largely context-dependent (Rand and Hoen 2017 Jul 1). Figure 17 shows the frequency for the different models of resistance identified.

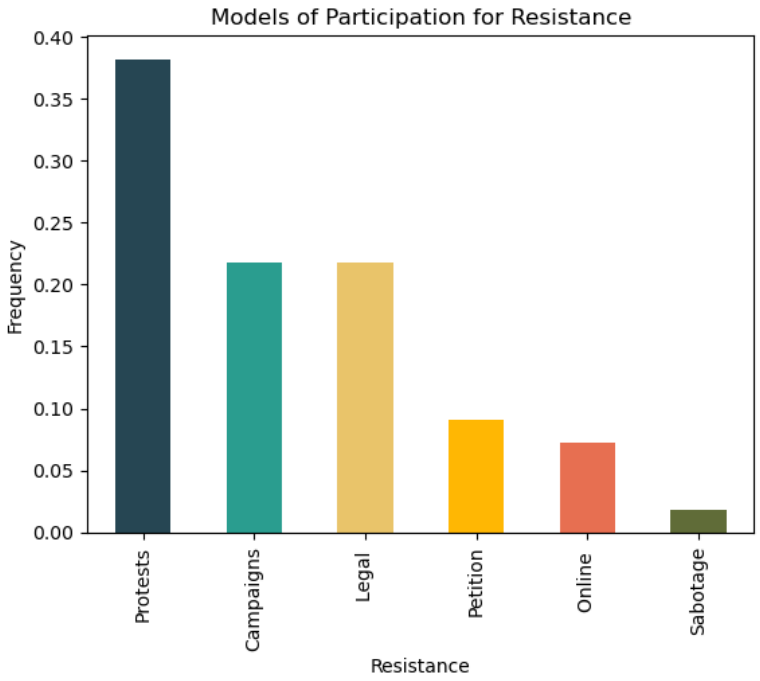

Figure 17 Models for resistance

5.3.3 INFORMATION

Transparency and information are critical components of any participatory process. One study showed that, in Germany, information transparency is preferred by citizens over other participation methods (Langer et al., 2017). Communities need access to clear and accurate information about wind energy projects to make informed decisions and effectively participate in the development process. For example, Winter and colleagues (Winter et al., 2022) demonstrated that public communication which highlights the benefits of wind parks is more effective in curbing the spread of conspiracy theories compared to public debates where arguments against wind parks are present. Unfortunately, lack of transparency and insufficient information are common issues in wind energy development, which can lead to mistrust and conflict between developers and communities.

Project developers can use various methods to disseminate their plans to build a wind energy project. Traditional communication channels, such as newspaper articles and press releases, are the most common. Unfortunately, there is a lack of data about this type of outreach or its impact on the social acceptance of wind energy projects.

The use of quality labels can be an effective way to build trust and transparency in the development and operation of wind energy projects and to increase public participation in the decision-making process. For example, the quality label “Partner for Fair Wind Energy”, awarded by the Service Unit Wind Energy in Thuringia, certified wind project developers that adhered to certain standards of quality, transparency, and participation (Nowakowski and Wnuk, 2018). Quality labels can play a vital role in fostering public trust and acceptance of wind energy projects by providing clear and concise information to citizens about the sustainability and environmental impact of these projects.

Digital communication methods such as social media and project websites can be used to engage with the public and provide information about the proposed wind farm. In the case of the Tooma II wind park in Estonia, information provision was made using electronic channels and written orders, including local county newspapers and the municipality’s website (Nowakowski and Wnuk, 2018). Although there is not much information focused on wind energy, some studies have investigated digital communication methods for renewable energies in general (Barrios-O’Neill and Schuitema 2016; Sinclair et al. 2017; Biddinika et al. 2019; Corbett and Savarimuthu 2022).

Twinning, along with other methods that use digital or virtual communication, can be effective tools to inform citizens about the benefits and challenges of wind energy projects (Solman et al., 2022). In addition, online forums, and virtual reality simulations, can be used to engage citizens and provide them with a deeper understanding of wind energy projects. For example, Ribe and colleagues (Ribe et al., 2018), showed that citizens’ social acceptance of wind parks can be inferred beforehand using visual-acoustic simulations. Although currently restricted to experts and governance actors, digital twinning can be developed for citizens as a socially innovative method of participation (Solman et al., 2022).

Finally, elicitation methods can be a way to inform and engage citizens about wind energy projects, of which many examples can be found in the scientific literature (Guan and Zepp,

2020; Spielmann et al., 2021; Vargas, 2020). Figure 18 shows respectively the frequency for the different models of information identified.

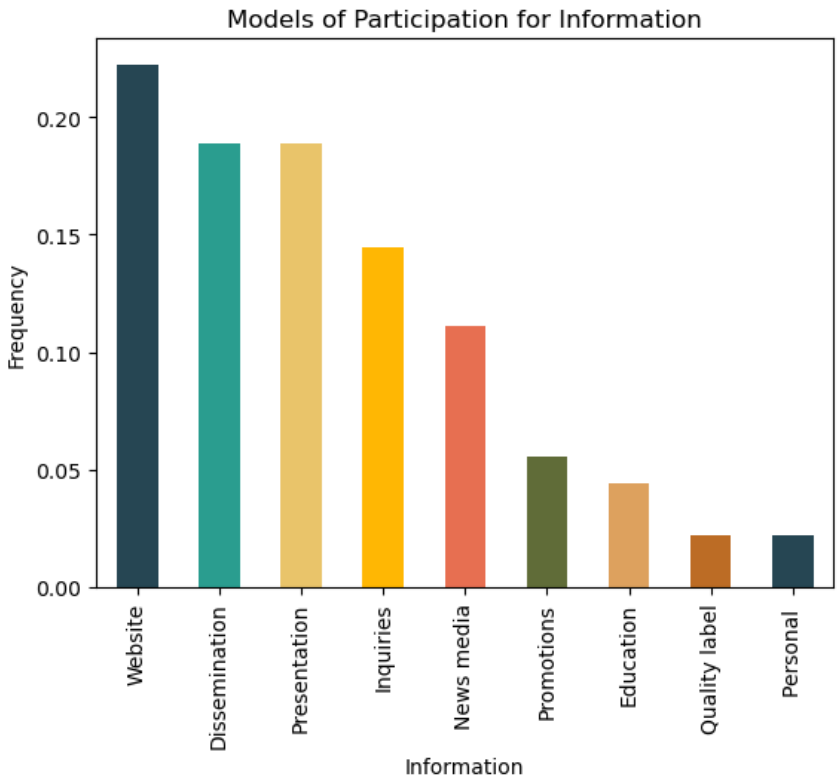

Figure 18 Models for information

5.3.4 CONSULTATION

Public consultation is an essential component of wind energy development, particularly in countries where it is mandated by law (through Environmental Impact Assessments) (Glucker et al., 2013). Effective public participation can ensure that local communities have a say in the development process and that their concerns and perspectives are accounted for. In many cases, public participation can also improve the overall quality of wind energy projects by identifying potential issues and opportunities for improvement. In countries without a strong wind energy component, public participation processes can take many years until they become common practice. Such was the case in Ethiopia, where the only two wind farms in the country had no public participation at all (Gebreslassie, 2020). Public meetings and informal dialogues are frequently arranged by municipalities and project developers to engage with local communities and reduce opposition. Several examples of participatory planning are described in the literature. The regional planning unit of Oderland-Spree, one of five regional planning units in Brandenburg, hosted informal dialogues with communities and citizen initiatives to revise the regional wind plan (Nowakowski and Wnuk, 2018). Another illustrative example of the importance of consultation in wind energy projects can

be seen in the extension of the Sa Turrina Manna wind park in Sardinia, Italy (Nowakowski and Wnuk, 2018). Initially, the local community had exhibited low opposition, with citizens unaware of the potential environmental and visual impacts of the wind park. However, when the extension was proposed, concerns were raised regarding the impact on the environment, visual landscape, and displacement of workers. The local community was included in a consultation process to address these concerns, resulting in an agreement that reduced the number and density of turbines and, in some cases, their relocation. The consultation process also led to the creation of recreational areas for various activities, including the allocation of 2% of the gross revenue generated by the farm to the Tula municipality, which was consulted on how to distribute the funds to benefit the community. As a result, municipal taxes were reduced for around 1600 households, and investments were made to improve the quality of life through family-friendly policies and education. Figure 19 and shows the frequency for the different models of consultation identified.

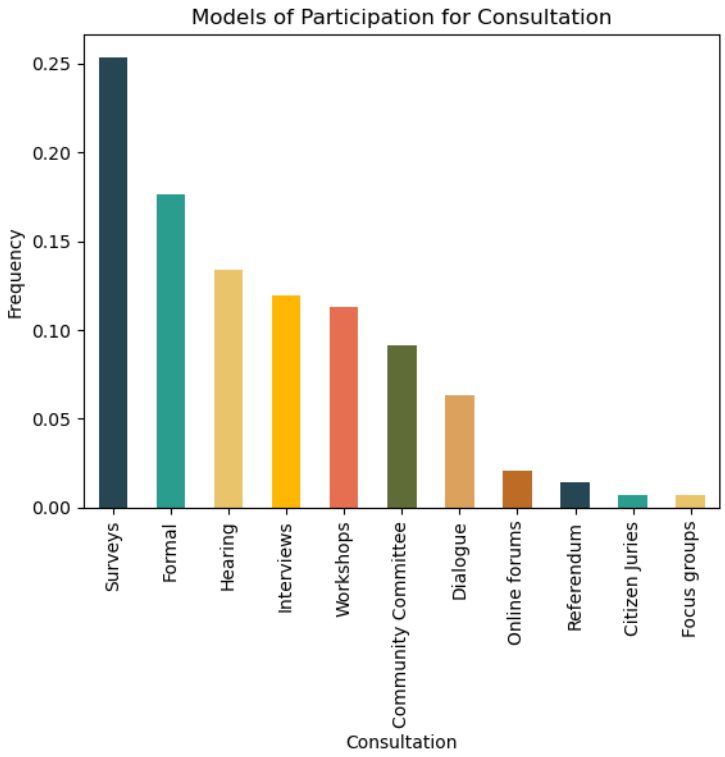

Figure 19 ***Models of consultation***

5.3.5 FINANCIAL PARTICIPATION

Financial participation can take up many forms, from cooperative investments to simple land lease payments and in-kind benefits provided to the community. Social innovations, such as community fund projects and new forms of financial participation (crowdfunding, crowdlending and citizen investments) provide equal examples of financial participation.

Wind energy cooperatives offer a promising way to involve citizens financially in the transition towards sustainable energy systems. Cooperatives represent a high level of energy

citizenship by allowing citizens to collectively invest in, and own wind turbines, enabling them to directly benefit from the production of renewable energy. The proximity to local consumers and prosumers has been found to increase the social acceptance of wind energy projects led by energy cooperatives (Bauwens and Devine-Wright, 2018). In fact, missing opportunities for financial participation can have strong negative consequences for community acceptance (De Luca et al., 2020). In this regard, citizens can participate financially in wind energy cooperatives, through different models.

A paid membership is perhaps the most common form of participation in wind energy cooperatives (Maleki-Dizaji and del Bufalo, 2019). Individuals can purchase shares in the cooperative, thus becoming co-owners of the wind turbines. These shares may be sold to members of the local community or outside investors. Shares typically come with voting rights that allow members to have a say in the decision-making process and access to information about the cooperative's activities and financial performance. For example, Windkraft Simonsfeld AG (Austria) and Ecopower (Belgium) are two wind energy cooperatives that offer their members the opportunity to invest in the cooperative and receive dividends based on the amount of energy produced by the turbines. Members also have voting rights in the general assembly and can participate in the cooperative's decision-making process.

Land ownership is another way that citizens can participate financially in wind energy cooperatives. Landowners may choose to lease their land to cooperatives for the placement of wind turbines. This can be an attractive option for landowners who wish to diversify their income streams and contribute to the production of renewable energy. For example, Windrad Bürgerwindräder GmbH (Germany) is a cooperative with several wind turbines installed on land owned by local farmers and pays them rent for the use of their property.

Nevertheless, there are other models of financial participation, which do not necessarily entail citizens' participation in decision-making, such as energy discounts negotiated with the energy producer company, and other forms of compensation payments to local communities (Mason and Milbourne, 2014), which may be perceived as bribes and increase local antagonism towards some projects (Ryder et al., 2023).

An innovative model is the ‘community trust or fund’, which can be set based on a share of the dividends from annual energy production (Armeni, 2016). Figure 20 shows the frequency for the different models of financial participation identified.

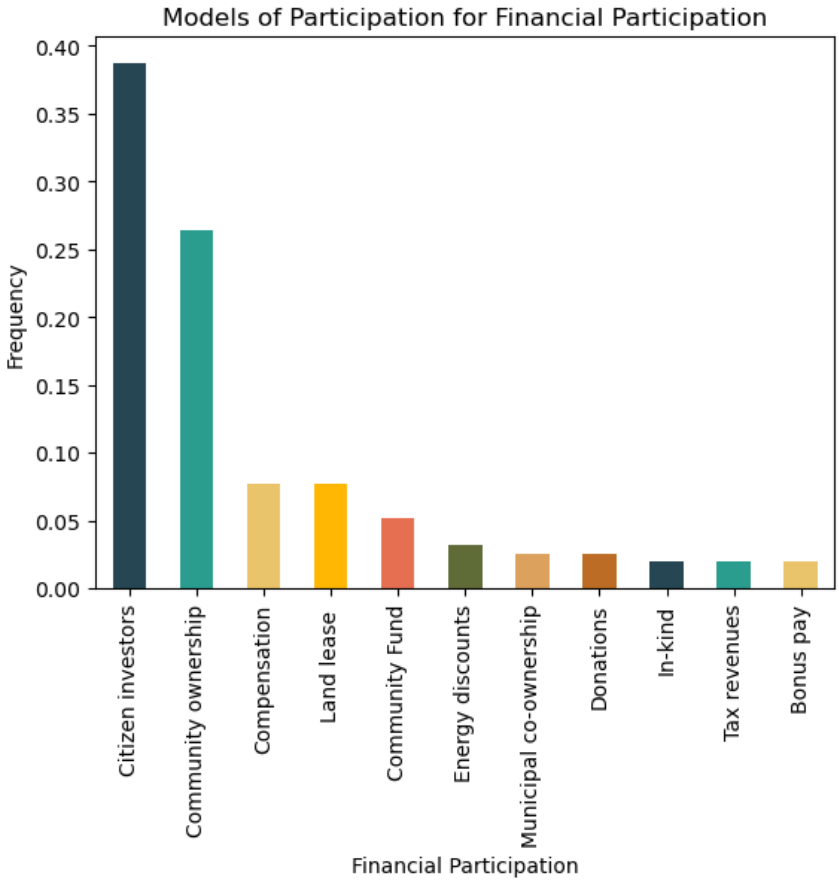

Figure 20 Models of financial participation

5.3.6 COOPERATION

Cooperation cases are mostly voluntary and include several social innovations, such as the setting up of transdisciplinary committees, working groups and cooperative general assemblies, or the establishment of communities of practice for integrating offshore wind farms and nature conservation efforts (Steins et al., 2021). Cooperative planning refers to a collaborative and inclusive process where all relevant stakeholders can engage in the decision-making process of a project. It is a departure from traditional top-down planning models that often neglect local knowledge and interests. In recent years, cooperative planning has gained traction in the field of renewable energy, particularly in wind energy projects, as it is recognized to enhance social acceptance, reduce conflicts, and increase project sustainability (Linnerud et al., 2018). The Service Unit Wind Energy in the rural districts of Steinfurt and Thuringia are a good example of this. The creation of a pro-active, dialogue-oriented and integrated approach to wind energy planning by these units has increased engagement between different stakeholders and ensured a balanced distribution of costs and benefits in the projects (Nowakowski and Wnuk, 2018). In the Mountain Communities in Italy, institutional entities have come together in mountain municipalities for the development of regional policies and the enhancement of sustainable development. In agreement with the CODIF and the Ministry of Environment, all parties promoted investments in the wind energy sector, as well as the dissemination of opportunities for

participation methods, and the creation of a public company to realize the wind farm implementation process (Nowakowski and Wnuk, 2018). Based on the publications collected, citizen assemblies have not been attempted for wind energy projects, although they have been practised in the context of renewable energy planning in countries such as Lebanon (Shehabi and Al-Masri 2022) and Ireland (Devaney et al. 2020). Figure 21 shows the frequency for the different models of financial participation identified.

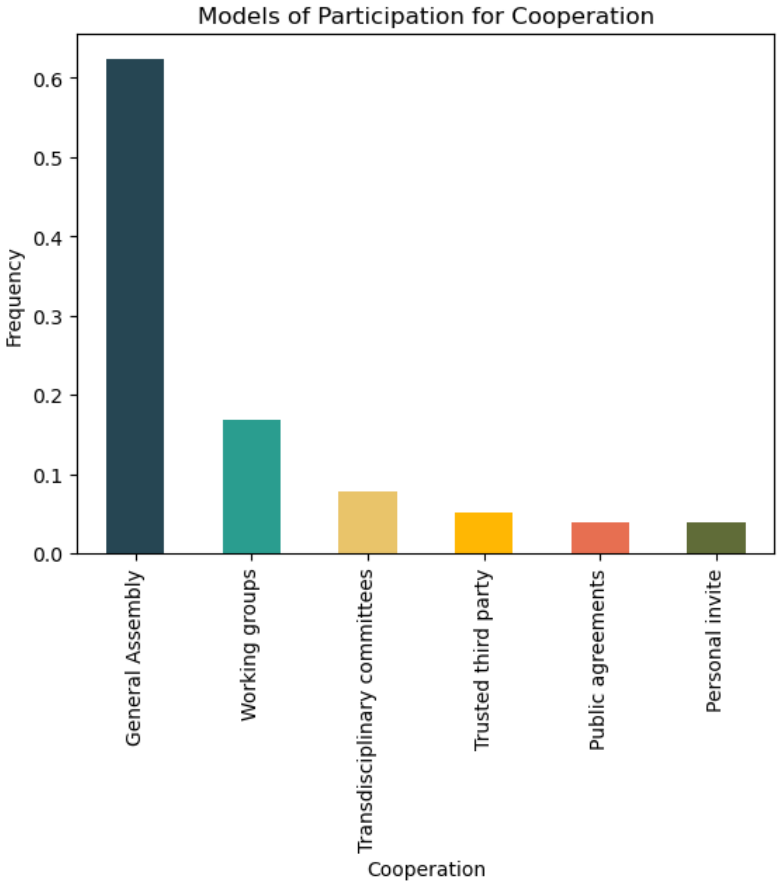

Figure 21 Models of cooperation

5.4 PERCEIVED SOCIAL, ENVIRONMENTAL, AND ECONOMIC IMPACTS

The results on perceived social, environmental, and economic impacts of the projects undertaken, including of the participatory processes implemented, were collected based on the documents reviewed and are illustrated in Figures 22 to 24.

The impacts reported may be positive or negative, depending on the context, although some impacts such as “noise” (172 cases) are related as a negative aspect, while other impacts are positive, such as “awareness” (77 cases), which refers to increased awareness of the

relevance of decarbonisation efforts. Other impacts such as “land use” (54 cases) tend to be negative but may be also positively perceived. “Access to energy” (38) is generally a positive impact as is the setup of “community fund” (n=30). In addition, there are 13 cases which referred to negative impacts on “health”, 7 cases which raised questions of personal “safety” for local communities and 6 cases where “shadow-flicker” is reported as a negative impact (which together with noise, is also referred to as a cause for mental health issues) (see Figure 22).

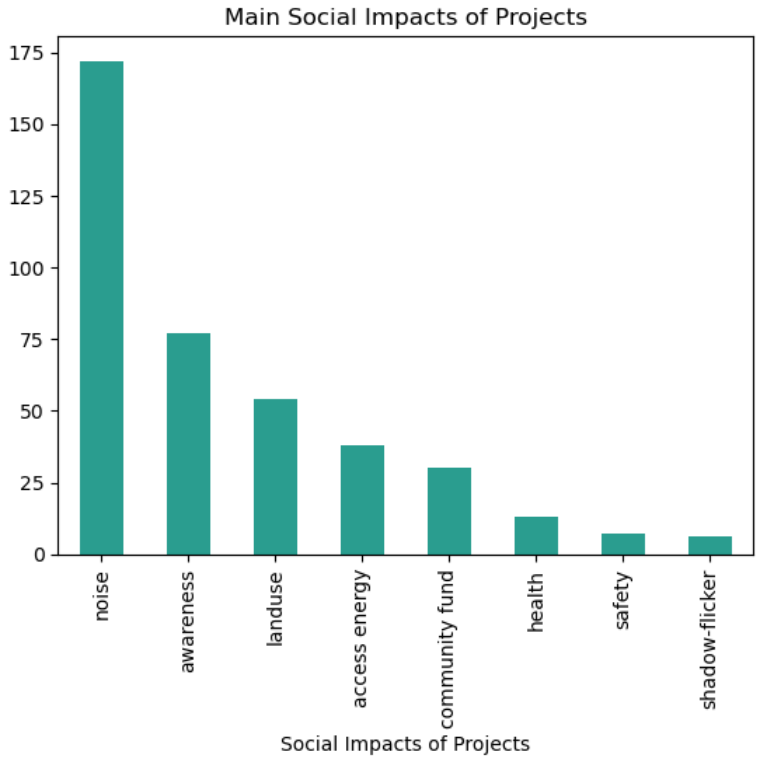

Figure 22 Main social impacts of projects reviewed.

Regarding environmental impacts, while the primary objective of wind energy developments is to reduce “emissions”, this impact was explicitly mentioned in documents (301 cases). In contrast, documents reported also less favourable impacts on “biodiversity” (67 cases) and “landscape” changes (29 cases) (see Figure 23).

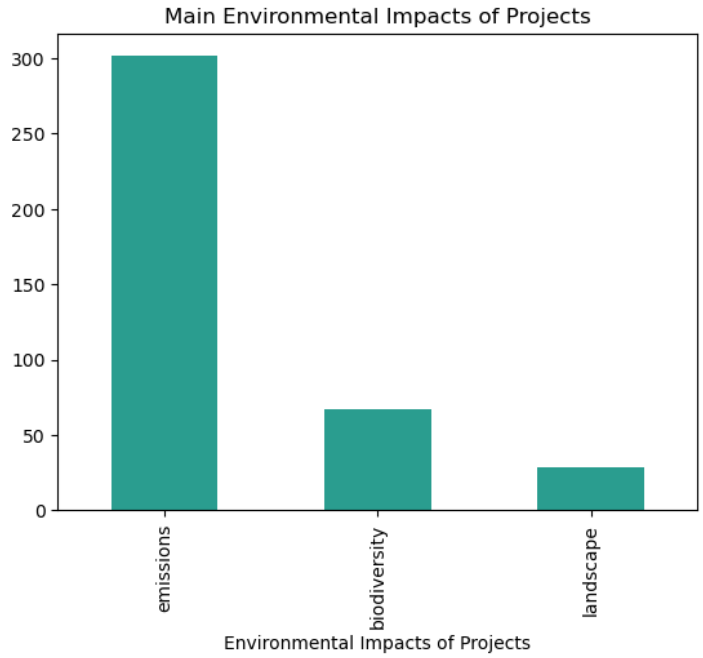

Figure 23 Main environmental impacts of projects reviewed.

The main economic impacts of projects reported were "innovation" (mostly a positive impact, with 212 cases), the creation of "new jobs", also positive (70 cases), but also impacts which can be either negative or positive (depending on the context), such as impacts on local "livelihoods" (30 cases), "tax" (19), "tourism" (14 cases) and "property prices" (11 cases) (see Figure 24).

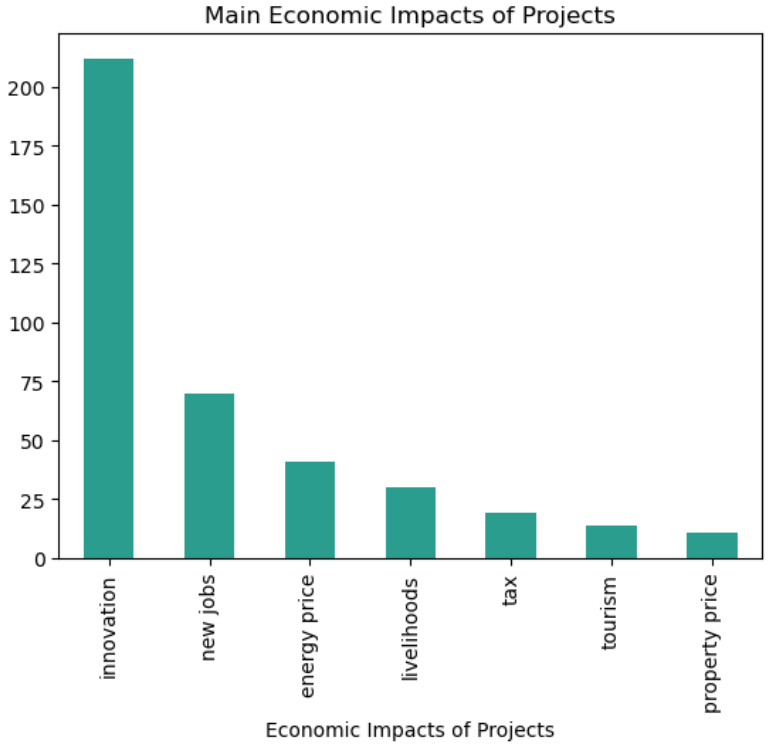

Figure 24 Main economic impacts of projects reviewed.

The 'Perceived impacts of projects' were scored based on the documents reviewed for each case. Most examples have "moderate positive" impacts (41%, 165 cases) or are "neutral" (19%, 79 cases), followed by 71 cases with "many positive" impacts (17%). (see Figure 25).

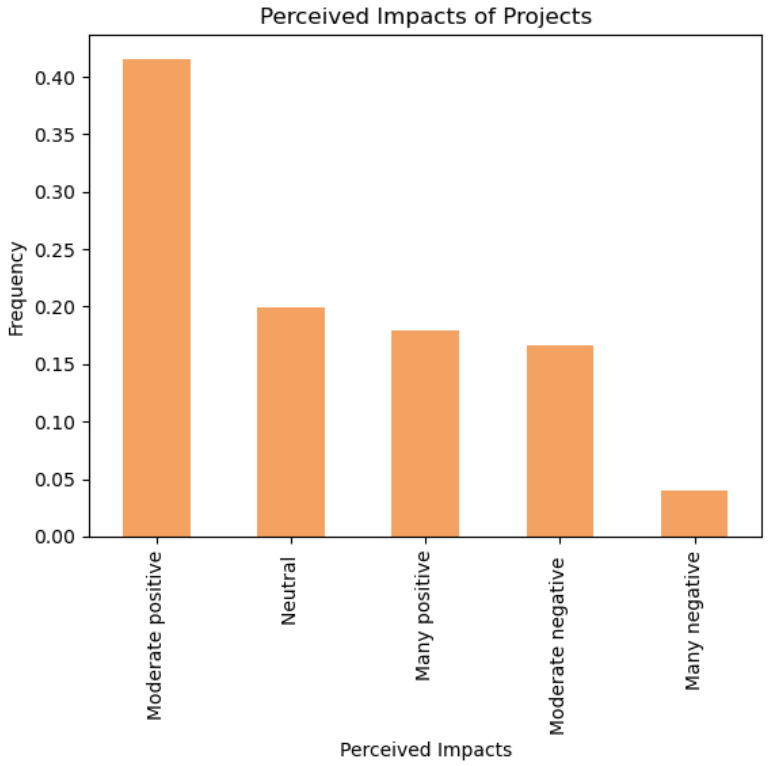

Figure 25 Perceived impacts of projects, based on reviewed documents.

Concerning the perceived impacts and the level of participation, impacts are most positive when participation implies cooperation, financial and consultation, and are mostly negative when resistance occurs. There is no cooperation when many negative impacts are perceived (see Figure 26).

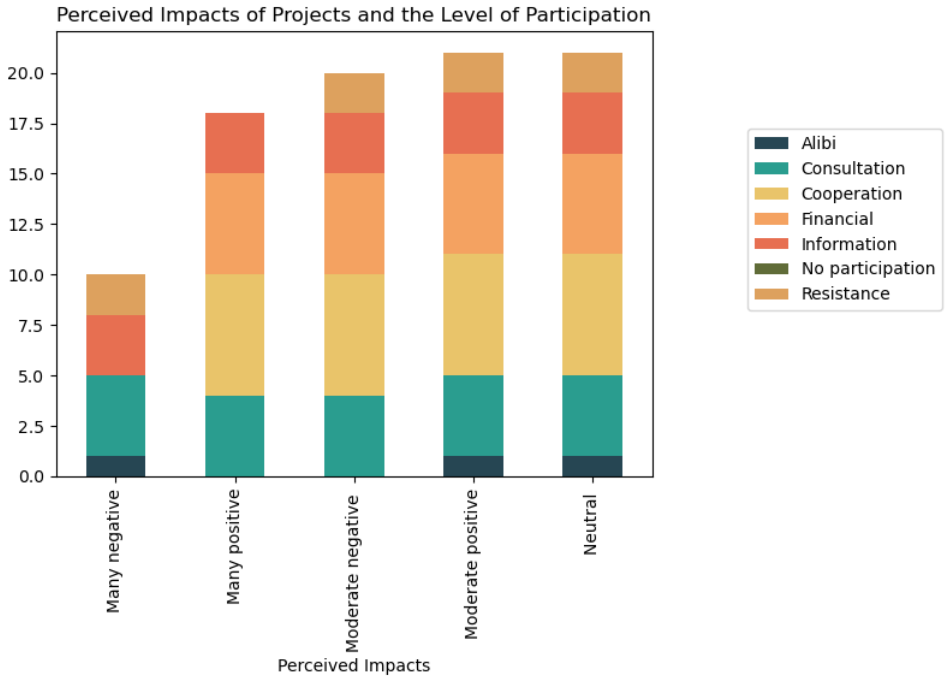

Figure 26 Perceived impacts of projects and the level of participation

Having a legal obligation to include participation is more frequent when impacts are positive. Voluntary participation is present both when impacts are moderate and when there are many positive impacts (see Figure 27).

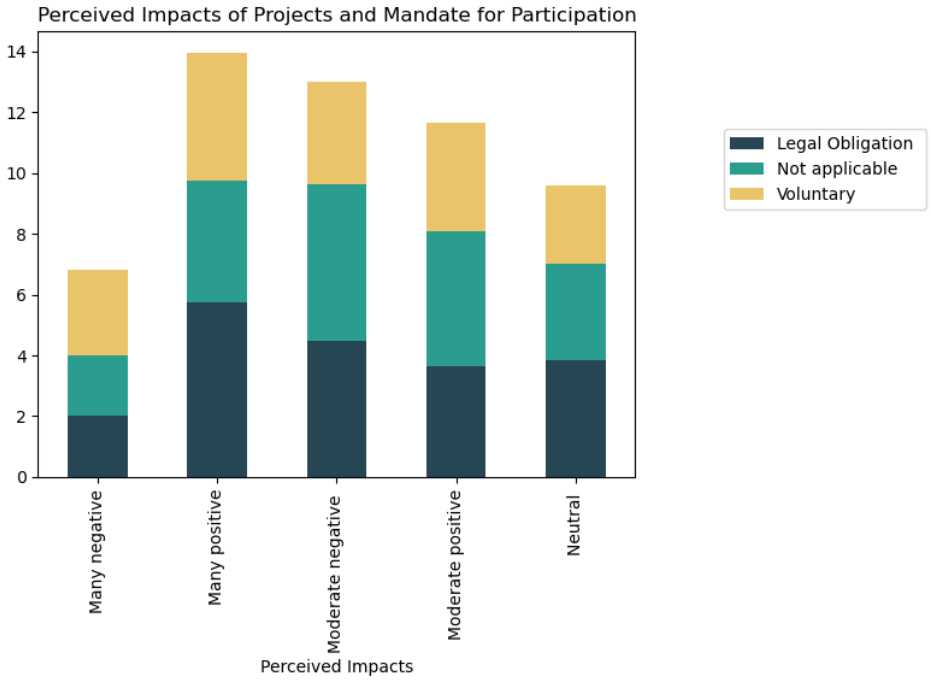

Figure 27 Perceived impacts and a mandate for participation

6. CONCLUSION AND FUTURE RESEARCH

This work aimed to provide a detailed mapping of the diversity of participatory practices in the context of wind energy and thus open the way for further inquiry into how to foster energy citizenship and social innovation in wind energy development.

The systematic documents review, and the database development provided an overview of the main levels, models, subjects, and objects of participation in the context of both onshore and offshore wind energy developments, while also collecting information regarding the key social, environmental, and economic impacts of projects in Europe and elsewhere.

Overall, participation is still a work in progress, and a larger effort is required to bring participation processes to the centre of wind energy implementation. As large-scale wind energy investments, both onshore and offshore, are foreseen for the near future in Europe and across the globe, there are immense opportunities for new governance and policy frameworks, capable of fostering inclusive and rewarding participatory processes, engaging citizens, and communities in wind energy decision-making.

Future research will benefit from comparing how different models of participation are valued by the citizens and communities involved. For instance, are citizens more interested in participating as co-investors in cooperatives, or rather would prefer to benefit from a community fund (based on the revenues of wind energy installations) that could be applied to other local needs? Are citizens more interested in participating in a comprehensive consultation process, or would citizens prefer to establish a cooperation model, such as local working groups or transdisciplinary committees? Next to these questions, it is important to understand the key regulatory frameworks as enabling or hindering factors for different forms of participation, including financial participation, and assess how these factors may vary between European countries, as well as elsewhere.

Research is still fragmented on what the best times for participation are. Are citizens to be involved at the planning stages, or earlier, in co-designing and exploring the goals for local wind energy developments? It is equally relevant to understand whether governance frameworks are equipped to foster opportunities for participation, through multilevel policies that incentivise an inclusive process. Furthermore, in situations of crisis, for instance, in periods of high energy prices and high inflation, how is citizen's engagement and participation affected?

Regarding published research, emerging markets in Europe, namely countries with a younger history of democratic governance regions are still under-researched. Likewise, studies focusing on Southern Hemisphere countries and regions are still scarce, and citizens' and communities' participation in wind energy developments in these regions is largely invisible.

Moreover, it is important to comparatively consider the actual impacts versus the perceived impacts of projects. Here, there is still a significant research gap in understanding how to measure local impacts, particularly social impacts, and how positive/negative impacts may be interlinked to participatory processes and more broadly to procedural justice considerations.

This report offers a descriptive overview of the findings to date, but the database can be continuously updated by others, with additional examples of specific case studies of participation and social innovations and, if possible, with examples from other regions of the globe, not yet represented. The database analysis can also be further developed to

explore the relationships between installed capacity, technology, level of participation, opportunities for participation and the impacts of the project. These additional analyses will be conducted by the authors and published in upcoming peer-reviewed articles.

REFERENCES

Anshelm, J., Simon, H., 2016. Power production and environmental opinions – Environmentally motivated resistance to wind power in Sweden. Renew. Sustain. Energy Rev. 57, 1545–1555. https://doi.org/10.1016/j.rser.2015.12.211

Armeni, C., 2016. Participation in Environmental Decision-making: Reflecting on Planning and Community Benefits for Major Wind Farms. J. Environ. Law eqw021. https://doi.org/10.1093/jel/eqw021

Batel, S., 2020. Research on the social acceptance of renewable energy technologies: Past, present and future. Energy Res. Soc. Sci. 68, 101544. https://doi.org/10.1016/j.erss.2020.101544

Bauwens, T., Devine-Wright, P., 2018. Positive energies? An empirical study of community energy participation and attitudes to renewable energy. Energy Policy 118, 612–625. https://doi.org/10.1016/j.enpol.2018.03.062

Beautiful Soup Documentation — Beautiful Soup 4.4.0 documentation [WWW Document], n.d. URL https://beautiful-soup-4.readthedocs.io/en/latest/ (accessed 9.26.23).

Bidwell, D., 2016. Thinking through participation in renewable energy decisions. Nat. Energy 1, 16051. https://doi.org/10.1038/nenergy.2016.51

Campos, I., Brito, M., Luz, G., 2023. Scales of solar energy: Exploring citizen satisfaction, interest, and values in a comparison of regions in Portugal and Spain. Energy Res. Soc. Sci. 97, 102952. https://doi.org/10.1016/j.erss.2023.102952

Campos, I., & Flávio, O. (2023). Database of Participatory Practices and Social Innovations in Wind Energy Developments [Data set]. Zenodo. https://doi.org/10.5281/zenodo.10055085

Chilvers, J., Bellamy, R., Pallett, H., Hargreaves, T., 2021. A systemic approach to mapping participation with low-carbon energy transitions. Nat. Energy. https://doi.org/10.1038/S41560-020-00762-W

Chilvers, J., Pallett, H., Hargreaves, T., 2018. Ecologies of participation in socio-technical change: The case of energy system transitions. Energy Res. Soc. Sci. 42, 199–210. https://doi.org/10.1016/j.erss.2018.03.020

Cousse, J., Wüstenhagen, R., Schneider, N., 2020. Mixed feelings on wind energy: Affective imagery and local concern driving social acceptance in Switzerland. Energy Res. Soc. Sci. 70, 101676. https://doi.org/10.1016/j.erss.2020.101676

Database of Participatory Practices and Social Innovations in Wind Energy Developments, n.d. https://doi.org/10.5281/zenodo.10055085

De Luca, E., Nardi, C., Giuffrida, L.G., Krug, M., Di Nucci, M.R., 2020. Explaining factors leading to community acceptance of wind energy. Results of an expert assessment. Energies 13, 2119. https://doi.org/10.3390/en13082119

Devine-Wright, P., 2009. Rethinking NIMBYism: The role of place attachment and place identity in explaining place-protective action. J. Community Appl. Soc. Psychol. 19, 426–441. https://doi.org/10.1002/casp.1004

Dwyer, J., Bidwell, D., 2019. Chains of trust: Energy justice, public engagement, and the first offshore wind farm in the United States. Energy Res. Soc. Sci. 47, 166–176. https://doi.org/10.1016/j.erss.2018.08.019

Ellis, G., Schneider, N., Wüstenhagen, R., 2023. Dynamics of social acceptance of renewable energy: An introduction to the concept. Energy Policy 181, 113706. https://doi.org/10.1016/j.enpol.2023.113706
Enserink, M., Van Etteger, R., Van den Brink, A., Stremke, S., 2022. To support or oppose renewable energy projects? A systematic literature review on the factors influencing landscape design and social acceptance. Energy Res. Soc. Sci. 91, 102740. https://doi.org/10.1016/j.erss.2022.102740
European Commission, 2020. 2050 long-term strategy [WWW Document]. URL https://climate.ec.europa.eu/eu-action/climate-strategies-targets/2050-long-term-strategy_en (accessed 3.7.23).
European Commission, 2015. Fact Sheet: Connecting power markets to deliver security of supply, market integration and the large-scale uptake of renewables.
European Commission, Joint Research Centre, Ferraro, G., Ellis, G., 2017. The social acceptance of wind energy: where we stand and the path ahead. Publications Office. https://doi.org/doi/10.2789/696070
Ferrari, R., 2015. Writing narrative style literature reviews. Med. Writ. 24, 230–235. https://doi.org/10.1179/2047480615Z.000000000329
Fleming, D., 2014. Ireland's rural protests over wind energy. BBC News.
Gebreslassie, M.G., 2020. Public perception and policy implications towards the development of new wind farms in Ethiopia. Energy Policy 139, 111318. https://doi.org/10.1016/j.enpol.2020.111318
Glucker, A.N., Driessen, P.P.J., Kolhoff, A., Runhaar, H.A.C., 2013. Public participation in environmental impact assessment: why, who and how? Environ. Impact Assess. Rev. 43, 104–111. https://doi.org/10.1016/j.eiar.2013.06.003
Guan, J., Zepp, H., 2020. Factors affecting the community acceptance of onshore wind farms: a case study of the Zhongying wind farm in eastern China. Sustainability 12, 6894. https://doi.org/10.3390/su12176894
Hewitt, R.J., Bradley, N., Compagnucci, A.B., Barlagne, C., Ceglarz, A., Cremades, R., McKeen, M., Otto, I.M., Slee, B., 2019. Social Innovation in Community Energy in Europe: A Review of the Evidence. Front. Energy Res. https://doi.org/10.3389/FENRG.2019.00031
Hoicka, C.E., Savic, K., Campney, A., 2021. Reconciliation through renewable energy? A survey of Indigenous communities, involvement, and peoples in Canada. Energy Res. Soc. Sci. 74, 101897. https://doi.org/10.1016/j.erss.2020.101897
Hoppe, T., Vries, G. de, 2018. Social Innovation and the Energy Transition. Sustainability. https://doi.org/10.3390/SU11010141
Hunter, J.D., 2007. Matplotlib: A 2D Graphics Environment. Comput. Sci. Eng. 9, 90–95. https://doi.org/10.1109/MCSE.2007.55
IEA, 2022. Renewables 2022: Analysis and forecast to 2027. International Energy Agency, Paris.
Langer, K., Decker, T., Menrad, K., 2017. Public participation in wind energy projects located in Germany: Which form of participation is the key to acceptance? Renew. Energy 112, 63–73. https://doi.org/10.1016/j.renene.2017.05.021
Lennon, B., Dunphy, N., Gaffney, C., Revez, A., Mullally, G., O'Connor, P., 2020. Citizen or consumer? Reconsidering energy citizenship. J. Environ. Policy Plan. 22, 184–197. https://doi.org/10.1080/1523908X.2019.1680277
Linnerud, K., Aakre, S., Leiren, M.D., 2018. A literature review of social acceptance of wind energy development, and an overview of the technical, socio-economic and regulatory starting conditions in the wind energy scarce target regions (Deliverable

No. 2.1), Technical and socio-economic conditions. Directorate-General for Research and Innovation, European Commission.
Maleki-Dizaji, P., del Bufalo, N., 2019. Synthesis and comparative analysis of In-depth best practice cases for promoting the social acceptance of wind energy (Deliverable No. 4.3), Best practice cases including socially inclusive governance forms and mechanisms. Directorate-General for Research and Innovation, European Commission.
Mason, K., Milbourne, P., 2014. Constructing a 'landscape justice' for windfarm development: The case of Nant Y Moch, Wales. Geoforum 53, 104–115. https://doi.org/10.1016/j.geoforum.2014.02.012
Munn, Z., Peters, M.D.J., Stern, C., Tufanaru, C., McArthur, A., Aromataris, E., 2018. Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. BMC Med. Res. Methodol. 18, 143. https://doi.org/10.1186/s12874-018-0611-x
Nowakowski, P., Wnuk, R., 2018. Best practice portfolio (Deliverable No. 4.2), WinWind, winning social acceptance for wind energy in wind energy scarce regions. Directorate-General for Research and Innovation, European Commission.
Package overview — pandas 2.1.2 documentation [WWW Document], n.d. URL https://pandas.pydata.org/docs/getting_started/overview.html (accessed 10.30.23).
Park, S., Yun, S.-J., Cho, K., 2022. Public dialogue as a collaborative planning process for offshore wind energy projects: Implications from a text analysis of a South Korean case. Renew. Sustain. Energy Rev. 169, 112949. https://doi.org/10.1016/j.rser.2022.112949
Pel, B., Haxeltine, A., Avelino, F., Dumitru, A., Kemp, R., Bauler, T., Kunze, I., Dorland, J., Wittmayer, J., Jørgensen, M.S., 2020. Towards a theory of transformative social innovation: A relational framework and 12 propositions. Res. Policy 49, 104080. https://doi.org/10.1016/j.respol.2020.104080
Ribe, R.G., Manyoky, M., Wissen Hayek, U., Pieren, R., Heutschi, K., Grêt-Regamey, A., 2018. Dissecting perceptions of wind energy projects: A laboratory experiment using high-quality audio-visual simulations to analyze experiential versus acceptability ratings and information effects. Landsc. Urban Plan. 169, 131–147. https://doi.org/10.1016/j.landurbplan.2017.08.013
Ryder, S., Walker, C., Batel, S., Devine-Wright, H., Devine-Wright, P., Sherry-Brennan, F., 2023. Do the ends justify the means? Problematizing social acceptance and instrumentally-driven community engagement in proposed energy projects. Socio-Ecol. Pract. Res. 5, 189–204. https://doi.org/10.1007/s42532-023-00148-8
Ryghaug, M., Skjølsvold, T.M., Heidenreich, S., 2018. Creating energy citizenship through material participation. Soc. Stud. Sci. 48, 283–303. https://doi.org/10.1177/0306312718770286
Silvast, A., Valkenburg, G., 2023. Energy citizenship: A critical perspective. Energy Res. Soc. Sci. 98, 102995. https://doi.org/10.1016/j.erss.2023.102995
Simón, X., Copena, D., Montero, M., 2019. Strong wind development with no community participation. The case of Galicia (1995–2009). Energy Policy 133, 110930. https://doi.org/10.1016/j.enpol.2019.110930
Solman, H., Kirkegaard, J.K., Smits, M., Van Vliet, B., Bush, S., 2022. Digital twinning as an act of governance in the wind energy sector. Environ. Sci. Policy 127, 272–279. https://doi.org/10.1016/j.envsci.2021.10.027
Sovacool, B.K., Ratan, P.L., 2012. Conceptualizing the acceptance of wind and solar electricity. Renew. Sustain. Energy Rev. 16, 5268–5279. https://doi.org/10.1016/j.rser.2012.04.048

Spielmann, V., Brey, T., Dannheim, J., Vajhøj, J., Ebojie, M., Klein, J., Eckardt, S., 2021. Integration of sustainability, stakeholder and process approaches for sustainable offshore wind farm decommissioning. Renew. Sustain. Energy Rev. 147, 111222. https://doi.org/10.1016/j.rser.2021.111222

Steins, N.A., Veraart, J.A., Klostermann, J.E.M., Poelman, M., 2021. Combining offshore wind farms, nature conservation and seafood: Lessons from a Dutch community of practice. Mar. Policy 126, 104371. https://doi.org/10.1016/j.marpol.2020.104371

Tawfik, G.M., Dila, K.A.S., Mohamed, M.Y.F., Tam, D.N.H., Kien, N.D., Ahmed, A.M., Huy, N.T., 2019. A step by step guide for conducting a systematic review and meta-analysis with simulation data. Trop. Med. Health 47, 46. https://doi.org/10.1186/s41182-019-0165-6

Vargas, N., 2020. The effects of the wind farms on the Indigenous Zapotec community of the Isthmus of Tehuantepec, Mexico. Occams Razor 10.

Winter, K., Hornsey, M.J., Pummerer, L., Sassenberg, K., 2022. Anticipating and defusing the role of conspiracy beliefs in shaping opposition to wind farms. Nat. Energy 7, 1200–1207. https://doi.org/10.1038/s41560-022-01164-w

Wüstenhagen, R., Wolsink, M., Bürer, M.J., 2007. Social acceptance of renewable energy innovation: An introduction to the concept. Energy Policy 35, 2683–2691. https://doi.org/10.1016/j.enpol.2006.12.001

APPENDIX 1: EC SUMMARY REQUIREMENTS

Changes with respect to the DoA	There has been some adjustment in relation to the DoA, which describes the task leading to this database (i.e., Task 3.1) as "rapid evidence assessment". However, we opted for doing a "systematic review", which allowed for deepening the level and increasing the scope of analysis. Both was considered necessary to for the purpose of developing a relevant database.
Dissemination and uptake	The database will be taken up by other tasks within JW4A, especially as a basis and input for the co-production activity in the different Wind Labs (T4.2-4.6), but it will also inform the further work in WP3 tasks. Results will find their way also into D3.2. which are recommendations for regional just and effective wind energy governance. After the embargo period, the database will also be shared via the JW4A website and made accessible to different user groups as inspiration for different co-creation activities. Finally, the JW4A team plans to write at least one scientific article based on the analysis of the database results.
Short Summary of results (<250 words)	The report presents a descriptive summary of 397 examples of participatory practices collected, of which 314 are examples of specific cases of wind energy developments, including 218 social innovations. The database resulted from a systematic review of documents of different types and includes examples from Europe, North and South America, as well as some examples from Africa, Asia, and Australia. Participation levels include alibi participation, cases of resistance, information, consultation, financial and cooperation participation processes, which take are implemented through several different models also identified, such as community funds, public hearings, and transdisciplinary committees. The database is highly dimensional and offers the possibility for different types of analysis, for instance, focusing on specific levels of participation

	and relationship with perceived impacts of the projects.
Evidence of accomplishment	This deliverable and the associated database: Database of Participatory Practices and Social Innovations in Wind Energy Developments Available ZENODO: https://zenodo.org/records/10055085 Jupyter Notebooks with the descriptive analysis are on GitHub: https://github.com/inezcampos/windenergyparticipation