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# Trade-offs in German wind energy expansion: building bridges between different interests, values and priorities

Sybill Reitz<sup>1\*</sup>, Lauren Goshen<sup>1</sup> and Dörte Ohlhorst<sup>2</sup>

## Abstract

**Background:** To achieve climate targets, a transition to low-carbon energy production is necessary. However, conflicts between different interests, values and priorities, particularly at the community level, can constrain this transition. This paper aims to analyze lines of conflict and opportunities to build bridges between conflicting interests in the expansion of wind energy in Germany at the local level, to achieve successful implementation of wind energy projects.

**Results:** Our analysis of four cases of local-level wind energy projects in Germany shows that limited local options for action reinforce the need for local actors to maximize the benefits of energy transition projects. In addition to the conflict over scarce space, the lines of conflict at the local level run primarily along the dimensions of costs and benefits, winners and losers. Real or perceived procedural and distributive injustices had the potential to fuel resistance to wind energy projects in the analyzed cases. However, wind energy projects were successfully implemented despite the presence of local opposition.

**Conclusions:** The results show that, by integrating procedural and distributive justice into the project planning and implementation and offering tailored solutions, community support for expansion of renewable energy projects can be enhanced. The paper advances the concept of societal ownership (“gesellschaftliche Trägerschaft”), which suggests the willingness of members of a community to tolerate decisions even when some conflicts related to the decision remain unresolved. Societal ownership is presented as an alternative to the concept of simple acceptance; it implies a more positive, more supportive community attitude, where members aim to address conflict as a normal aspect of decision making. Rather than sweeping alternative opinions aside, the community addresses alternative viewpoints, seeking to achieve greater procedural and distributive justice. In this way, a sense of societal ownership of a project can develop, enhancing its likelihood of success.

**Keywords:** Energy transition, Wind energy expansion, Trade-off, Conflict resolution, Societal ownership, Gesellschaftliche Trägerschaft

## Background

After the German Federal Constitutional Court decided that Germany’s Climate Protection Act of 2019 was inadequate [1], the federal government announced a plan to achieve carbon neutrality by 2045. This requires a faster expansion of renewable energies; as a result, the competition for space for energy infrastructure will intensify, while local protest increases.

\*Correspondence: sybille.reitz@tum.de

<sup>1</sup> Environmental and Climate Policy, Bavarian School of Public Policy, Technical University of Munich, Munich, Germany  
Full list of author information is available at the end of the article



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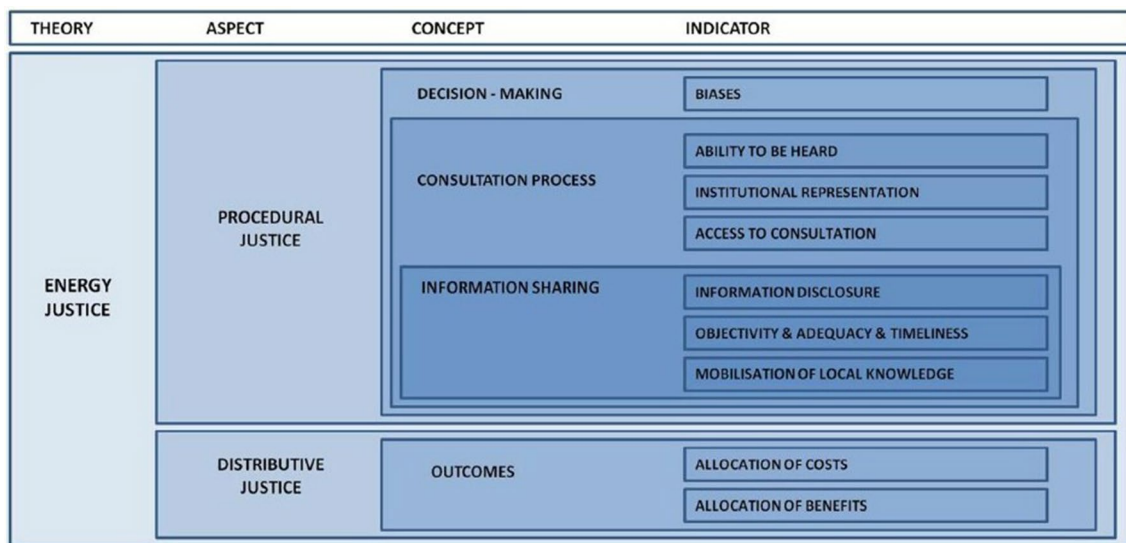
The majority of citizens in Germany support the energy transition and are generally supportive of renewable energy systems [2, 3]. At the same time, the energy transition is associated with various political challenges. One of the challenges lies in the multi-level system of German federalism: the German energy transition is jointly governed by the national (federal) and subnational (state) level. The subnational governments can complement national rules with their own laws and regulations [4]. However, the implementation of the increasingly decentralized energy supply system lies primarily with local governments. Accordingly, conflicts for space, especially related to wind energy deployment, have to be dealt with largely on the local level. In the context of the energy transition, municipalities' policy options range from strategic and planning activities (land-use planning, approval processes) to carrying out their own energy management activities [5]. Designation of wind energy areas and decisions about the locations of wind turbines by local governments are constrained by state and regional planning laws and regional land-use designations which supersede local planning authority. As a result, while this varies among German states, municipalities generally have little discretion over siting decisions governing wind turbines. In addition to the limited scope of decision making at the municipal level, further challenges include conflicting goals between climate and environmental protection, biodiversity and land use, as well as distribution of social costs and benefits [6–8]. The classification and evaluation of these conflicts is often based on different personal normative beliefs and values with regard to the energy transition. This can create a feeling of injustice and powerlessness among affected citizens—and can thus affect the acceptance of the energy transition by the public [9, 10].

Despite extensive research on acceptance and aspects of energy justice [11–14], there are still uncertainties regarding the question of whether and how conflicting interests and different values and normative beliefs can be reconciled and whether compromises can be negotiated. The aim of this study is to contribute to the development of mechanisms, instruments and institutions that can help to build bridges and to find compromises to address the often perceived imbalanced distribution of burdens, or to prevent it from arising. The present study examines the question of how procedural and distributive justice in local wind energy projects can build bridges and initiate consensus building. In addition, this study takes a critical look at the prevailing understanding of the concept of acceptance in the literature.

## Energy justice

In our study we use the concept of 'energy justice', which offers a suitable theoretical framework to assess the question of whether the processes and results of energy policy and energy transition projects are just and fair, and in turn, contribute to achievement of social acceptance. The importance of questions of justice in the energy transition, especially the dimensions of procedural justice (fair participation in planning and decision-making processes) and distributive justice (fair distribution of costs and benefits) is recognized by various authors [12, 15–17]. According to Jenkins et al. [11], the concept of energy justice encompasses three main aspects: "(a) where injustices emerge, (b) which affected sections of society are ignored, (c) which processes exist for their remediation" [11]. A similar approach is taken in McCauley et al. [18], which describes energy justice as a "triumvirate of tenets", including the three tenets of procedural, distributive and recognition justice [18]. For this purpose, it is also understood that (in)justices include those which are both real and perceived [11].

To analyze policies and systems under an energy justice framework, we follow the approach of Mundaca et al. [16] and Kluskens et al. [12], which identifies procedural and distributive justice as two main aspects of energy justice. Mundaca et al. [16] draw, for example, on social psychology literature [19] highlighting the effect of information processes on procedural and distributive justice, as well as on management literature [20] pointing to distributive and procedural justice as important predictors of outcomes. According to Mundaca et al. [16] procedural justice relates to decision making processes and is aimed at providing access to processes to all actors in a non-discriminatory manner. This conceptualization of procedural justice also recognizes stakeholder participation, which "entails citizens involvement in decision-making processes" [12]. Elements and processes of decision-making are at the core of the concept of procedural justice, and include the consultation process and information sharing. Therefore, indicators of procedural justice, which represent the elements of this concept, include transparency, access to information, recognition of unjust procedures, and lack of bias by decision makers. Particularly in the local context, information sharing, exchange of ideas, early inclusion in processes and ability to be heard are decisive factors for local acceptance. Distributive justice is related to the outcomes of the decision-making process, particularly the distribution of costs and benefits. In terms of wind energy projects, typical examples of perceived distributive injustices relate to the chosen location of wind power plants, the selection of the energy provider, ownership questions, income, and compensation measures. Recognition justice refers to the



**Fig. 1** Analysis framework for the Energy Justice concept [16]

requirement to recognize and represent all perspectives in society, including social, cultural, ethnic, racial and gender differences [11, 18]. While recognition justice is an important dimension of an evolved justice concept, we do not consider it relevant for this study. Instead of focusing on the “visibility” of social groups, an element of recognition justice, we focus on the participation of local actors in decision-making processes and the perceived injustice in the distribution of cost and benefits, which are core aspects of procedural and distributive justice. These two main aspects of the energy justice framework, with the correlating concepts and indicators, are depicted in Fig. 1.

Stakeholders that were interviewed for our case studies clearly called for a debate about the values guiding the energy transition. Values often lie behind decisions, but at the local level, where citizens are most likely to be involved in decision making, there is rarely an explicit debate about values preceding decisions. The ideas and values that guide decision making are often not traceable for local citizens, which often results in opposition. This illustrates that conflicts over values require social dialogue and negotiation. Our study shows that, under certain conditions, citizens are willing to tolerate decisions despite holding opposing opinions. We argue that the understanding of acceptance that has so far prevailed in the scientific literature is insufficient to account for this form of tolerance (for details see discussion). Therefore, we put forward the broader concept of “societal ownership” (“gesellschaftliche Trägerschaft”) as a central point of our analysis. We conceptualize societal ownership as a more active understanding of society, according to

which society deals more consciously with the limitations, advantages and disadvantages of the energy transition. This concept recognizes that stakeholders who are affected by the energy transition are willing to tolerate decisions that are made on the basis of fair compromises and fair processes. We further argue that the chance of gaining societal ownership of wind energy projects is higher if distributive and procedural justice are present in the project planning and implementation process.

## Methodology

Through detailed analysis of four selected cases involving conflicts over wind energy projects, we identified mechanisms, processes, and actors that have contributed to negotiation of compromises between differing interests, values and normative beliefs. These cases were analyzed under the energy justice framework (see Fig. 1) to evaluate how procedural and distributive (in)justice were addressed, and in turn, how this can explain the successful implementation of wind energy projects in each case.

To identify suitable cases for our study, we analyzed German newspapers, magazines, and journals in the Nexis Uni Database spanning a time frame from 2015 to 2020. The contents of these sources were indexed according to various topics: environment and natural resources, labor and employment, society, social welfare and lifestyle, and energy and utilities and environmental industries. A limitation was that the Nexis Uni database does not include all German daily newspapers; wide-circulation dailies such as the *Frankfurter Allgemeine Zeitung* and *Süddeutsche Zeitung* are excluded.

**Table 1** List of interviews, with function and/or job title of interviewees at the time of project implementation

#1—01.12.2020—Nature protection	#9—16.03.2021—Forestry
#2—24.01.2021—Municipal Administration	#10—16.03.2021—Wind park developer
#3—23.02.2021—Species Protection	#11—17.03.2021—Wind park developer
#4—23.02.2021—Municipal Administration	#12—25.03.2021—Citizen
#5—23.02.2021—Economic development	#13—27.04.2021—Municipal Administration
#6—25.02.2021—Forestry	#14—26.05.2021—Municipal Administration
#7—28.05.2021—Wind park developer	#15—28.05.2021—Regional planning office
#8—09.03.2021—Municipal Administration	#16—15.06.2021—District-level official

The next step was to specifically search for coverage of successfully implemented renewable energy projects. Details of these projects, including the type of renewable energy generation and existence of local protests, were further verified in pilot interviews. For this purpose, nine pilot interviews were conducted by telephone between November 2020 and January 2021. Media articles mentioning successfully implemented renewable energy projects provided the starting point to identify interview partners for the pilot interviews. Individuals named in the articles were contacted for interviews to enable us to better understand the context, local situation and to identify relevant cases [21]. The process also served to test the questionnaire that was used in further interviews. A convenience (“talking with whoever happens to be available” [21]) and snowball sampling strategy (chain referral [22]) was then applied when selecting the final interviewees, as identifying and accessing potential respondents turned out to be difficult [22]. Subsequently, we narrowed the focus of the study to cases in which wind energy projects were successfully implemented, despite protests from the local community during the planning phase. To incorporate a variety of regional contexts into our study [23], cases from four different regions of Germany were chosen: Brake in Lower Saxony, Uebigau-Wahrenbrück in Brandenburg, Kefenrod in Hesse, and Berg in Bavaria.

The qualitative analysis of these cases was performed by evaluating documents and interviewing local actors. From December 2020 to June 2021, 16 interviews were conducted with local actors who were either involved in the implementation of wind energy projects on site or observed them and were, therefore, able to describe the local processes and their characteristics. The interviews were semi-standardized and were conducted by telephone or video conference by a single researcher. An interview guide was used to support the interviews, but it was not presented to the interviewees in advance. To protect the identity of the interviewees, the interviews in this report have been anonymized and assigned a reference number and corresponding interview date (see Table 1). To further prevent identification of interviewees in some situations, the reference number and date of the

interview are replaced by the name of the applicable city or town. Secondary sources used in the analysis include data from federal and state statistical offices, national and regional daily newspapers, official journals of public offices, and websites of municipalities, local media, government ministries and companies.

To capture the range of contextual variables of the selected cases, we applied Ostrom’s Institutional Analysis and Development framework (IAD). The IAD is a framework through which action situations and decision-making processes are analyzed, including the roles of participating actors, positions, power, and information. In applying the IAD, exogenous variables constituting the context, including the biophysical environment, community attributes, and existing rules, which influence the action and decision making processes are also defined [24–27].

While we do not apply all of the variables of the IAD (see Table 2) systematically in our case analysis, the variables of the framework were used to construct the questionnaire and the interview protocol. In the first step of our case analysis, we identified biophysical conditions forming the context of our cases and we consulted regional databases and official statistics to determine community attributes (size, location, number of inhabitants, socio-demographic and economic factors). To describe the respective action situations in each case, interviewees were asked about the origins of the local wind energy projects, with a focus on the location, procedure, project sponsor, costs and benefits. Drivers of action (e.g., climate change, nuclear phase-out, coal phase-out, revenues) were also investigated during interviews. After asking interviewees about their involvement in the projects and their attitudes toward the energy transition to capture their points of view, inquiry was made regarding participation opportunities, decision making and intervention options, and communication and information offerings [24, 25]. In addition, interviewees were asked about their experiences and opinions regarding mechanisms and instruments suitable to build bridges between conflicting actors or goals, to find compromises, or to resolve or avoid conflicts altogether.

**Table 2** Definitions of IAD variables

Variable	Definition
Biophysical/material conditions	Physical, material environment, which influences possible actions taken in action situations, for example, existing infrastructure
Community attributes	Socio-economic characteristics of the community
Rules	Institutions, e.g., formal laws and regulations that enable or constrain behavior of participants
Action situation	Social interaction space, in which participants decide on actions on the basis of the available information: how and to which outcomes do these actions lead, and which costs and benefits are connected to these outcomes?
Participants	Individual actors or actor groups, e.g., governmental or non-governmental bodies or firms
Interactions	Procedural aspects, i.e., interaction among participants in an action situation
Outcomes	Results of interactions, which can be institutions, knowledge, or operational outcomes, for example, implementation of new technologies
Evaluative criteria	Criteria that are used to assess interactions and outcomes, e.g., sustainability, distributive equity, economic efficiency

Source: Adapted from Milchram et al. [27]

**Table 3** Local characteristics

Municipality Characteristics	Berg, Bavaria	Brake, Lower Saxony	Kefenrod, Hesse	Uebigau-Wahrenbrück, Brandenburg
Area	15 villages; 36.63 km <sup>2</sup> ; mainly forest and forest areas	11 city districts; 38.30 km <sup>2</sup> ; majority agricultural use, settlement- and traffic areas	Five villages, 30.67 km <sup>2</sup> ; mainly areas for agricultural use	20 city districts, 135.61 km <sup>2</sup> ; mainly areas for agricultural use
Residents (2019)	8301	14,860	2733	5306
Population Density (inhabitants/km <sup>2</sup> ), average 2019	226.6	388 (high population density) <sup>1</sup>	90 (sparsely populated)	38.39 (very sparsely populated, rural)
Average annual district income 2018 in euros/capita <sup>2</sup>	Starnberg: 35,356 euros one of the highest income districts in Germany	Wesermarsch: 21,936 euros just below the national average income	Wetterau: 24,647 euros above German national average	Elbe-Elster: 19,046 euros well below German national average

Sources: [28–33]

<sup>1</sup> The average in Lower Saxony is 167 inhabitants per km<sup>2</sup>

<sup>2</sup> National average: 22,899 euros per capita

The interviews were not transcribed but the researcher took detailed short-form notes during the interview. Immediately after the interview, the researcher processed the notes and complemented the information by spelling out the short-form notes. The interviews were coded in MAXQDA using the indicators of the energy justice concept of Mundaca et al. [16] concept as codes (decision making, consultation process, information sharing, outcomes). The coding served solely to facilitate the analysis of the interviews.

## Results

The cases analyzed in this study have different biophysical conditions and properties that influence the action situation on site, as well as interactions and decisions of the actors. These factors are shown in Table 3 below. In this section, for each of the four selected municipalities, the project genesis and local conflicts are described and procedural and distributive justice is analyzed.

### Berg municipality, Bavaria

Until the district of Starnberg adopted the goal to supply the district with renewable energies by 2035, renewable energies did not play an important role in the municipality of Berg. However, Berg's decision in 2009 to support the district's renewable energy goal was a turning point at which the municipality decided to pursue wind energy [34]. While interviewees associated with Berg were generally positive toward the energy transition, they were not without reservations. Interviewees called for other technologies such as photovoltaics, biogas or biological waste to also be included in the energy mix. In addition, the perceived lack of attention to issues of energy efficiency and energy saving has made the energy transition incoherent, according to interviewees.

The four wind turbines in the municipality of Berg are operated by "Bürgerwind Berg" (Community Wind



Berg),<sup>1</sup> and are located in a forested area<sup>2</sup> [34–36] Berg local authorities decided to designate concentration zones for wind power plants. This was a reaction of the community to the plans of a Berg business person who had intended to build new wind turbines in addition to one he already privately operated [37]. Taking a proactive approach, the local authorities wanted to assert municipal decision-making authority and to ensure that the interests of the local citizens were taken into account when searching for the final location and in designing the project [35, 38]. Although up to seven wind turbines would have been possible at the selected location [39], only four wind turbines were approved to avoid excessive burden of the local population [34, 40].

Various factors were particularly important with respect to implementing the wind energy project in Berg: (a) the municipality was the initiator of the project; (b) maximum economic efficiency of the project; (c) it needed to be a community energy project, and (d) equal footing between the municipality of Berg and the project developer [interviews #1 on 24.01.21; # 11 on 17.03.21]. For the latter reason, a collaboration that had been planned with Stadtwerke München (the City of Munich's municipal utilities company) was not pursued, but instead a planning office was engaged [34, 41]; [interview Berg].

Citizens expressed their resistance to the wind turbines in Berg through numerous statements, an open letter and establishment of two citizens' initiatives opposing the wind turbines. According to an interviewee from Berg, most arguments against wind energy were based on nature conservation, but some were also based on a fear of depreciation of property value. The interviewee states a rather unpleasant personal exchange including threats and demonstrations in front of the Forestry Office (interview Berg). In particular, opponents of the wind turbines were concerned about the preservation of the forest, insight into the planning process, and nature and environmental protection [39]. A citizen initiative<sup>3</sup> aimed to prevent the wind turbines in Berg [42] and citizens of Berg and the neighboring community Schäftlarn banded together to protest.<sup>4</sup> Individual members of the municipal council in Berg were also critical of the wind park proposal [35], and the municipal council of Schäftlarn

decided to take legal action against it [43]. Schäftlarn's main concern was a fair distribution of disadvantages attributable to the wind park [44]. Opposition to the wind park escalated to the point of death threats against the mayor of Berg [45]; [interview Berg].

#### ***Procedural justice: information, consultation, decision***

The decision to set up a wind park in Berg was viewed as a preventive measure to avoid what was perceived to be imminent "uncontrolled growth" of wind turbines caused by private investors (interviews #11 of 17.03.21, #9 of 16.03.21). However, the citizens of Berg were not involved in this decision. Early public participation was a component of the planning process in Berg [interview # 5 of 23.02.21]. For example, the Starnberg District involved the municipalities and their citizens in developing a land-use plan for wind energy [46]; [interview #16 of 15.06.21]. The location of the wind turbines, however, is closer to neighboring community of Schäftlarn than to the residential area in Berg [interview #9 of 16.03.21]. Schäftlarn was informed about the plans early on but was not consulted about the location. Actors involved in the process viewed the mandatory notification of the planning process as fulfilling the need to involve all affected actors [47]; [interview #13 of 27.04.21]. The Bavarian State Forests confirmed to the community of Schäftlarn that a condition for construction of wind turbines in the state forest area was not to build them against the will of the local population. However, it was later argued that the interests of the neighboring communities were already addressed by their ability to participate in the district-level land use planning procedure [interview #13 of 27.04.21]. In this regard, Schäftlarn was not characterized as the relevant local population in the same sense as the Berg community, and Schäftlarn's agreement was not essential to the State Forests' decision to move forward with implementation [interview # 9 of 16.03.21].

The introduction of the wind park project in Berg was accompanied by public and non-public meetings, festive activities, a groundbreaking ceremony, a beer social event, and communication measures. Several information events and a panel discussion were held. In addition, there were municipal council meetings [39, 40]; [interviews #9 of 16.03.21, #11 of 17.03.21], in which citizens of the local community and the neighboring communities could participate. The municipal council meetings were key to the decision-making process, and opposition and critical questions were heard in these meetings [interview #11 of 17.03.21]. However, from Schäftlarn's point of view, the community's concerns were not adequately addressed [interview #13 of 27.04.2021].

Official meetings with the mayor were described as a further means of information and communication

<sup>1</sup> Bürgerwind Berg is a private limited liability company that started operating four wind turbines in 2015.

<sup>2</sup> The wind turbines are located in the Wadlhauser Gräben forest in the Starnberger See-Ost conservation area.

<sup>3</sup> Verein zum Schutz der Wadlhauser Gräben (Association to Protect the Wadlhauser Gräben).

<sup>4</sup> A poster campaign against the energy initiative of the then-mayor of Berg was created.

[interview #11 of 17.03.21]. In addition, the intensive personal support (seriously hearing and addressing concerns) of critical citizens by the mayor and the project developer was considered an important bridging element for the “silent majority” [interview #11 of 17.03.21].<sup>5</sup> The construction phase was documented in detail on the Berg community web site [34], and an energy monitor was made available through which the energy mix, the status of the energy supply by the municipality’s own wind park and the development of the share of renewable energies could be observed [48].

#### **Distributive justice: cost/benefits**

Despite the intention of the municipal representatives to derive the greatest possible benefit from the wind park in Berg by securing their decision-making authority, citizens primarily expected disadvantages. They feared high costs, negative impacts on health (subsonic noise, shadows, red light), impacts on nature and species protection [interviews #11 of 17.03.21, #9 of 16.03.21] and economic disadvantages (to property owners, tourism and leisure business) [interviews #5 of 23.02.21, #9 of 16.03.21; #11 v. 17.03.21].

Health concerns were addressed with technical noise control inspection certificates. Measuring devices were installed to minimize the negative impact caused by shadows and red light [interview #11 of 17.03.21]. The interference with nature was balanced by compensatory measures (payments by the operator to an environmental fund, reforestation) [interview #2 of 24.01.21]. In addition, the use of the area for wind energy was classified by a local expert from a nature protection organization as harmless with regard to nature conservation [46]; [interview #9 of 16.03.21].

To increase local economic benefit, the municipality decided to operate the wind turbines itself.<sup>6</sup> With a minimum share of 5,000 euros, citizens of Berg and neighboring communities were able to invest directly in the wind park. Local investors were preferred in the allocation of shares [34, 40, 49, 50]. The municipality itself was also an investor, such that—after loan repayment—the municipality and its residents would fully benefit from the return on investment. Despite the success of this participation model, not all actors are convinced that financial participation increases acceptance of wind turbines. An interviewee expressed the opinion that, despite financial and procedural participation opportunities, people would still reject wind turbines that were located in their

own communities (interview #9 of 16.03.21). Due to the ongoing conflict over the wind park, citizens of neighboring Schäftlarn did not take advantage of the offer of financial participation [interview #13 of 27.04.21]; [see also 44; 47].

The interviewee suspected that financial compensation for neighboring communities could have reduced possible location problems [interview #13 of 27.04.2021].

Some interviewees expressed doubts about the coherence of the energy transition. Out of fairness, they expected transparency about the conflicting goals of the energy transition and openness about the advantages and disadvantages. The impacts, in particular on people and species protection, should be presented and justified in the context of an overall concept: why was which solution pursued (for example, wind turbines in areas with low winds) and which alternative measures were taken? According to interviewees, decisions should be based on an overall consensus, with the State of Bavaria also having to make compromises instead of generally refusing to use wind energy<sup>7</sup> [interview #13 of 27.04.21].

#### **City of Brake, Lower Saxony**

The Brake city council unanimously approved a location concept in March 2014 to establish additional wind turbines<sup>8</sup> [53, 54]. Two locations were identified as suitable: an area in the northwest of the existing “Hammelwarder Moor” wind park and the “Golzwarderwarp” area on the northwestern city limits of Brake. Both of these are privately owned agricultural areas; the city does not own any land itself. The three wind turbines in the Hammelwarder Moor went into operation in 2017 and 2018 [55, 56], and the six wind turbines built in Golzwarderwarp have been in operation since 2017 [57].

During the planning process, two citizens’ initiatives were formed against the wind parks [58, 59]. The initiatives were opposed to lifting the priority for green spaces, but also argued against the wind parks on the basis of historical monument protection and the destruction of cultural landscape. In the Hammelwarder Moor in particular, there were concerns that the stability of buildings would be endangered by a necessary lowering of the groundwater level for construction and the moor-like ground [60]. However, there were also concerns about adverse effects on health from shadows, subsonic noise,

<sup>5</sup> Several interviewees stated that the mayor of Berger personally faced the critical questions of the neighboring community comprehensively [interviews #5 of 23.02.21, #13 of 27.04.21].

<sup>6</sup> The municipality founded the company “Bürgerwind Berg GmbH”.

<sup>7</sup> Bavaria’s “refusing to use wind energy” is a reference to the state’s so-called ‘10-H Rule’, which generally requires that wind turbines be located a minimum distance from residential areas of at least 10 times the height of the turbine. The result of this rule, which went into effect in 2014, was to substantially slow down wind energy expansion in Bavaria 51.

<sup>8</sup> Since 2002, five wind turbines have been in operation in the “Hammelwarder Moor” area of Brake 52.

construction noise and truck traffic [61, 62]; [interview #13 of 26.05.21]. The protesting residents felt ignored by the City of Brake and above all demanded transparency [59, 63, 64]. The conflict over the construction work in the Hammelwarder Moor escalated to the point that it was temporarily stopped due to a lawsuit by three residents [65].

#### ***Procedural justice: information, consultation, decision***

Since the wind turbines in Brake were to be placed on privately owned plots, the city's decision-making power was limited to the design of a land use plan and the conditions for implementation by the developer. An interviewee pointed out that the city had the opportunity to control the project via the development plan and urban development contracts, which is the option that was used. The city imposed conditions on the developer to limit the maximum height of the wind turbines to 175 m, and the wind turbines had to be at least 500 m away from the nearest residential area. In addition, certain compensation measures were defined [interview #14 of 26.05.21].

Public participation in the form of information events was initiated at an early stage for both wind parks as part of the preparation of the project-related municipal development plans [66–69]. From the residents' perspective, however, a decision on *whether* to build wind parks was not put up for debate. [70, 71]; [interview #14 of 26.05.2021].

In terms of opportunities for public participation, the city jointly organized public events with the project sponsors (a large information event on the Hammelwarder Moor, three public events at the Golzwarderworp wind park) [60, 61]; [interview #14 v. 26.05.21]. A site inspection was also carried out at the Golzwarderworp site with a newly founded citizens' initiative, during which concerned citizens were able to exchange ideas with the mayor and representatives of the city council. This provided an opportunity to address an information deficit that had led to incorrect assumptions about the wind park [63]. Furthermore, the city and project sponsor offered a hotline and regular consultation hours for citizens to discuss complaints and problems. In addition to the formal information events, there were informal events, such as a barbecue with affected residents [interview #14 of 26.05.21].

#### ***Distributive justice: costs/benefits***

For the political actors in Brake, the increase in local added value was an important argument in favor of introducing wind energy, with the aim to improve the financial situation of the city [interview #14 of 26.05.2021]; [see also 61]. One interviewee stated that acceptance would increase if such a project provided substantial

added value for the municipality, and not just for wind park operators and farmers on whose land wind turbines were built.

Financial participation models for individuals were not employed in Brake, but Brake was able to incur economic benefits for the city through agreements regarding trade tax payments. One project sponsor was obligated to establish a local company. A contract regarding trade tax income was signed with the mayor of the municipality in which the company was originally located. The other project sponsor agreed to waive special tax depreciation (known as "Sonder-AFA") [72]; [interview #14 of 26.05.21]. In addition, the 16 families that own the land on which the wind turbines were built founded an association (known as a *Förderverein*) which, in consultation with the project sponsor, makes funds available for socially beneficial purposes in the region [55, 73]; [interview #14 of 26.05.21].

One of the two project sponsors responded to the concerns of two residents that the stability of their houses could be damaged due to possible lowering of the groundwater and the swamp-like ground near the wind park. The project sponsor offered free building assessments before and after the completion of construction to document and compensate for possible damage to the houses [60, 61, 72]; [interview #14 of 26.05.21]. Another compromise was found with citizens who complained about shadows cast by turbine rotors. The project sponsor offered to pay for window blinds for the residents [72]; [interview #14 of 26.05.21]. Furthermore, an offer was made to buy residents' houses if they felt that their quality of life was permanently impaired. Finally, compensation for the loss of market value was offered by the owner of the Golzwarderworp wind park. Residents were given the opportunity to have their house values appraised by an independent consultant, and the difference would be paid for houses sold below market value within 5 years [72]; [interview #14 of 26.05.21]. Because of these creative problem-solving approaches tailored to individual needs, citizens were more likely to be motivated to tolerate the wind energy project. This finding supports the concept of societal ownership as playing a role in the realization of the wind park.

For the members of the citizens' initiatives in Brake, regional justice played a role in their opposition to the wind parks, in addition to nature and environmental protection. They pointed out the high density of wind turbines already in the Wesermarsch District [59]. Despite the general support for wind energy from municipal actors, the coherence of the energy transition with regard to the choice of technology was also discussed in Brake. The central question was whether wind energy was "the ultimate wisdom", and whether innovative ideas with



less negative effect on citizens had a chance, or whether the lobby interests of energy producers had already created a technological path dependency [interview #14 of 26.05.21].

### **Kefenrod municipality, Hesse**

In Kefenrod, four wind turbines have been in operation since April 2014 [74, 75]. The wind park plans were secured by a municipal development contract and a contract between the project sponsor and the municipality. The development contracts for the wind park ended a long-term debate around wind energy in Kefenrod [76], with the municipality responding to increased interest in locations for wind turbines. From the perspective of community representatives, it was problematic that many companies had concluded preliminary contracts with property owners without first consulting the community [77]; this had led to an "unpleasant gold rush mood". The situation was improved by the decision to build wind turbines only on municipally owned land [78]; [interview #6 of 25.02.21, #8 of 09.03.21].

The project sponsor is a subsidiary of the local electricity supplier, and the perception of the sponsor as a "local company" significantly contributed to trust and acceptance in the community [78–80]; [interview #8 v. 09.03.21].

Conflicts in Kefenrod around wind energy arose from the municipality's general rejection of wind turbines. It had "permanently defended itself against wind energy" [77] and had left potential project sponsors stranded. Reasons for rejection of wind energy cited by residents of Kefenrod included: changes in the landscape, unjust burden sharing, the destruction of nature, the red blinking of the wind turbines lights at night, and proximity to residential developments.

### ***Procedural justice: information, consultation, decision***

The top priority for the municipality was retaining its autonomy over the use of its municipal lands and to retain planning sovereignty over the process [78]; [interviews #6 of 25.02.21, #8 of 09.03.21]. Representatives of the municipality feared that their decision-making authority would be restricted by the development of a new regional-level special land-use plan for renewable energies [interview #8 of 09.03.2021]. Exercising its authority, the municipality reduced the originally planned wind energy development area from 250 to 55 hectares and added a development freeze to the municipal building development plan to prevent "uncontrolled construction" [77]; [interview #8 of 09.03.21].

It was important for local decision makers to determine a project sponsor who "then at least does what they [the community, editor's note] want" [interview #10 of

16.03.21]. Direct decision-making channels between the municipality and the project sponsor were also important to the municipal actors, and many things could be decided informally. It was also important to the municipality that the company was available for on-site visits, which from its point of view led to the selection of the best site and a balance of interests [interviews #6 of 25.02.21, #8 of 09.03.21].<sup>9</sup> One interviewee took issue with decision making processes concerning the locations of wind energy projects, criticizing failures of project planners to visit sites along with the local authorities when deciding locations, which can lead to problems [interview #6, 25.02.21]. Another interviewee emphasized the advantages of cooperating with municipalities to find customized solutions, an approach made more difficult by regional planning decisions [interview #10 of 16.03.21].

Another factor that Kefenrod residents viewed as a threat to their decision-making authority was that a non-local project planning office, which had been active in Kefenrod for many years, had planned wind turbines directly with private property owners and bypassed the municipality.

In Kefenrod the conclusion was reached that wind energy could not be prevented permanently, but "uncontrolled growth" should be avoided [interview #8 of 09.03.21]. It was considered a compromise that the mayor at the time initiated and closely monitored the development of wind turbines, to have maximum influence on project development, to maintain as much control as possible and to ensure maximum benefit for the municipality and its citizens [interviews #10 of 16.03.21; #10 of 09.03.21].

The local nature conservation association was also involved early in the process [interview #6 of 25.02.21] and approved of the professional and qualified procedures followed by the project sponsor. The association additionally considered the location in the forest to be harmless [82]. As a result, the association committed to the construction of the wind turbines and engaged in informing critical citizens at numerous events [interview #1 of 01.12.20]. Citizens were also able to obtain information and exchange ideas during an event organized by the municipality and the project sponsor, through the community paper, through discussion evenings with interest groups and in bilateral talks [interviews #3 of 23.02.21, #6 of 25.02.21, #8 of 09.03.21, #10 of 16.03.21]. After the

<sup>9</sup> The final location of the wind park was selected after an on-site inspection with the project sponsor, community representatives, foresters and nature conservationists [78]; [interview #6 of 25.02.21]. The decision was taken to build the wind turbines in a forested area that was damaged by storms [81]; [interviews #1 of 01.12.20, #6 of 25.02.21, #8 of 09.03.21].

wind park opened, citizens had the opportunity to attend an open house [83].

#### ***Distributive justice: costs and benefits***

Benefits to the local economy played a central role in Kefenrod, and generating revenue for the municipality was a main argument in favor of wind turbines [79, 80]; [interviews #6 of 25.02.21; #8 of 09.03.21; #10 of 16.03.21; #12 of 25.03.21]. These benefits helped to gain support for the project and contributed to societal ownership of the wind turbines. The decentralization of the energy supply was seen as an advantage and was perceived as fair with regard to local value creation [interview #10 of 16.03.21]. “Financial participation for all” and finances for the common good were in the foreground of local decision making. With the goal of improving the tax revenues of the communities, one interviewee suggested the improvement of depreciation options for wind turbines, such that they would break even faster and thus municipalities would receive trade tax payments sooner [interview #10 of 16.03.21]. Compensation of neighboring communities was also put forward as an equitable compromise [interview #8 of 09.03.2021]. One interviewee found lacking a balancing of costs and benefits [interview #3 of 23.02.21]. Another faulted missing links to other energy or infrastructure projects [interview #8 of 09.03.2021].

Compensatory measures offered by the project developer included: security payments for turbine dismantling, compensatory land, biotopes, automatic shutoff, and a feeding station for red kites [interviews #1 of 01.12.20, #6 of 25.02.21]. However, there was limited confidence in the long-term monitoring of compensatory measures.

Certification programs, such as green or fair energy labels, were also discussed. One interviewee found a label for the evaluation of project developers helpful, but another preferred a local energy provider which would not be expected to act against the interests of local clients [interviews #3 of 23.02.21, #8 of 09.03.21]. A further interviewee expressed interest in such labels, but ultimately preferred energy cooperatives as wind energy operators, due to ease of compromises [interview #10 of 16.03.21]. In Kefenrod, in addition to procedural and distributive justice, overriding issues with the energy transition were also discussed. For example, it was pointed out that conflicting objectives (e.g., overexploitation of land) should have been addressed, and conditions such as dismantling or recycling should have been clarified, because these topics offered points of attack for opponents of wind energy [interview #8 of 09.03.21]. The economic model of the energy transition also needed clear explanation [interview #12 of 25.03.21]. Furthermore, the attention paid to the interests of lobbyist and industries in the development of the energy transition has received

criticism [interview #3, 23.02.21]. An interviewee opined that energy saving and energy efficiency should be given higher priority, as an alternative in case wind turbines do not receive local majority support [interview #10 of 16.03.21]. Interviewees expressed diverging opinions on balancing between nature and species protection and the needs of people, against the background of the energy transition. The perceived incoherence of the overall concept for the energy supply system was viewed critically [interviews #1 of 01.12.20, #3 of 23.02.21, #8 of 09.03.21, #10 of 16.03.21].

#### ***City of Uebigau–Wahrenbrück, Brandenburg***

The wind park in Uebigau–Wahrenbrück consists of 21 wind turbines.<sup>10</sup> The wind park was developed in three stages, with 17 turbines built between 2005 and 2007, two in 2014, and two in 2016 and 2017 [84]. Despite support for wind energy among the city council and regional planning office, protests against wind energy arose in the region. However, these protests were not organized. Rather, the opposition “cut across many interest groups and parties” [85]. Opposition in this case was focused on unequal regional distribution of wind turbines, negative effects on the landscape, and the expectation of a negative influence on tourism [85, 86]. Unpleasant noise caused by the wind turbines was also a topic of complaints by local residents during the process of expanding the wind park in 2007 [87].

#### ***Procedural Justice: information, consultation, decision making***

The State of Brandenburg had decided to steer the selection of land for wind energy use via regional planning, which ultimately limits the decision-making authority of local governments [88]. The advantage of this process, according to the regional planning office, is that it guarantees a fair distribution of wind turbines and sustainable implementation of energy projects. The goal is to build wind turbines in designated areas to avoid uncontrolled growth and impairment of the landscape [89]. Another benefit of this regional approach to wind energy siting is to accomplish wind energy expansion without local pressures on mayors who might locate wind turbines in unsuitable areas or bow to pressure of private landowners, whereas the regional level did not have to endure the same kind of political pressure [interview Uebigau–Wahrenbrück]. In addition, the regional planning office coordinates regional plans with mayors before publication to exclude procedural errors [interview #15 of

<sup>10</sup> The wind park is situated on agricultural land between the communities of Uebigau and Beiersdorf.

28.05.21]. It also assists local governments with project planning and implementation by providing guidance and opinions regarding project developers, based on experience developed over the years. The interviewee voiced concerns about mayors allowing themselves to be led around by project developers and “allow themselves to be intimidated by arrogant project developers” [interview Uebigau–Wahrenbrück).

One interviewee stated that municipalities were motivated by the regional planning office to expand wind energy and had the opportunity to discuss concentration areas, but they were excluded from the regional planning process [interview #4 of 23.02.21]; [90]. The interviewee further reported the failure of an attempt by the city to make a minor expansion of a designated area for wind energy in the regional land use plan process [interview #4 of 23.02.21]. Despite a resolution of the city council [91], the regional planning association rejected the expansion due to lack of agreement with the regional plan, and to avoid a concentration of turbines and, therefore, potential grid congestion.

In recognition of the resulting lack of opportunity for some municipalities to participate in the regional planning association, the law has changed recently. The Brandenburg state parliament authorized the inclusion of all municipalities—regardless of how small—in the regional planning assembly, starting in 2025 [92]. However, the extra work associated with the higher participant numbers poses challenges for the regional planning office [interview #15 of 28.05.21].

Citizen participation in the planning procedures in Uebigau–Wahrenbrück occurred in many forms. In addition to legally required public participation procedures, information [93–95] and training events were important instruments aimed at raising awareness of climate protection and creating understanding about the energy transition [interview #4 of 23.02.21]. This included renewable energy fairs [96], idea and cooperation exchanges [97], painting competitions [98], and school events [99]. The project sponsor also opened a citizens’ office in Uebigau–Wahrenbrück [100]; [interviews #4 of 23.02.21, #7 of 28.05.21].

From the perspective of one interviewee, however, municipalities have not only the right to fair procedures and distribution of costs and benefits, they also have duties. Following measures, such as integrated urban development or transport development concepts, an interviewee proposed the mandatory creation of an energy concept for every municipality. Such a concept would address the expansion of renewable energies in a technology-open manner and be tied to financial transfers. In this way, measures could be holistic and long-term, and concepts could be protected from

short-sighted political influence. While constitutional concerns stand in the way of mandating municipal energy concepts[101],<sup>11</sup> the German Citizens’ Climate Council, which recently concluded deliberations, recommends that policymakers establish mandatory municipal climate protection programs to implement climate neutrality in the energy sector [102].

#### ***Distributive justice: costs/benefits***

Interviewees clearly stated a need for financial participation by citizens and host municipalities in wind energy projects [interview #4 of 23.02.21]; [93]. They voiced strong concerns about a disadvantageous balance between costs and benefits, for example, in situations where non-local companies earn profits from wind turbines and host regions do not receive tax revenues [interview #4 of 23.02.21]. The lack of citizen wind parks as an example of financial participation, particularly in eastern German states, lies in the historically evolved land ownership structure, according to an interviewee. Land is mostly managed by agricultural companies, which means there are fewer individual landowners [interview #7 of 28.05.21]. In Uebigau–Wahrenbrück, it was possible to compensate for this deficiency in financial participation opportunities in part through urban development contracts. Revenues were used, for example, to refurbish a multipurpose building and develop a multigenerational meeting place. In addition, under a new trade tax splitting rule enacted in May 2021, 90% of the trade tax from renewable energy now remains in the local municipality [103]. However, one interviewee criticized the lack of municipal authority to levy property taxes on wind parks [interview #15 of 28.05.21]. A proposal by the federal government to grant municipalities property tax levy authority over wind park areas failed in the mediation committee of the two houses of the federal parliament in 2019 [104, 105].

Nevertheless, one interviewee saw improved participation opportunities for communities hosting wind turbines, noting that income generation and participation have become easier due to an amendment of the Renewable Energy Law (Section 36k)<sup>12</sup> [interview #7 of 28.05.21].

Despite the interest of the citizens of Uebigau–Wahrenbrück in a citizen participation model [106], an option for financial participation by citizens was not found until

<sup>11</sup> The German Constitution precludes the federal government from establishing new tasks for municipalities in a directly binding manner (Art. 84, Abs. 1, S. 7, *Grundgesetz*).

<sup>12</sup> According to Section 36k of the Renewable Energy Law, project developers may offer financial compensation to affected communities. “Affected municipalities” means those which are located within 2500 m of a wind turbine.

2017. Earlier plans failed, among other reasons, due to demands of the Federal Financial Supervisory Authority [interview #7 of 28.05.21]; [94]. However, since the beginning of 2018, the project developer has offered a citizen savings model in cooperation with a financial institution, through which investors can invest between 500 and 15,000 euros at a fixed interest rate of 4% [107].

Beyond financial participation opportunities in the wind turbines, citizens of Uebigau–Wahrenbrück have benefited from cooperation with the project developer. Benefits have included sponsored events, the supply of learning materials for a mobile teaching unit of a local educational academy and support for city festivals [interview #4 of 23.02.21].

In addition to financial aspects, the project planning and construction phase included compensation for encroachments on and impairment of the landscape through renaturation projects, nature conservation funds and measures, such as orchards and tree planting [interview #4 of 23.02.21].

Despite financial participation opportunities and general willingness to build more wind energy plants, interviewees desired more regional equity (inter-regional, urban–rural) as well as mandatory solar panels on buildings [interviews #4 of 23.02.21, #15 of 28.05.21].

In addition to procedural and distributive justice, the issue of higher level conflicts between goals was also raised. One interviewee found lacking a debate on values, about the way of life and advantages and disadvantages of a centralized or decentralized power supply on all levels of society [interview #15 of 28.05.21]. Another interviewee would have liked to see more local participation in national decisions rather than “top-down decisions” [interview #4 of 23.02.21].

## Discussion

This study examines how procedural and distributive justice can help build bridges between different interests in local wind energy projects and identifies important factors that can lead to consensus building or facilitate compromise.

It is suggested in the literature that energy justice contributes to achieving social acceptance if the processes and results of energy policy and the energy transition are just and fair [16]. This study confirms this assumption; at the same time, our findings raise questions regarding the understanding of acceptance as it is linked to “issues of fairness and equity” [16].

In the academic literature, social acceptance is regarded as a central factor enabling successful implementation of infrastructure projects, including sustainable energy projects [16, 108]. Acceptance is particularly relevant in the context of the expansion of wind energy

[10, 109, 110]. However, Zuber and Krumm [109] characterize “acceptance” as a “difficult term” in the context of the energy transition due to the lack of a clear definition and the general understanding of acceptance as having a positive connotation. Acceptance is generally associated with words, such as “acknowledge, consent, affirm, agree”; hence, a person who accepts something “provides a positive value judgment” [109]. Batel [111] and Colell [110] criticize that the understanding of acceptance that has so far prevailed in the scientific literature is insufficient (for a comprehensive discussion on this see, in particular, Colell [110]). Batel [111] argues that some theoretical proposals and concepts have contributed to the notion that the opposition to renewable energy transition is found on the local level. This criticism relates to the concept of Wüstenhagen et al. [15] in which community acceptance is separated from socio-political acceptance and these are analyzed as distinct domains [111]. Thereby, “socio-political acceptance is social acceptance on the broadest, most general level”, while community acceptance is “acceptance of siting decisions and renewable energy projects by local stakeholders, particularly residents and local authorities” [15]. This separation between community members and the broader public is understood as an artificial separation of the “national and the local” (...) “if one assumes a relational ontology (...) in which both national/local spatialities, or the public and local communities, are relationally intertwined and, therefore, the same” [111]. Our results confirm that it is necessary to remove the artificial separation between the analytical dimensions “community acceptance” and “socio-political acceptance”, as described, for example, in Wüstenhagen et al. [15]. Especially in the energy transition, the public/national level and the local community are relationally intertwined in that the local community needs to implement what the national level decides and the public supports (the majority of citizens in Germany support the energy transition). At the same time our interviewees oppose the top-down decision making and demand a debate about the energy transition by society as a whole and that decisions should be based on an overall consensus.

Colell [110] criticizes that, in the context of community acceptance, protest is viewed as something to be avoided or overcome, “rather than acknowledged as a contribution (re)politicizing the debate of energy system change”. Furthermore, the full range of attitudes of communities toward energy projects, such as support, uncertainty, and apathy, are typically ignored under the acceptance framework [112].

Drawing on this criticism, and supported by the findings of the present case study, we put forward the broader concept of *societal ownership* (“*gesellschaftliche*



*Trägerschaft*”) as an alternative to the concept of simple acceptance. In the cases analyzed for the present study, interviewees emphasized that “acceptance”—in the form of active positive local support—can hardly be achieved, given the presence of conflicting goals and interests related to wind energy expansion. There will always be residents who are critical of the introduction of wind energy. However, these critical actors may tolerate wind energy projects and refrain from taking action against the projects if distributive and procedural justice are adequately addressed. It is this form of tolerance, based on distributive and procedural justice, that we conceptualize as societal ownership. Citizens show a sense of ownership if they are engaged in planning processes, which enhances political support and the chances for implementation. Derived from legal and jurisdictional issues, the conceptual notion of ownership relates to “responsibility, obligation and caring” that citizens show for public resource planning and management [113]. Lachapelle and McCool [113] expand this concept and include, among other things, the understanding that ownership involves processes “by which voices are heard and considered legitimate or valid”. They argue that “ownership involves the association of citizens and agencies to collectively define, share, and address problem situations with implicit reexamination of the distribution of power”. Relative to this understanding of ownership, societal ownership entails a more active understanding of society, according to which society deals more consciously with the limitations, advantages and disadvantages of the energy transition. The societal ownership concept recognizes that stakeholders who are affected by the energy transition are willing to tolerate decisions that are made on the basis of fair compromises and fair processes.

A further finding is that societal ownership can be enhanced through integration of the procedural aspect of energy justice. Critical actors are willing to come to terms with, or tolerate, the expansion of wind energy if they were involved in and had an opportunity to be heard at an early stage of the planning process. This is achieved through the willingness of local governments and project developers to provide intensive, individual support, and to offer tailored solutions to problems.

### Procedural justice

Procedural justice, as an aspect of energy justice, is aimed at providing procedural transparency, access to objective and comprehensive information, the exchange of information, early involvement in the project process, the opportunity to be heard, the consideration of citizens’ arguments and their integration in the process, and the recognition of unfair procedures [16].

Local decision makers in the selected cases made clear that they considered their cooperation in the expansion of wind energy to be a compromise. In return, they expected some control over both the process and design of the projects, to achieve more fair distribution of costs and benefits for their citizens, as well as to increase the benefits to their municipalities and citizens. This “taking over control” is an aspect of ownership, where direct decision making authority implies a shift in power [113]. Our study results further confirm that participatory processes particularly can lead to an agreement with the renewable energy project, when the local actors, where early involved in the project planning process, had the power to shape it and were given the opportunity to exercise agency [114]. We recommend a corresponding design of the planning and negotiation process in the municipalities.

### *The role of project developers and wind energy operators*

Project developers play a central role as the main point of contact in the planning and implementation of energy projects. Where the developer was more willing to respond individually to needs and concerns of local actors and citizens, to deal intensively with the reservations of citizens and find creative solutions, the willingness to compromise was greater. The effect was to counteract feelings of powerlessness among local actors. We observe this especially in the cases of Kefenrod and Brake. In Kefenrod even local authorities had been opposed to wind energy for years, but willingness to cooperate increased after the local decision makers felt they had to take action because of an initiative of private actors bypassing the municipality. In both cases interviewees stated that affected citizens responded positively to creative and uncomplicated offers to address concerns involving threats to species, loss of property value or disturbances caused by red light, for example. In particular, some interviewees were supportive of measures, such as joint site inspections. These measures should also be extended to neighboring communities. We found that transparency, objectivity and openness in the processes increased trust of local actors [10, 14].

As a result of our findings, we recommend that project developers cooperate with affected local governments and residents regarding location, turbine height, number of turbines, and the like. These aspects can be incorporated into urban development contracts [101]. We further recommend the development of standards for fair procedures and certification labels for fair wind energy [109], see, e.g., [115] which could increase transparency about the manner in which project developers operate. Confidence in this instrument could be increased if organized by impartial public institutions, such as energy



agencies. An example is the Thuringian energy agency that has produced a fair wind energy label program with pre-defined standards [116], which companies can join.

An additional benefit could come from access to a pool of experts or neutral moderators, who could, for example, be called into difficult public events and who could voluntarily submit to a code of conduct. Project developers should also be supported by opportunities for pooling knowledge on procedures, technical developments or new regulations. For example, technical innovations that improve protection of species, nature and health and reduce nuisances (flickering, shadows, noise, endangerment of animals by rotor blades, etc.) associated with wind turbines can be used to reduce burdens created at wind park sites. Promising approaches to this can be found in the form of a wind energy handbook [117] and studies on environmental energy law [118], which should be regularly updated and expanded to include best practice examples [119].

### **Decision making**

The municipalities' demands for autonomy to act and for opportunities to exert influence over the expansion of wind energy appeared easier to achieve in municipalities that controlled the expansion of wind energy through land use plans and had municipally owned land at their disposal. In contrast, early community involvement in the process was more difficult, where land use designations were controlled at the regional level. In these cases, the risk arises that regional control of land designation precludes individual agreements between municipalities and project developers, or municipalities can only enter these agreements within the regional planning framework. This dilemma could be mitigated by the expansion of eligibility for membership in regional planning assemblies, which have been limited to municipalities of a certain population size. An example of an expanded membership policy is found in Brandenburg, where all municipalities will be included in regional planning assemblies starting from 2025. This could be part of the "democratization impulse" that Radtke et al. [114] see as an effect of the energy transition. The authors actually refer to the decentralization of the expansion of renewable energies, but see this as one development that gives the local population more opportunities to influence and make decisions about energy issues. However, including all municipalities in regional planning imposes additional requirements on the regional planning office with regard to managing the extended planning assembly. Due to the increased coordination effort, the regional planning committees will need personnel and technical support.

Particularly in the eastern federal states of Germany, in many cases agricultural cooperatives own suitable land

for construction of wind turbines. In these cases, not only a development plan,<sup>13</sup> but also the urban development contract is an instrument that provides a means of controlling wind park projects, including height, number of turbines, and type of public participation measures. The urban development contract, which is defined in the Building Code,<sup>14</sup> gives municipalities room to negotiate agreements to promote renewable energy [101]. Municipalities should be strengthened in using this instrument. They should have access to respective advisory services [116, 120] which could be linked to existing offers, developed by organizations with a high level of expertise, such as the German Competence Center for Nature Conservation and Energy or the Specialist Agency for Onshore Wind Energy.

At the municipal level, wind energy projects are often promoted by the mayor and municipal council, or the district administrator. These actors often take positions in favor of the projects and commit to them, which was also reported by the interviewees in our cases. As a result, opponents of wind energy projects can get the impression that their concerns are not considered in an unbiased manner.

### **Distributive justice**

Distributive justice refers primarily to the distribution of costs and benefits, such as siting of wind turbines, choice of energy sources, ownership issues, revenues, and compensation measures [16]. Two distributive justice issues that arose in our analysis are the distribution of local added value from wind parks and the regional distribution of wind parks.

### **Increased local added value**

Among the local decision makers interviewed for our analysis, the increase in local added value from wind parks played a central role [10]. Those benefiting from wind park revenues should preferably not be individual actors, but the community as a whole. For example, revenues from wind energy can be used to replenish empty municipal coffers and provide funding for the common good. Opportunities for municipal governments in Germany to generate revenues from wind parks have recently improved due to a new trade tax splitting rule introduced in 2021. To complement this, some interviewees expressed a desire to give municipalities the right to levy a property tax increment on wind parks. However, plans to change the applicable tax law to enable this failed

<sup>13</sup> Section 9, BauGB.

<sup>14</sup> Urban development contracts are provided for pursuant to Section 11(1), no. 4, BauGB.

in 2019 in negotiations in the German parliament. A resumption of these plans is recommended. A further tax law option to improve municipal income from wind projects could be achieved through improved depreciation options for project developers. By improving the depreciation framework, wind turbines could more rapidly generate profits, and municipalities would thus more quickly receive the benefit of income tax.

Maleki-Dizaji et al. [120] have shown that financial participation that contributes to the creation of regional or local added value is one of the most common success factors for community acceptance. This finding is directly in line with our results. In the case of the municipality of Berg, financial participation in the citizens' wind project played a major role in municipal value creation. Based on experience from this project, a priority allocation of shares to local actors (municipal and private investors) is recommended. However, when developing financial participation models, the economic situation of the region should be taken into account. In Uebigau–Wahrenbrück, for example, plans for a citizens' wind turbine project could not be realized; rather, the developer, in cooperation with a financial institution, set up a program for citizens' wind savings accounts, in which even small investments of a few hundred euros were possible.

In the case of Berg, conflict with a neighboring community formed the core of the protests against the construction of wind turbines. Although the Renewable Energy Law now authorizes compensation payments for affected communities which are located within 2,500 m of a wind turbine, this is only an option and not a mandate. It is, therefore, recommended that financial compensation for neighboring communities become an obligation under the Renewable Energy Law. Interviewees provided diverse evaluations of the offer of financial compensation for affected residents. Instead of direct financial compensation to affected citizens, it is recommended that project developers develop solutions together with local actors. In Brake, for example, owners of the land on which the wind park was constructed have given the people of Brake a share of their income from wind energy through a support association. Developers have also compensated for disadvantages of wind turbines through creative offers; these include free building surveys, purchase of shutters for residential buildings, and compensation for loss of value of residential property.

### **Regional distribution**

Another distributive justice issue criticized in several interviews was the unequal distribution of costs and benefits between regions and between urban and rural areas. The German think tank Agora Energiewende calls for a balanced, regional expansion of wind and solar energy

systems in the interest of supra-regional perceptions of justice. This affects both the distribution between town and country and between the federal states [109]. We support these findings: in terms of inter-regional justice, it is recommended that the construction of wind turbines in federal states with a low expansion quota be promoted. First steps in this direction have been taken: in the Renewable Energy Law of 2021, inter-regional distributive justice can be achieved through a "southern quota," which aims to encourage a greater share of wind energy expansion in the south of Germany<sup>15</sup> [121, 122]. At the same time, regional planning bodies should agree to negotiate an expansion of their existing wind parks with municipalities that are willing to expand, even if the regional planning body views this as being in conflict with the principle of sustainable and balanced management. The unequal treatment of municipalities could also be reduced by a mandatory energy and climate concept, which should include renewable energy potential. The German Citizens' Climate Council also recommends mandatory municipal climate protection programs to implement climate neutrality in the energy sector [102]. Due to constitutional constraints,<sup>16</sup> the development of a legally valid model is advisable.

With regard to urban–rural equity, various interviewees called for an obligation to install solar panels, at a minimum, on all public buildings. This obligation should also be extended to new buildings, and the suitability of existing buildings should be assessed.<sup>17</sup> In this context, barriers such as roof warranties, monument protection, and limitations on installation imposed by homeowners' associations should be removed.

### **Coherence**

In addition to the aspects of procedural and distributive justice, which were prominent themes in the interviews, some interviewees expressed doubts about the coherence of Germany's energy transition. In this context, an honest and transparent discussion about conflicting goals in the energy transition is needed. Interviewees raised the need to address societal values with regard to the energy transition and demand for an open debate. All opportunities

<sup>15</sup> The "southern quota" refers to plans to encourage the expansion of wind energy particularly in the states of Bavaria and Baden-Württemberg in southern Germany, by creating an adjusted compensation model for municipalities 121.

<sup>16</sup> Under Article 84 (1) sentence 7 of the German Constitution, the federal government is prevented from directly assigning new municipal tasks to municipalities in a binding manner 101.

<sup>17</sup> The Federal Environment Ministry wanted to introduce mandatory installation of photovoltaic or solar thermal systems on new buildings and major roof renovations with the Renewable Energy Law in 2021, but failed to do so because of the Federal Ministry of Economics 123.

and risks, advantages and disadvantages, should be on the table, and a compromise should be worked out for society as a whole. This should be preceded by a discussion about our way of life, incentives for saving energy, and technology-openness. The advantage of taking an approach that includes an open debate about the energy transition is that it promotes societal ownership, which can better secure implementation.

## Conclusions

The central results of the case analysis can be summarized as follows:

- Local lines of conflict mainly run along the dimension of distributive justice (costs and benefits) and local, ideally community level, value creation is the main argument employed by local decision makers to justify expansion of wind energy. To achieve a balance of costs and benefits, the benefits at the local level need to be increased.
- Some citizens associate the lack of involvement in national decision making with doubts about the coherence of the energy transition, and ask for a society-wide debate about the values and goals of the energy transition.
- (Critical) actors may tolerate a wind energy project and refrain from taking action against it (societal ownership) if distributive and procedural justice are adequately addressed.
- This study has shown that limited local opportunities for action have a negative impact on the tolerance of wind energy projects. Local actors try to expand their scope of action and maximize the benefits of energy transition projects for local residents. If this succeeds, the acceptability of the projects or the willingness to compromise increases.
- The study also confirms the importance of distributive justice as a factor in the Energy Justice concept. Within the scope of the study, it became clear that distributive justice is essentially achieved through political instruments, such as increasing municipal value creation, financial participation, opportunities for community wind savings accounts, financial compensation payments, fair taxation, regional distribution, mandatory energy and climate concepts, or an obligation to install photovoltaic systems.

This study confirmed the importance of procedural and distributive justice as conditions to achieve social acceptance [16]. At the same time, this study has raised important questions for acceptance research. Our case studies show that limited opportunity for citizen participation in energy policy decision making is a challenge for the

successful expansion of renewable energies. This clearly indicates the need for a holistic perspective when examining questions of acceptance of the energy transition.

Contrary to prevalent conceptualizations of social acceptance, local acceptance cannot be examined separately from socio-political acceptance. Another weakness from our perspective is that acceptance research, when examining local structures and actors, considers citizens to be passive actors who accept decisions under certain conditions. Protest is seen as something to be avoided rather than as a valuable contribution to the energy transition debate. This not only has implications for acceptance research, but it raises important questions for policy makers as well. Conflicts over values require a social dialogue and negotiation processes. Policy makers have to determine how this requirement can be integrated in the participation process without delaying the energy transition. In addition, they have to determine how joint learning processes between science, politics, business and society can be designed to successfully shape energy policy and drive the energy transition.

Our data also confirm that each case is different and that individual factors guide actions of affected citizens. Taking their needs into consideration is perceived as the basis for compromise. This poses a challenge for policy makers, especially with regard to standardized rule-making. This also implies that it is crucial to understand that the implementation of the energy transition requires a much deeper plunge into the local context than we have typically made.

These findings should be supplemented by further research. This study came to the conclusion that project developers are among the key actors for the successful expansion of wind energy, since they are managing the planning and implementation of wind energy projects. Our research has shown that the greater the willingness of the project developers to respond individually to the needs of municipal actors and citizens, the greater the willingness of these actors to compromise. Therefore, it is surprising that there are hardly any studies on project developers of renewable energy systems. In this context, it would be worthwhile to broaden the focus of this study and to examine how the interests of additional groups of actors such as project developers influence the energy transition, what this means for the societal owners (especially local actors) of the energy transition and, finally, how a balance between the varying interests of these different interest groups can be achieved. We also see a need for further research on intermediary actors and instruments. Furthermore, more analysis of citizens' understanding of the energy transition is needed, which should go beyond supplying the place of residence with renewable energy. The aim of such research should be to

incorporate local knowledge, to conduct a technology-open debate and to explore the willingness of citizens to change their own lifestyles.

### Abbreviations

AFA: Absetzung für Abnutzung (Depreciation deduction for wear and tear); IAD: Institutional Analysis and Development framework; Km<sup>2</sup>: Square kilometers.

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### Author contributions

DO and SR conceptualized the study and developed its methodology. SR collected the data and conducted the analysis. LG supported data collection to verify interview data. SR prepared the original draft supported by LG. DO reviewed and edited the manuscript and supervised the study. All authors have read and agreed to the published version of the manuscript. All authors read and approved the final manuscript.

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### Availability of data and materials

Interviews were conducted on the basis of the guarantee of anonymity. The summaries of the interviews are available from the corresponding author on reasonable request.

### Declarations

#### Ethics approval and consent to participate

Not applicable.

#### Consent for publication

Not applicable.

#### Competing interests

The authors declare no conflict of interest.

### Author details

<sup>1</sup>Environmental and Climate Policy, Bavarian School of Public Policy, Technical University of Munich, Munich, Germany. <sup>2</sup>Munich School of Politics and Public Policy/TUM School of Social Sciences and Technology, Munich, Germany.

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