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The struggle of energy communities to enhance energy justice: insights from 113 German cases

Florian Hanke^{1*} and Rachel Guyet²

Abstract

Background Energy communities provide access to energy services, such as affordable clean energy and energy-efficiency measures. Some of these services are of particular benefit for vulnerable households struggling with high energy prices and low incomes. European energy policy stipulates an enabling framework to support energy communities offering such services to all households, explicitly soliciting the inclusion of vulnerable and low-income groups enhancing energy justice and democracy. With transposition still pending in Germany, the question remains as to what extent vulnerable groups benefit in practice.

Results Based on the data from an online survey among 113 German energy communities, this paper investigates the extent to which energy communities enhance energy justice and democracy in the German energy transition. We have therefore to ask how energy communities reach out to vulnerable groups and describe the hurdles energy communities face. Even though some energy communities successfully reach vulnerable households, we show that the majority struggle to truly reach out to these groups. In the absence of regulatory support for engaging with vulnerable groups and confronted with a competitive energy market, energy communities are focussing on remaining in business. In this context, it should also be mentioned that some energy communities do not reach out to vulnerable groups to offer beneficial services that are of particular interest for the majority of them.

Conclusion Based on these findings, we would like to underline the need for enabling regulations to support energy communities' contribution to justice and democracy. An 'enabling framework' demands a clear taxonomy, which distinguishes different organisational and social energy community characteristics to acknowledge their social welfare-enhancing role and avoid misinterpretations and potential misuse.

Introduction

The energy community literature is currently concerned with the question of whether energy communities drive a more equitable and just energy transition. The energy justice framework is increasingly applied to study

different energy community processes and outcomes with respect to their potential to enhance energy justice [1]. Energy justice relates to the fair distribution of energy system benefits and burdens and to a fair and representative decision-making process [2]. In this light, EU energy policy highlights energy communities' potential in increasing vulnerable groups' access to RE and energy efficiency alleviating energy poverty: "renewable energy communities (...) advance energy efficiency at household level and (...) fight against energy poverty through reduced consumption and lower supply tariffs" [3]. RED

*Correspondence:

Florian Hanke

hanke.florian@gmx.de

¹ European University Viadrina, Frankfurt (Oder), Germany

² European Institute, Nice, France



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II further highlights that all citizens, “including the most vulnerable and low-income households”, should be able to participate [3].

With approximately 900 renewable energy cooperatives [4], Germany achieved one of the highest numbers of energy communities in Europe [5]. Energy communities in Germany, the diversity of their manifestations and characteristics have been studied from various perspectives: economic development [6, 7]; governance and cooperation models [8–10]; municipal support structures [11, 12]; citizen participation [13–15] and member characteristics [16]; social acceptance of RE [17]; energy democracy [18]; regional value creation [19]; climate change [20]; social innovation [21] and more.

However, while a growing body of international literature investigates energy communities in the context of a socially just energy transition [1, 22], similar work for the German context is still growing. For example, Yildiz et al. [23] find that members of energy cooperatives are usually male with high incomes and education levels, thus illustrating that energy cooperatives are not as diversified as they are expected to be in the framework of energy democratisation. Drowing and Glanz [24] investigated energy communities’ homogenous member structure and different mechanisms of exclusion. They found that among others the organisational culture and affiliation to certain social networks determines the participation and often results in the (unintentional) exclusion of other social groups. Radtke and Ohlhorst [25] reported on low levels of diversity among energy community members. Especially women and younger people are less engaged in community energy. They stress the importance of enabling policies to enhance energy communities’ potential for engaging citizens across age, gender, income, and education levels.

It is the aim of this article to expand the German energy community literature by investigating energy communities’ contribution to a socially just energy transition. Energy communities in this article fulfil the main defining criteria of a citizen energy community according to the German renewable energy directive (EEG 2021). According to § 36g EEG (2021), a citizen energy community (Bürgerenergiegesellschaft) consists of (i) at least ten natural persons as voting members or voting shareholders, (ii), from which at least 51 percent of the voting rights are held by natural persons who, for at least 1 year have had their registered main place of residence in the independent town or district, in which the wind turbine(s) is/are to be erected and (iii) in which no member or shareholder holds more than 10% of the voting rights.

In addition and according to RED II, renewable energy communities should provide “environmental, economic or social community benefits to its members or

shareholders or to the local areas where they operate rather than to generate financial profits” [3]. Economic benefits are often quantified by investments in RE or energy efficiency or tax revenues generated; environmental benefits include reduced CO₂ emissions and increased air quality; social community benefits include access to affordable clean energy and energy efficiency [3]. In this way, energy communities are expected to contribute to the sustainable development goal (SDG) seven “affordable and clean energy” of the 2030 Agenda for Sustainable Development, adopted by all United Nations’ Member States in 2015 [26].

While economic and environmental benefits of energy communities are often highlighted [4], social community benefits are less researched. Therefore, to explore whether German energy communities contribute to energy justice in the German energy transition, this paper focuses on analysing energy communities’ social benefits. Renewable energy communities according to RED II fulfil the following definition criteria: open and voluntary participation, autonomy, effective control by shareholders or members that are located in the proximity of the renewable energy projects that are owned and developed by the renewable energy community; the shareholders or members are natural persons, SMEs or local authorities, including municipalities.

Based on data collected from 113 German energy communities through a questionnaire, we apply the energy justice framework to investigate energy communities’ contribution to a just energy transition. Doing so, we investigated energy communities’ procedures to understand whether these procedures recognise the specific needs of different social groups, in particular of underrepresented groups such as women, minorities or vulnerable households struggling with the payment of energy bills. When looking at energy communities’ procedures, we mainly ask the question whether they could help to democratise the local energy transition through providing a voice and choice to local citizens. Likewise, we evaluated whether energy communities could enable a just distribution of energy community benefits and services to different social groups. Finally, we assessed the extent to which energy communities contributed to alleviating energy poverty in Germany. Doing so, we develop indicators to assess energy communities’ contribution to recognitional, procedural and distributional energy justice. Based on this analysis, we developed policy recommendations to enhance justice in the German energy transition.

The paper consists of six sections: followed by this introduction, section two presents the energy justice framework, its links with energy democracy and its operationalisation in the context of German energy

communities. Section three briefly describes the data collection methodology and the final data sample. Section four displays the main survey results. Based on the survey data, section five discusses the extent to which energy communities in our sample enhanced energy justice in the German energy transition. Based on the findings, we derive policy recommendations for enabling regulatory conditions to enhance energy justice. Section six is our conclusion.

Background

Energy justice describes “a global energy system that fairly disseminates both the benefits and costs of energy services, and one that has representative and impartial energy decision-making responsibilities” [27]. The energy justice framework can be used to identify different forms of injustices as well as different social groups impacted by such injustices [28]. The energy justice framework usually entails distributional, procedural and recognitional justice [28, 29]. Based on a previous study [30], we apply procedural, distributional and recognitional energy justice to investigate energy communities in our German sample. More concretely, we investigate what kinds of benefits and energy services energy communities in our sample offer, either to their members or external consumers (or both) and whether existing procedures enable different social groups’ access to such benefits and services. In this light, in the following, three different dimensions of energy community benefits and services are briefly outlined: environmental, economic and social as proposed by RED II.

Environmental benefits and services entail the production and distribution of clean renewable energy to members or external consumers. Although to a lesser extent, the same applies to energy efficiency, renewable heating, energy storage and aggregation, or e-mobility [5], in this way, energy communities can provide broader benefits to the local community, such as improving local environments and contributing to low carbon societies [31–33].

Economic benefits of services encompass providing clean energy and energy efficiency advice at an affordable cost to members and/or external costumers. Other energy communities focus on providing returns on RE investments to their members and primarily function as investment vehicles; decentralised energy supply plays a subordinate role. Hybrid versions of energy communities providing affordable energy services and returns on investments exist as well [34]. Further, energy communities can bring added value to the region where they are installed through providing local jobs, developing skills, promoting social cohesion, addressing inequalities, enhancing equity and autonomy [35–38].

Social benefits and services are mainly linked to contributing to a more just and equitable (local) energy transition. This entails supporting and empowering the local community, e.g., by offering energy consultations or supporting local sports events or fostering citizen participation and promoting social innovations locally [5].

In this light, energy communities are increasingly referred to as democratising energy [39]. Energy democracy is mainly concerned by involving and engaging citizens in deliberation and decision-making [40] with the intention to add legitimacy [41], local knowledge [42] and multiple stakeholder views [43] to local energy transitions. Instead of energy policy as a “technoscientific domain reserved for experts” [44], energy democratisation is an “ideal political goal, in which citizens are the recipients, stakeholders (as consumers/producers) and account holders of the entire energy sector policy” [44]. The idea is that local citizens know best about local energy transition needs and should get involved in shaping regional energy transition to raise needed investments and trigger changes in consumer behaviour to enhance energy efficiency and increase public acceptance, community trust and bridge social networks [18, 39, 45].

Likewise, energy communities are increasingly expected to help mitigate energy poverty through providing access to affordable energy services such as renewable energy and energy-efficiency measures [3]. In this paper, we refer to Bouzarovski and Petrova’s [46] definition and define energy poverty as a household’s propensity to be unable “to attain a socially and materially necessitated level of domestic energy service”. Although energy poverty is not defined as such by German policymakers, scholars increasingly point at different aspects of energy poverty and injustices linked to the German energy transition most prominently by an unfair distribution of energy transition costs among private households. For instance, a number of scholars show that the RE levy is disproportionately burdensome for low-income households while high income earners benefit [47, 48]. Although the RE levy was reduced at the beginning of 2022 and will likely be discontinued, recent drastic increases in energy prices spread the threat of energy poverty even further and put energy vulnerabilities related to price inflation at the centre of political debates. While the German government decided to mitigate the social consequences of energy price increase due to the war in Ukraine [49], the introduction of a definition of energy poverty nor a reflexion on the role of energy communities in this regard have been considered so far. Energy poverty is often driven by highly visible factors such as high energy prices, low incomes, and low energy

Table 1 Assessing energy communities' contribution to democratising energy. Source: Authors

Energy democracy	Element	Indicator
Internal energy democracy	Internal decision-making [45]	Members control and engagement in decision-making processes
External energy democracy	External representation [44, 56]	Member diversity Member proximity Engagement of non-members

efficiency. The root causes, however, go beyond these factors. For instance, financial precarity changes the way households think and make (energy) choices [50, 51]. The causes of energy poverty are complex: intersecting axes of inequality [52]—including income, gender, age, education, health status, and ethnicity but also real estate and energy markets¹ and social welfare systems² and political representation³—constitute households' energy-related struggles [54].

Energy justice and energy democracy

As follows, our approach to apply the energy justice tenets recognitional, procedural and distributional justice to energy communities is described. Doing so, we investigate the extent to which energy communities in our sample contribute to energy justice and energy democracy. We link energy democracy to the procedural dimension of energy justice [45]. Further, we highlight that the three energy justice tenets are interlinked and intersect with each other. The same applies to the concept of energy democracy. While there is a multitude of energy communities' theoretical benefits and services, due to restrictions in the data collection process (see "Methods" section), we focus our investigation on the elements described below.

Procedural justice looks at procedures that allow all local citizens and stakeholders to engage with and participate in the energy transition in a non-discriminatory and inclusive way [28]. In assessing energy communities' contribution to procedural justice, we focus on current energy communities procedures [29, 55] and how they enable different social groups' access to energy community benefits and services. We distinguish between direct access to such benefits and services via membership and indirect access through activities targeting individuals

that are not members or the local community at large. In this light, energy democracy is closely linked to procedural energy justice [45, 56]. To assess energy communities' contribution to democratising energy, we distinguish between internal and external energy democracy. Internal energy democracy mainly concerns procedures within the energy community that enables all members to get involved in decision-making processes to exercise control [10, 45]. External energy democracy in the context of energy communities refers to the extent to which the local community in which the energy community operates is included in the way the respective energy community shapes the local energy transition. One way of achieving citizen engagement is through citizen co-ownership in renewable energy [44]. Participation in energy communities in turn is a form of citizen co-ownership [56]. Therefore, the main indicator for external energy democracy is member diversity in the energy community. We also look at members' geographic proximity to the energy community to understand the geographic scope of democratising energy. Further, to understand the degree to which members are directly involved in decision-making processes within the energy community, we investigate internal decision-making structures. Finally, we look at energy community activities to reach out to individuals of the local community that do not participate in the energy community as members yet.

We apply the following indicators to assess energy communities' contribution to procedural justice and democratising energy: participatory requirements such as membership fees and share prices; member diversity and proximity to the energy community; governance structure, information and engagement activities targeting the local community and vulnerable groups. Table 1 summarises the approach to assess energy democracy. Table 2 summarises the elements identified for each energy justice tenet and respective indicators. The intersections of the two concepts of energy justice and energy democracy are highlighted with respect to the selected indicators, e.g., for internal energy democracy and procedural energy justice.

Distributional justice looks at the production and consumption of energy and where injustices in the

¹ Households with low, precarious incomes often live in cheap dwellings with low energy efficiency.

² Unemployment benefits in Germany (Arbeitslosengeld II) do not cover electricity costs. Electricity costs are deducted from the basic living allowance.

³ Elsässer et al. [53] show that policy-making in Germany systematically misrepresents the needs of low-income households.

Table 2 Energy justice elements and indicators. Source: Based on [30] adapted by the authors

Tenet	Element	Indicator
Procedure	Access to information [42, 61, 65, 66] Access to membership [67] Representation of stakeholders [28]	Member diversity Participatory requirements Targeted information and engagement activities
Distribution	Access to outcomes in the form of benefits and services [27, 62]	Energy services offered to different social groups
Recognition	Awareness of energy vulnerability and energy poverty [54, 64] Recognition of energy communities' role for enhancing energy justice [3]	Level of knowledge about energy vulnerability and poverty Engagement with energy vulnerable and poor households Primary purpose and responsibility for social inclusion Alleviating energy poverty

energy system emerge [28]. For instance, distributional energy justice has been applied to investigate distributional burdens of increases in energy prices [57] or the distribution of renewable energy's costs and benefits [58]. In Germany, it has been shown that the initial decision of the government to fund energy transition based on a tax levied on energy bills had a regressive impact on the most vulnerable households. The latter contribute the most to the funding of energy transition while benefiting the least from RE [59, 60]. In a reference to a previous work [30], we apply distributional justice to investigate the distribution of energy community benefits and services to different social groups [27–29, 61, 62]. The main energy services are access to renewable energy, energy efficiency, renewable heating, energy storage and e-mobility. We use the following indicators to assess distributional energy justice: member diversity, and the distribution of energy services to different social groups.

Recognitional justice inquires which sections of the society and what needs are ignored or misrepresented in the context of the energy system and its transformation [28, 29, 63]. Recognitional justice focuses on understanding differences and accommodating particular needs, especially those of vulnerable groups [29]. As described, different energy vulnerabilities intersect and create differences in domestic household needs and capacities, often restricting the possibilities and choices of vulnerable groups [54]. A fair distribution of both the benefits and costs of energy services (distributional justice) and energy decision-making and governance (procedural justice) requires recognising these differences and restrictions. Only based on such an understanding can empowering and inclusive procedures emerge that enable a fair distribution of benefits and burdens [64]. Based on a previous work [30], we therefore investigate whether energy communities are aware of energy vulnerability and energy poverty and the restrictions vulnerable groups face when trying to access energy communities' services. Doing so, we

apply the following indicators to assess recognitional justice: the level of knowledge about energy vulnerability and poverty, the preferences, needs and living situation of vulnerable and energy-poor households as well as engagement activities targeting energy vulnerable and poor households. We further look at energy communities' primary purpose to understand whether they perceive providing social benefits and services and engaging with vulnerable groups as their responsibility.

Methods

This paper builds on the results of a previous exploratory research focusing on the role of energy communities in tackling energy poverty in Europe [30]. For this article, the research process in Germany began in 2021 with conducting telephone interviews with executive members of five German energy communities. The aim of these interviews was to become familiar with the current challenges of energy communities regarding their contribution to a socially just energy transition to adapt a previously developed online survey to the German context. The final survey contains 31 questions structured by four categories, each corresponding to a different information need:

1. Filter questions (information about the responding organisation' structure and purpose);
2. Underrepresented groups (information about inclusive action and services offered)
3. Energy poverty (information about energy poverty mitigation);
4. Your organisation (information about the responding organisation and its members).

We ran a pre-test distributing the survey to 10 individuals in the energy research community. We cleaned, tested, and analysed the data using the computational programme SPSS to structure and display the data. We applied content analysis to both the interviews and open text replies in our survey. In September 2021, the updated survey was sent to 900 German energy communities, of

Table 3 Member categories. Source: Authors

Member category	N	Percent of cases (%)
Citizen	113	100
SMEs	32	28
Local municipalities	46	41
Schools, NGOs, associations	10	9

which 134 replied. The list of citizen energy communities results from online research among three major and public websites listing existing citizen energy projects in Germany: Bürgerenergie Jena, Energieagentur NRW and Netzwerk Energiewende jetzt e.V. In the end and after a thorough data processing, the sample consists of 113 energy communities. In the online survey, all responding organisations claimed to comply with the definition of ‘Bürgerenergiegesellschaft’ as defined by the German renewable energy act (EEG) (§ 36g EEG). Further, all responding organisations describe themselves as renewable energy communities as defined by RED II. A majority of 104 (92%) of cases are organised as cooperatives, three as limited liability companies and two as associations and two civil-law partnerships.

Before presenting the results and discussion, we would include some comments about limitations. The main restriction of the data sample is the low response rate of 12.5. Further, we must assume that only energy communities responded to the online survey that were interested in the main question raised, that is, participation of underrepresented groups and energy poverty. Therefore, when making statements about “energy communities”, we refer to energy communities in our sample only. Also, the responding energy communities do not have information on the socio-economic characteristics of their members and customers. As we will show below, a considerable number of energy communities offers services to external customers. However, we were not able to collect data on socio-economic characteristics of customers nor on the engagement activities targeting different customer groups. Finally, this is exploratory research and while we can address important issues there is a need for more in-depth research on the impact of different engagement activities on the local community.

Results

We structured the results section according to the above identified indicators (see Tables 1 and 2).

Member diversity

Energy community members are usually citizens, followed by local municipalities and SMEs (see Table 3).

With respect to member characteristics, energy communities stress that they often do not have detailed information on their members and thus do not know much about members’ socio-economic characteristics—an observation confirming the results of a previous research project [30]. We can however note that a gender gap prevails: in 76 (67%) of cases, less than 30 percent of members are women, and in 72 (64%) of cases more than 70 percent are men. On average, energy communities in our sample have 370 members, which is 20 percent more than the average energy cooperative in Germany [4].

Decision-making bodies and procedures

According to RED II and EEG, membership should be open to all citizens. And indeed, 108 (96%) respondents report that membership is (theoretically) open to all citizens; two cases link membership to the requirement to have a residence close to the energy community. And although this requirement is explicitly mentioned only in two cases; in 105 (91%) of cases most of their members are located in the proximity of the energy community (a median of 20 km).

Nearly in all cases (91%) of the members control the organisation. The general assembly is the most important decision-making body. Further, it appears that the executive board often makes most decisions and represents the community judicially and extrajudicially. The executive board consisting of natural members of the organisation, is elected by the members and must inform the members. 21 (19%) of energy communities explicitly declare that members have a say in all fundamental decisions. In 17 (15%) of cases, members can get involved in workgroups and other tasks (usually on a voluntary basis). In 13 (12%) of cases, all decisions are managed by the supervisory and executive board, which is run by members, but members do not exercise any additional control.

Participatory requirements, information and engagement activities

Based on a previous work [30], we define underrepresented groups as low-income households, energy-poor households, young families, households with migration backgrounds and women. 28 (25%) of energy communities specifically address underrepresented groups, and 64 (57%) do not specifically address these groups. Specifically addressing underrepresented groups entails informing them about the possibility of participating and the different ways to get involved. Further, the online survey distinguishes between general engagement activities targeting the public and engagement activities and underrepresented groups specifically. 19 (17%) reply that they address such groups through general engagement and participation offers, as one respondent puts it: “We do

Table 4 Underrepresented groups addressed. Source: Authors

Underrepresented group	N	Percent of cases (%)
Low-income households	21	19
Energy-poor households	12	11
Women	19	17
Households with migration background	14	12
Young families	23	20
Other	17	15

them, include below 300 members, which is 40 percent less. Reasons for not approaching underrepresented groups differ. Firstly, energy communities trying to address these groups report difficulties when trying to reach out—they often simply do not manage to reach vulnerable households. Further, when having reached them, energy communities struggle to bring across their offer. Here, the main difficulty is finding the right words (understandable language) to explain their offer and vulnerable households' financial restrictions and living situation. As one respondent puts it: "They have other

Table 5 Reasons for not addressing underrepresented groups. Source: Authors

Reasons for not addressing underrepresented groups	N	Percent of cases (%)
We need to focus on our core activities	20	18
We do not have sufficient resources to address these groups	11	10
We would like to, but we don't know how to reach these groups and what they need	3	3
This topic has never been discussed	33	29
Current regulations and policies hinder the inclusion of these groups	6	5
It is not our task to address these groups	7	6
Other	20	18

Table 6 Energy services offered. Source: Authors

Energy service	N Group A ^a	N Group B ^b	N total	Percent of cases (%)
Electricity from renewable sources	26	33	59	52.00
Electricity tariffs below market price	21	18	39	35.00
Heating based on renewable sources	14	17	31	27.00
Energy efficiency advice	12	16	28	25.00
Discounted membership fees	18	8	26	23.00
Installation of energy-efficiency measures	10	9	19	17.00
Financing of energy-efficiency measures	10	9	19	17.00
E-mobility	11	7	18	16.00
Renewable energy aggregation	8	6	14	12.00
Energy storage	7	5	13	11.00

^a Group A includes all energy communities stating to address underrepresented groups

^b Group B includes all energy communities stating to not address underrepresented groups

not distinguish between these groups". Nine energy communities address underrepresented groups with specific engagement and information activities targeting these groups while acknowledging the specific restrictions underrepresented groups might face. The remaining energy communities did not reply to the question. Table 4 provides an overview of different underrepresented groups addressed by energy communities in the sample.

Energy communities addressing these groups have on average 500 members, while those that do not address

problems than participating in our energy community." Secondly, as displayed in Table 5, the main reasons for not addressing underrepresented groups are unawareness, the need to focus on the core business activities and a lack of resources. The core business activities are reflected by the primary purpose (Table 8) and the kind of energy services offered (Table 6). Other reasons mentioned for not addressing underrepresented groups are lack of enabling regulatory conditions for energy communities in general but also specific instruments such as tenant power models. When asked the question

Table 7 Energy efficiency and prices. Source: Authors

Energy efficiency	N Group A	N Group B	N total	Percent of N total (%)
Only members	21	10	31	46.00
Only external customers	4	12	16	24.00
Both	8	12	20	30.00
			67	100
Affordable energy	N Group A	N Group B	N total	Percent of N total (%)
Only members	13	9	22	56.00
Only external customers	2	8	10	26.00
Both	6	1	7	18.00
			39	100

who is responsible for enabling the participation of these groups, of 68 (60%) replies, 43 (38%) replied that the responsibility for inclusion remains with energy communities, 31 (27%) with local authorities and 23 (20%) with the Federal government.

Other aspects frequently mentioned are financial membership requirements. Respondents mention a minimum financial participation from as low as 50 Euro up to 3000 Euro. Concerning financial requirements, respondents' replies and opinions are diverse: for instance, a range between 250 and 3000 Euro is perceived as low enough to allow for a broad participation of different social groups. Other respondents identified a lack of financial means restricting vulnerable groups' participation as one of the main reasons for their underrepresentation stating that even 50 Euro is a considerable barrier for low-income households. Some respondents state that they offer payments by instalments to include low-income households; others provide private loans from members to vulnerable members to help them finance their share. In theory, such loans could be paid back using dividends. However, as one energy community reports during a telephone interview, it can be difficult to pay out dividends due to low profits. For a small energy community, due to financing costs, low market premium for fed-in electricity and obligatory biennial audits, the capability to pay out dividends to members is limited.

Energy community services offered to different social groups

The primary purpose of promoting RE is reflected by the energy services offered. Promoting and offering affordable energy from renewable sources is the main service, closely followed by energy efficiency by both energy communities addressing underrepresented groups and those

that do not provide the same energy services, as illustrated in Table 6.

Likewise, among the energy communities that responded to the question, half offers energy efficiency services (advice, combined installation and financing) and electricity tariffs below the market price only to members. In contrast, the other half offers these services either only to external customers or to both members and external customers (see Table 7).

Primary purposes

Both IMED and RED II agree that energy communities should have a primary purpose beyond merely making financial profits. Both mentioned environmental, economic and social community benefits are linked to energy communities' activities. The primary purpose of the organisations in our data sample is the promotion of RE (88%), followed by promoting regional value creation (44%) and independent energy supply (39%). When asked whether providing social benefits is among their primary purpose, only two energy communities confirmed (see Table 8).

Table 8 Primary purposes. Source: Authors

Primary purpose	N	Percent of cases (%)
Promoting renewable energy	100	88
Promoting regional value creation	50	44
Payment of dividends	26	23
Energy supply in own hands	44	39
Providing social benefits	2	1.7
Other	9	8

Table 9 Reasons for not addressing energy poverty. Source: Authors

Reasons for not addressing energy poverty	N	Percent (%)
The topic was never discussed	47	42
We need to focus on our core activities	18	16
We do not have enough resources to fight against energy poverty	4	4
We would like to, but we don't know how to reach these groups and what they need	4	4
Energy poverty is not a problem in our region	12	11
We do not know exactly what energy poverty means	3	3
Current regulations and policies are holding us back	3	3
Other	1	1

Alleviating energy poverty

Of 103 energy communities that replied to the question, nine stated to address energy poverty. Among those that address energy poverty, most do so in cooperation with partners such as Caritas Germany or other Charity organisations or the local municipality, e.g., by sharing information and educating regarding energy services. One respondent addresses energy poverty indirectly through tenant power projects mostly installed on social housing. The main reason for not addressing energy poverty is unawareness of the topic (in 51% of cases), followed by a need to focus on core business activities (16%) and the statement that energy poverty is not an issue in the local community (10%). Further respondents stress that energy-poor or vulnerable members avoid talking about their situation, that current regulation does not support measures such as energy sharing and that energy communities do not have enough resources to address energy poverty locally. Further, tenant power models facilitated by energy communities were mentioned by six energy communities as a way of addressing vulnerable and energy-poor tenants. However, respondents stress that regulations for tenant power in 2021 were still bureaucratic restricting its wider application. Table 9 presents further reasons for not addressing energy poverty.

Discussion

In the following, we apply the above outlined results to investigate the extent to which the responding energy communities contribute to a more just and democratic energy transition. The above raised limitations, that is, the limited number of energy communities included in the sample and the assumption that only energy communities responded to the online survey that were interested in the main question, however, must be considered.

Procedural energy justice

Energy communities' member structure indicates whether energy community procedures enable and

empower a broad participation of different social groups. With that in mind, we note that women remain underrepresented. Regarding the inclusion of other social groups roughly half of the energy communities claimed to address underrepresented groups. However, the extent to which energy communities successfully enabled underrepresented groups to participate remains vague—energy communities often do not receive information about the socio-economic characteristics of their members or customers. It stands out that energy communities also claim to engage with vulnerable groups that do not have targeted engagement approaches in place. While these energy communities claim to reach underrepresented and vulnerable households, we do not have robust evidence to assess how successful such engagement activities might be.

Access to energy community benefits is granted either for members or external customers. In both cases, individual members of the local community need to be aware of the local energy community and its benefits. Therefore, engagement and information activities targeting different social groups are the primary indicator to assess procedural justice. Most energy communities target the local community through *general* engagement and information activities—these typically include newsletters, flyers, or information booths in public places or during public events. Energy communities specifically addressing vulnerable groups, however, stress that general information and engagement activities do not reach vulnerable groups. Based on their experience, they highlight that information needs to be presented clearly and understandably through direct communication channels. Examples for such *targeted* engagement activities are the setup of energy cafes, or home visits. Further, they report that vulnerable groups' precarious financial situation restricts their capacity to participate in energy communities as members. In this light, 26 (23%) of energy communities offer discounted membership fees or provide financing schemes to enable vulnerable groups

Table 10 Energy communities' contribution to procedural justice. Source: Authors

Element	Indicator	Findings
Access to information [42, 61, 65, 66]	Member diversity	Women and other groups remain underrepresented; limited awareness for targeted engagement activities (see "Recognitional energy justice") which are resource-intensive and remain the exception; participatory requirements such as financial means pose an obstacle to engaging vulnerable groups
Access to membership [67]	Participatory requirements	
Representation of stakeholders [28]	Targeted information and engagement activities	

participation such as payment in instalments or micro loans. They also reported that targeted engagement approaches are resource-intensive (time of staff or members to go from door to door or financial means to offer discounted member fees). However, resources, especially of smaller energy communities, are limited. Smaller PV projects are often only profitable when the produced electricity is self-consumed; past and current energy law does not allow for energy sharing models to rely on the public grid—often a reason why such projects remain economically unfeasible. In addition, the highly regulated German energy market sets a number of requirements and obligations to be met by energy suppliers. Smaller energy communities do not have the resources to meet these requirements instead more than 100 energy cooperatives use the service of the 'Bürgerwerke eG' for electricity distribution and supply.

In this light, engaging with vulnerable groups often requires cooperating with other cooperatives, local municipalities, NGOs or charities. This is especially the case when energy communities try to identify and reach out to vulnerable households in the local community. For instance, in Belgium the city of Eeklo buys membership shares from the local energy community and redistributes these shares to vulnerable community members. In this way they gain access to affordable energy services. Likewise, enabling cooperation with local charities as mentioned by some of the respondents can help energy communities identify vulnerable households and therefore better adjust their communication/engagement activities.

In this light, a considerable difference between energy communities addressing underrepresented groups and those not doing this, is member size: the more members, the more likely an inclusive action would be. One explanation could be that bigger organisations have more resources necessary to address different groups. This is confirmed by the responses of energy communities that do not yet address underrepresented groups: they must commit all organisational resources to focus on their business activities, additional resources for inclusive procedures are not available. Based on the reported experiences and difficulties of energy communities when trying to reach vulnerable groups, we must assume that lacking

targeted information and engagement activities hinders the successful inclusion of underrepresented groups and thus constitutes a procedural shortcoming. Table 10 summarises the findings with respect to energy communities' contribution to procedural justice.

Energy democracy

With respect to energy democracy, we mainly look at the extent to which the local community can shape the local energy transition through enabling co-ownership, decision-making and control. Doing so, we distinguish between internal and external energy democracy. Internal democracy is mainly about the extent to which energy community members have access to decision-making. Here most of the energy communities reported that their members control the organisation, the main decision-making body being the general assembly. In most cases, the executive board or the director run the daily business, prepare, and shape most decisions. In 12 (10%) of cases it seems that members' involvement in decision-making is limited to electing the executive and supervisory board. 21 (19%) of energy communities reported that their members can participate in work- and project groups throughout the year and are included in all fundamental decisions. Given that 89 percent of cases are organised cooperatively, with more than 20 members, they are by law obligated to instal both an executive and supervisory board consisting of elected members of the cooperative. The same applies to the general assembly and the one member one vote rule. In the end, the cooperative law provides the basis for a democratic governance structure within energy cooperatives [68]. The degree to which energy communities provide their members with possibilities to get involved beyond participating in the general assembly and electing the executive board depends on the individual community and members' capacity (mostly free time but also knowledge) to take on additional responsibilities.

External energy democracy denotes mainly the way the respective energy community empowers the local community to shape the local energy transition. This can be achieved either through enabling membership in the energy community (co-ownership) or through additional activities such as information campaigns or community

Table 11 Energy communities' contribution to democratising energy. Source: Authors

Element	Indicator	Findings
Internal decision-making [45, 55] External representation [44, 56]	Members control and engagement in decision-making processes Member diversity and proximity Engagement of non-members	Usually, members exercise basic control, e.g., electing the boards; additional involvement is less common and depends on the respective community; although members are usually local ones, not all social groups have the same possibilities to get involved; energy communities' contribution to democratising energy locally remains restricted to a predominantly male group

Table 12 Energy communities' contribution to distributional justice. Source: Authors

Element	Indicator	Findings
Access to outcomes in the form of benefits and services [27, 62]	Energy services offered to different social groups	Energy communities provide a range of beneficial energy services to members and customers; only half of energy communities try to offer these to vulnerable groups while even less specifically address vulnerable groups; energy communities' potential to support energy-poor households is confirmed but not exploited

meetings to discuss RE projects. In this light, none of the energy communities in our sample report to have organised community meetings to discuss their projects with the local community (resp. with non-members of the energy community). Still, energy communities also interact with non-members that are customers of the energy community. However, none of the energy communities reported that the customer relationship includes discussing local energy projects. With a clear majority of members living in proximity to the RE installations of the energy community, we may conclude that energy communities contribute to democratising energy locally—the extent to which a diverse body of social groups benefits, however, depends on the respective energy community's procedures and whether they reach different groups. Therefore, we assume that the above-discussed procedural shortcomings with respect to reaching out to vulnerable members of the local community have an equally restricting impact on external energy democracy. Table 11 summarises the findings with respect to energy communities' contribution to democratising energy.

Distributional energy justice

In assessing distributional justice, we mainly look at energy communities' services and benefits and which groups gain access. Half of the energy communities in the sample offer energy services such as affordable (below market price) and clean energy and energy-efficiency measures either exclusively to their members, to external customers or both. Nearly all energy communities address citizens with their services. However, only 28 (25%) explicitly address underrepresented groups such as

young families, low-income households, and women, and in this way increases energy communities' reach beyond a traditionally homogenous, male group of members. With respect to distributional justice, we thus note that although a considerable number of energy communities offer services and benefits that would be of benefits for vulnerable and energy-poor households, only a minority offers energy services and benefits to those in need. We also noted that accessing energy services and benefits is not always linked to membership: in roughly half of these cases, energy communities provide energy services and benefits to external customers as well. Thus, when looking at new ways to enhance distributional justice, one way of doing so could be linked to offering services to vulnerable households as external customers. For instance, a social tariff, as is mandatory in Portugal, could help energy communities reach the most vulnerable. The potential of energy communities to enhance energy justice thus lies in providing access to energy services and benefits to energy-poor households—which is mainly a question of enabling and empowering procedures. These in turn requires a thorough recognition and understanding of energy vulnerability and of the particular barriers, vulnerability creates. Only based on such recognition, energy communities can address procedures that prevent households from gaining access to energy community benefits and services—an observation highlighting the importance of recognitional energy justice. Table 12 summarises the findings with respect to energy communities' contribution to distributional justice.

Table 13 Energy communities' contribution to recognitional justice. Source: Authors

Element	Indicator	Findings
Awareness of energy vulnerability and energy poverty [54, 64]	Level of knowledge about energy vulnerability and poverty	Energy communities usually remain unaware of local energy poverty or the restrictions vulnerable groups face; recognising energy communities' responsibility for inclusive action does not automatically translate to specific engagement activities; energy communities' primary purpose and business activities remain linked to producing, storing and distribution renewable energy services
Recognition of energy communities' role for enhancing energy justice [3]	Engagement with energy vulnerable and poor households	
	Primary purpose and responsibility for social inclusion	
	Alleviating energy poverty	

Recognitional energy justice

Recognitional justice is mainly concerned with energy communities' awareness for understanding the specific needs and restrictions of different social groups. In that respect, 43 (38%) of respondents found energy communities to be responsible for enabling the participation of underrepresented groups. However, with nine respondents, the number of energy communities being aware of energy poverty and vulnerability in the local community is considerably lower. Likewise, 28 (25%) of energy communities address underrepresented groups and reported to be aware of their underrepresentation. The majority, however, is not concerned with addressing these groups or finding new ways to engage with different social groups. Therefore, awareness of different social groups' underrepresentation is limited. But also, among energy communities claiming to address such groups, the understanding for the restricting living conditions varies. Most prominent is the statement of some energy communities that a minimum financial contribution ranging from 250 to 3000 Euro is low enough to facilitate all social groups' participation. Such examples fail to recognise the extreme financial precarity often experienced by energy-vulnerable households. One explanation could be linked to decision-making: all energy communities reported that members control the organisation, and with that, the decisions linked to addressing underrepresented groups. Here, a homogenous, male membership base characterised by high income and education levels [23, 25] might not be aware of local energy vulnerability, which is, after all, a live experience far from its daily reality. Finally, the need to focus on the core business activities reflected in the primary organisational purpose, that is "promoting renewable energy" (Table 8) and a lack of resources hinders energy communities to include energy vulnerability on their agenda. Table 13 summarises the findings with respect to energy communities' contribution to recognitional justice.

Summing up, energy communities have a considerable potential to enhance justice in the German energy transition. At the same time, this potential has not yet been

sufficiently exploited. Currently, energy communities that spend time and resources reaching underrepresented and vulnerable groups enhance justice in the energy transition but do not gain advantages from that, they do it as a form of philanthropy. As long as competition shapes the energy market and energy policy fails to provide an enabling framework to support energy communities in reaching out to low-income and energy-vulnerable households, as stipulated by RED II, energy communities face considerable limitations to engage in social actions.

Policy recommendations

Transposing RED II is not a choice but a legal obligation. The European legislator requires member states to provide details on transposing RED II into national legislation in the national energy and climate plans. REScoop.eu tracks RED II transposition on energy communities [69]. So far, Germany has not provided a specific law on energy communities, nor does it offer enabling conditions such as reduced bureaucracy, energy sharing or simplified tenant power schemes. Especially, the latter is currently the only instrument designed to grant tenants in (urban) apartment buildings access to RE produced on site. However, due to low financial incentives and high bureaucratic burdens for house owners, tenant power, despite its advantages, fails to empower vulnerable households [70].

Despite the lack of enabling regulation, the federal court of justice highlights that the expansion of onshore wind energy was often not possible due to the outstanding commitment of locally anchored energy communities [71]. The court concludes that energy communities' function in energy transition entails increasing local acceptance of RE projects through engaging and including local communities in the process. It stresses that voting rights should be widely distributed, and a concentration of voting rights in the hands of a few large shareholders should be prevented. Thus, preferential conditions should only apply to locally anchored energy communities that need protection. However, the past attempt to provide

preferential conditions for locally anchored energy communities failed. Commercial project developers founded organisations officially meeting the criteria of citizen energy communities. They thus, benefitted from preferential conditions and won the public tenders. These organisations, however, were not what the EEG defined as a locally anchored energy community, as especially the requirements for local members' control over the organisation were not fulfilled [71].

This experience illustrates the need to link additional enabling conditions with a clear taxonomy for energy communities. Both EU directives (RED II & IEMD) and national directives (EEG) provide taxonomy features (see "Introduction"). As Palacios et al. reported, more attention must be paid to the member structure to exclude large investors or minimise the number of eligible projects [72] in order to support non-financial objectives. In addition, measures are required to promote regional benefits from project ownership, e.g., direct community compensation for the lost property value associated with the realisation of the project [72]. However, these debates solely focus on organisational characteristics. While the federal court of justice highlights energy communities' impact on public acceptance, social impact-oriented features are as important as organisational characteristics. The latest EEG revision (to be in effect starting 2023) addresses previous regulatory shortcomings and the resulting disadvantages for energy communities [73]. Most importantly, it proposes new membership requirements to guarantee that energy communities remain locally embedded; reduces bureaucracy, e.g., through exempting energy communities from the tendering process; provides funds for the initialising process of new energy community projects; increases the remuneration of PV and wind turbines and tenant power model subsidies. However, as discussed above, merely because an energy community has local members does not mean that it represents the interests of all local citizens. To prevent an already privileged group (male and high income) from getting access to preferential treatment initially aimed at recognising the diversity of local interests in the energy transition, a taxonomy must reflect 'local diversity' in the locally anchored energy community. Thus, access to preferential treatment should be linked to energy communities' social impact.

Frameworks recognising the social welfare added by an organisation already exist. For example, the concept economy for the common good (www.ecogood.org) uses social and ecological indicators in addition to financial indicators to account for and rank the social welfare added by an organisation. Organisations receive tax incentives when they engage in social and environment friendly business practices. For instance, energy

communities offering discounted membership fees or financing options for vulnerable groups get support for their inclusive action. Energy communities that score high on a social welfare ranking would gain access to an enabling framework that includes tax benefits and access to subsidies to finance inclusive action. Energy providers ranking low on social welfare would carry a higher tax burden. The extra tax revenues could fund grants for socially engaged energy production. Consequently, engaging in social and ecological business practices becomes an economic advantage—an incentive for energy communities to engage in social actions.

In this light, the social entrepreneurship federation promotes similar ideas in Germany. Given that energy communities apply business solutions to increase RE and drive social acceptance by increasing citizen participation, they are increasingly concerned with social businesses driving social innovation and change [5, 74]. To support energy communities as social businesses in generating social welfare, this goal must also be reflected in reporting processes. For instance, social and sustainable impact reports according to the SDGs could be mandatory for all businesses applying for public funding including enabling policy frameworks for citizen energy communities. In consequence, energy communities reporting on their impact achieving SDG 7 'affordable and clean energy' would gain support doing so.

Conclusion

Energy communities are expected to contribute to a just energy transition. In contrast to commercial players, their purpose is not limited to profit-making but to provide social, ecological, and economic community benefits. The federal court of justice confirms these aspects in a recent ruling highlighting energy communities' role in increasing local acceptance for renewable energy.

Energy communities' contribution to energy justice and democracy mainly consists of making energy community benefits accessible to different social groups. They thus contribute to SDG 7 'affordable and clean energy'. However, the presented data about 113 German energy communities shows that only a minority increases access to energy community benefits to underrepresented and vulnerable groups—the main barriers for inclusive action being unawareness, limited resources, and a lack of regulatory support.

As stipulated by the European legislator, an enabling framework must support energy communities in enhancing equity and justice in the energy transition. A clear taxonomy must distinguish energy communities engaging in social action from those that do not and offer incentives to realise the expected social benefits. Additional research is necessary to understand the member

structure of German energy communities and whether diversity among members drives inclusive action.

In addition, little attention has been paid to investigating energy communities' customers. Finally, it is essential to note that the welfare state remains responsible for overcoming energy-related vulnerabilities and should not shift responsibility from social policy to local energy communities. Moreover, as long as the German legislator refrains from defining energy poverty, it will be challenging to create enabling conditions to support energy communities' involvement in mitigating energy poverty.

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FH contributed to the research idea and conception; contributed to the data collection and analysis; contributed to the writing of the manuscript; revised the manuscript. RG: contributed to the conception. All authors read and approved the final manuscript.

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Declarations

Ethics approval and consent to participate

All participants of the survey and of the interviewed were informed about the project and took part in the study voluntarily. They provided consent to participate in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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