



# Evidence behind the narrative: Critically reviewing the social impact of energy communities in Europe

Mona Biel<sup>a,\*</sup>, Celina Kacperski<sup>a,b</sup>, Florian Kutzner<sup>a</sup>, Sonja Klingert<sup>c</sup>

<sup>a</sup> Seeburg Castle University, Austria

<sup>b</sup> University of Mannheim, Germany

<sup>c</sup> University of Stuttgart, Germany

## ARTICLE INFO

### Keywords:

Energy community  
Community empowerment  
Social capital  
Energy democracy  
Energy justice

## ABSTRACT

Energy Communities are playing an ever greater role in the European renewable energy transition. As an instrument for citizen-led transformation, they are associated not only with economic and environmental, but also with social benefits. However, it is unclear whether Energy Communities in Europe deliver on the positive social impact they promise. In this paper, we analyze the conceptual background of the social impact associated with Energy Communities and clarify the underlying constructs of community empowerment, social capital, energy democracy and energy justice. We conduct a systematic literature review and develop an overview of studies which measured social impact. Through classifying evidence along methods and constructs measured in an evidence gap map, we demonstrate where rigorous evidence is missing: from quantitative and experimental studies, and longitudinal and counterfactual designs, which should guide future research. We conclude with recommendations for both research and policy to promote the collection of robust evidence on the social impact of Energy Communities in Europe.

## 1. Introduction

Energy produced from fossil fuels is one of the most relevant drivers of climate change. To meet the targets of the Paris Climate Agreement, the shift towards renewable energy sources plays a central role, which is acknowledged in both the revised Renewable Energy Directive [1] and the recast of the Electricity Market Directive [2]. To this end, the European Commission (EU) considers the upscaling of community energy actions in Europe as central. Diverse community energy actions usually refer to the process of involving community members in decision-making about energy production, consumption, and the distribution of associated benefits [3–5]. These actions are often seen “as a major force and at the center of the social movements in tackling future energy and climate change challenges” (p.95) [6].

The Renewable Energy Directive (REDII) and the recast of the Electricity Market Directive (EMD) provide a legal framework for two variants of community energy actions, ‘Citizen Energy Communities’ (CECs) and ‘Renewable Energy Communities’ (RECs) [7], henceforth called Energy Communities (ECs). These concrete variants of ECs come with narratives of environmental, economic and social benefits to communities [8]. Yet, research on ECs has either concentrated on how to

successfully start and run community energy actions, or on benefits in terms of environmental or economic impacts [9]. In contrast, potential social benefits seem to be under-researched [9–11].

This paper will therefore focus on the social impact of ECs in Europe. First, we will conceptually explore the commonly assumed social impacts and their underlying constructs. Building on this, we review the existing literature on social impact of ECs to give a systematic overview on amount and type of evidence. Finally, recommendations for future research as well as for policy will be derived.

### 1.1. Definition of ECs

ECs within this work will include all different forms which are reflected through either ‘Citizen Energy Communities’ (CECs) as defined in Article 2 (11) of the EMD: Directive (EU) 2019/944 on common rules for the internal market for electricity and amending Directive 2012/27/EU [2] or ‘Renewable Energy Communities’ (RECs) as defined in Article 2 (16) of the REDII Directive (EU) 2018/2001 [1] on the promotion of the use of energy from renewable sources. The definitions of both are given in Table 1. Such entities can be implemented in different ways, as for example through energy cooperatives or renewable energy

\* Corresponding author.

E-mail address: [mona.bielig@uni-seeburg.at](mailto:mona.bielig@uni-seeburg.at) (M. Bielig).

<https://doi.org/10.1016/j.erss.2022.102859>

Received 2 May 2022; Received in revised form 26 October 2022; Accepted 27 October 2022

Available online 10 November 2022

2214-6296/© 2022 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC license (<http://creativecommons.org/licenses/by-nc/4.0/>).

**Table 1**  
Definition of RECs and CECs as in [1,2].

	Renewable Energy Community (REC)	Citizen Energy Community (CEC)
Means a legal entity...	<p>(a) Which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects that are owned and developed by that legal entity;</p> <p>(b) The shareholders or members of which are natural persons, SMEs or local authorities, including municipalities;</p> <p>(c) The primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits</p>	<p>(a) Is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, including municipalities, or small enterprises;</p> <p>(b) Has for its primary purpose to provide environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits; and</p> <p>(c) May engage in generation, including from renewable sources, distribution, supply, consumption, aggregation, energy storage, energy efficiency services or charging services for electric vehicles or provide other energy services to its members or shareholders;</p>

initiatives in communities.

The main properties of ECs listed in these definitions also reflect the understanding of the concept in literature: ECs are characterized by their purposes, their way of organization, and their activity types [10]. They can be distinguished by their voluntary participation for shared goals related to energy [11] and to the needs of the community [6]. Since ECs in Europe are the main subject of our research, we include all studies which reflect the characteristics of the directive definitions [1,2]. That is, organizations have to be at least partly community or citizens owned, focusing on renewable energy, enabling some form of community citizens' participation as a specific form of governance, and aiming to generate benefits beyond merely financial profit for the respective community [7] to be classified as ECs within our review.

### 1.2. ECs' social impact narratives

Active participation of citizens in community projects is commonly assumed to yield a multitude of positive outcomes for the community, as well as for individuals within the community. The same is assumed to hold for the special case of ECs [12], which can be considered grassroots innovations towards a more sustainable energy system [4], and as a form of social innovation for civil society engagement [13].

Correspondingly, social impacts of ECs often play a central role in the narratives outlining positive impacts: ECs are expected to strengthen citizens' participation in energy matters [5,14], to raise acceptance for renewable energy transition [15], and to have social benefits on community and individual level: "Energy communities are a type of social innovation that can promote more socially fair models of energy prosumership. They enhance citizens' democratic decision-making and control over renewable energy, which is placed into the hands of communities and people." [3] (p. 33). Through participatory approaches and the active role of citizens, ECs are expected to build social consensus [16], to strengthen energy justice [17], and energy democracy [3,18]. As downstream consequences, ECs are assumed to lead to a higher acceptance of renewable energy in the whole of society [15], and to a change in social norms towards energy, an increase in social cohesion [3], social capital, and community empowerment [19,20]. In sum, these

social benefits represent a multifaceted social transformation of society [3,13].

Despite these expected social benefits, there is a lack of evidence as to whether ECs effectively do come with the social impact benefits they are associated with [9,11,21]. Often, social benefits are considered inherent to the implementation of a project as a 'community'. This intuitive assumption that ECs have positive social impact is increasingly criticized as a 'romanticized narrative' [22]. Creamer et al. [23] conclude that "there has been a broad tendency – in academia as well as policy and practice – towards an uncritical assumption that EC projects will inevitably lead to positive outcomes for the communities in which they are located (in addition to a material contribution to renewable energy generation capacity)." (p. 10).

In part, the heterogeneity of ECs poses an obstacle to evaluating their social benefit, as some are collective actions, which are often carried out without the intention to promote community benefits [5,24]. Yet, the more important obstacle seems to be the lack of a coherent conceptual definition of social benefits in the context of communal energy actions, including respective measurement methods [25]. As compared to economic, environmental or technological impacts of ECs [10], some scholars suggest that social impact on communities is inherently difficult to quantify [25,26]. Nevertheless, several approaches to capture social impact do exist. The goal of the current paper is to provide an overview of this literature of social impact, to classify the evidence alongside the methodology used, and to help counteract the previous tendency of projects and ECs to focus on 'getting on and doing' rather than evaluating, when it comes to social impact [27].

To achieve this goal, we will first clarify the definition of social impact of ECs as understood within this work. Building on this, we conduct a systematic literature review that provides an overview of the existing evidence on social impact of ECs. This results in a systematic overview of literature along methods and constructs of social impact measured. Through visualizing the current state of research in an evidence gap map, we identify research gaps and highlight the need for more robust quantitative evidence. We then discuss further implications and recommendations.

## 2. Social impact of ECs

In a first step, we define social impact in the context of energy communities. The integration of four recurring categories of social impact expected by ECs will be discussed. We will then propose measurable constructs to reflect these categories, as some have argued that, compared to economic and ecologic benefits, social benefits are harder to capture [25,26] and lack conceptual clarity [28].

While there not an agreed upon definition of the concept of social impact [25], the idea of the broader concept often builds on Vanclay et al.'s work about social impact [29–31]. The definition of social impact concentrates on both individual and communal level [31] and goes beyond purely economic benefits for communities [9]. Social impact refers to broader social consequences rather than immediate effects [23]: it concerns the direct or indirect affective change in individuals or a community from a perceptual or physical perspective [9,32] associated with social value creation [25]. Following the above definition, ECs are thus supposed to create social impact, as they should deliver benefits to their community in economic, ecological, and social terms. Existing reviews of benefits of ECs ([3,9,13,15,17,18,23], c.f. Table 2)

**Table 2**  
Recurring categories of social impact of ECs.

Social impact of ECs	Source
Energy justice	[3,13,17,23]
Energy democracy	[3,13,18,23]
Community empowerment	[3,9,15]
Social capital	[9,13,15]

consistently discuss four categories of social impact: energy justice, energy democracy, community empowerment and social capital. Yet, across these four categories, there is a lack of conceptual clarity [28], which complicates measurement of, and resulting conclusions for social impact.

The following section will define these categories and identify overlaps. We will point out recurrent constructs in their operationalization, which can then be used to integrate the broader concepts. This integration adds value because by identifying overlaps in operationalization, conclusions can be drawn at a broader level. The identification of concrete constructs serves to better classify the findings of our review.

As the presented categories each have an impressive string of literature attached, we do not claim our definitions to be exhaustive. Rather, we will derive a list of concrete constructs for each category based on the definitions mentioned beforehand: the selected constructs aim to represent the described categories as comprehensively as possible, and serve as basis for our overarching concept of social impact.

### 2.1. Energy justice

The definition of energy justice builds on the concept of social justice in the context of the global energy system: thus, all forms of consequences of the energy system, positive and negative, should be distributed equitably throughout society. This includes access to modern energy systems, representative and collaborative decision-making processes as well as explicit consideration of marginalized groups [33,34]. When assessing and conceptualizing energy justice, three tenets are differentiated in research: distributional, procedural and recognitional energy justice [33,34]. In a conceptual review which explores the key dimensions of energy justice, Jenkins et al. [34] give an overview on how these tenets are defined: distributional justice refers to the distribution of benefits and burdens of energy systems on all members of society, e.g. the physical siting of energy infrastructure as a potential burden. This also includes the affordable access to modern energy, skill development or job creation. Procedural justice is conceptualized as equality and representativeness within decision-making processes, which enable non-discriminatory and inclusive access to participation. Recognitional justice refers to an equal recognition of society members, particularly taking into account marginalized social groups in recognition processes [34]. Further literature extends procedural justice to transparency and fairness in decision-making processes in the context of participatory approaches, and distributional justice to include the perception of fairness in the distribution of costs and benefits among the different actors, as e.g. energy access, infrastructure siting or job creation [17,35,36]. Recognitional energy justice refers to the needs of marginalized groups and their diverse potential to experience energy injustice [17]. Further research on the recognitional energy justice perspective therefore adds the level of knowledge about vulnerable and energy-poor households, the existing engagement with them, and to what extent participation in ECs is made possible [8].

Energy justice is expected to strengthen participation, and foster resilience and democratic principles within the communities [17]. By integrating vulnerable consumers in ECs, energy justice can also refer to the reduction of energy poverty, which should be made possible through possible tax incentives, exemptions from levies or directly tangible benefits in the form of lower energy costs and additional revenues [8].

To conceptualize procedural energy justice, we will use the construct of *participatory governance* [8,17,22] which describes the presence of democratic principles in the decision-making of ECs, and thus the possibility of participation in decision-making processes and *diversity & inclusion: equality in access* to ECs, their resources and participation [34,36]. For distributional justice, we use the constructs *creation of jobs and employment* [17], the *reduction of energy poverty*, meaning an affordable access to modern energy for all [8,34] and *fairness in siting of infrastructure* [34,36] to overall reflect shapes of fairness in distribution of benefits and burdens. As construct of recognitional justice, we focus

on the *recognition of marginalized groups* [8,34] referring to both knowledge about and engagement with them.

### 2.2. Energy democracy

There is no generally accepted definition of energy democracy, and the literature is too fragmented for a clear definition [37]. Rather, it is an 'umbrella term' [38], summarizing different demands for more democratic processes in renewable energy contexts. Energy democracy refers to participation, the quality of access hereto, change in power structures and ways of civic ownership: it is often considered a component of energy justice [39], through reflecting the procedural justice side of energy politics and energy justice [22]. Justice in the context of energy democracy mostly refers to the opportunity for equal access [18,40], comprising also inclusiveness, transparency and information access [39]. Better access for vulnerable individuals or communities regardless of gender or socio-economic status should be established [41].

The concept of energy democracy also reflects the active role of citizens through participatory governance [42], thereby increasing participation in decision making [39,40]. This should in the long run strengthen the political power of citizens and create alternatives to existing power structures [18,40]. Community members should not only be passive recipients of energy policy, but rather active stakeholders in order to increase their influence in energy policy [39]. Furthermore, energy democracy aims for a reevaluation of ownership: energy production and supply should be cooperatively in the hands of community and civic collectives [38,39], leading to a greater control of energy related resources [40].

Some constructs of energy democracy correspond with these already identified for energy justice, such as *equality in access: diversity and inclusion* [18,39] and *participatory governance* [37,39]. Additionally, to conceptualize energy democracy, we consider *change in power structures* [18,42], *shared ownership* [39,40,43] of energy infrastructure and *active political citizenship* [18,40] to reflect stronger political involvement.

### 2.3. Community empowerment

Community empowerment refers to the enhancement of community resources, including increased access to resources [8] through the development of community capacity [9]. Resources include material, social-organizational or knowledge resources [44,45]. Especially the development of knowledge resources and skills regarding energy-related topics mark a relevant component of empowerment [9,46], which could also foster participation and improve access for marginalized groups [8]. Empowerment is furthermore associated with increased political power and participation [24], social cohesion [19,45] and improved community confidence [19,46]. Coy et al. [19] developed a framework to better understand the process, including enabling factors and outcomes closely interlinked with empowerment. Outcomes mentioned are participation in decision making, the capacity to execute decisions, and a possible change in existing power structures, represented in a ladder ranging from participation, over agency and autonomy, towards a power-shift. This principle of power shifting is conceptualized in detail through Brisbois et al. [47] examining the instrumental, structural and discursive dimensions of change in power structures within community energy related policies.

Building on the literature cited, we conceptualize empowerment through the constructs of *knowledge development* [25,44,45] particularly in energy related issues, *skill development* [9,15,25] for e.g. socio-organizational, energy related or political skills, *social cohesion* [19,45] and *community confidence* [19,27]. Same as for energy justice and energy democracy, empowerment is reflected through the constructs *participatory governance*, *change in power structures* [19,47] and *shared ownership* [19,47].

## 2.4. Social capital

Strongly overlapping with community empowerment is the concept of social capital [9,19]. Social capital is closely interlinked with the access to and use of resources: social capital, and the social relational structures that accompany it, should lead to usable resources for the individual and in particular, the embedding and access of these resources through social connections [48,49]. Early literature distinguishes between bonding and bridging social capital: while bonding social capital refers to processes within a group or community, bridging social capital describes capital between groups or communities [50]. The focus for ECs is particularly on bonding capital, which describes the formation of relationships within a group, i.e. refers to the social cohesion and network of the community [27,51]. In a review on social capital and the energy transition, Giacobelli [52] describes bonding capital as building on a common sense of identity and confidence. The author finds that social capital is mostly reflected through social network ties and trust. In literature of social capital in ECs, social capital is expected to promote common values and create a shared identity, whereby stronger internal networks and community trust are seen as both prerequisites and outcomes of social capital [9].

This leads us to the conceptualization of social capital through *social cohesion* [48,49] and *community confidence* [52], overlapping with the constructs of community empowerment. Additionally, constructs of social capital include *social network* [48,50,52], which describes the formation of relationships within a community, *social identification with community* [51,52] as well as *community trust* [9,49,52].

## 2.5. Integration of concepts

In the preceding discussion of different social impact concepts, many conceptual overlaps have been identified. Fig. 1 depicts a visualization of these overlaps with the aim to remove redundancies and reach conceptual clarity of social impact. By breaking down the overarching categories into concrete constructs, we aim for a holistic understanding of the social impact concept, and a better overall conclusion about the social impact of ECs can be drawn. This enables a more stringent classification of constructs reported in the studied articles as well as related methods in the subsequent overview of literature on social impact.

Based on these constructs, the research question we focus on is: Which aspects of social impact have been studies and what is the evidence strength for ECs creating social impact?

## 3. Method

To answer these research questions, a systematic literature review was conducted that classified the resulting evidence for social impacts of ECs. In the following, we will first clarify scope, criteria and method of our literature review and then give an overview over the research that includes evaluations and measurements of social impact. The systematic overview of the evidence is structured by social impact measured, type of evidence and measurement method.

### 3.1. Literature review

Our systematic review focuses on literature in which social impact is measured as an outcome, reflected as energy justice, energy democracy, community empowerment and social capital. All details of our systematic search process, including our criteria for selection, are depicted in Fig. 2. Both graphic and method are building on the PRISMA approach [53].

We conducted the literature search in Google Scholar and ScienceDirect. To keep the scope of the literature review focused and manageable, only literature in the English language, published in peer-reviewed journals was included.<sup>1</sup> For literature search, we combined ‘energy community’ with ‘social impact’ and its related concepts in a search string of (“energy community” AND “social impact” OR “energy justice” OR “energy democracy” OR “social capital” OR “community empowerment”). From a total of 7031 results ( $n_{\text{Google Scholar}} = 2420$ ,  $n_{\text{ScienceDirect}} = 4611$ ), we first visually screened title and publication details for peer-reviewed articles which suggested empirical relevance about energy communities and their social impact. This led us to  $n = 121$  studies, which were screened using more in-depth criteria (see below) and then sorted. Building on this, we furthermore sighted references from four highly relevant reviews of impacts of ECs identified in the first step [9,10,15,17], extracting those summarized under social impact ( $n = 68$ ), which were again screened in-depth and sorted.

For geographical scope, only studies within Europe were considered. All studies which were included had to reflect a form of EC as defined by the European Commission (see Table 1). Particular care was taken to include only studies which explicitly addressed outcomes of ECs in terms of a social impact (rather than motivations or conceptual descriptions) and which included a form of concrete measurement.

We analyzed the included studies ( $N = 19$ ) along their results, their methodology employed, geographical scope and sample sizes. Studies were selected both to give a descriptive overview over research results, and develop an evidence gap map for the four social impact concepts. The gap map methodology aims to structure evidence along the social impact concepts and categorize type of evidence for all studies. The type of evidence is differentiated through methodology employed in the respective study, which builds on the dominant research methods within energy social science, identified by Sovacool et al. [55]. Following their review, most research designs in the field employ one of the following seven categories or types of combination for data gathering or analysis, depicted in Table 3.

## 4. Results

We summarize the evidence found along the higher-level social impact concepts which are explicitly assigned by the title or content of the paper itself, which in most cases also matched the search term of the literature search. If no specific designation was made as to which concept of social impact was examined, we assigned the literature along the constructs reported. Afterwards, we give a systematic overview over the studies, which focuses on the constructs and method of assessing social impact to demonstrate possible gaps in research. This allows for broader conclusions about social impact, as the identified overlaps of constructs (as demonstrated in Fig. 1) help to draw conclusions about more than one concept of social impact. Additionally, we provide an evidence gap map of the reviewed evidence to visualize the state of research and identify gaps particularly in used methodologies, building on the research method classification depicted in Table 3.

### 4.1. Energy justice

With focus on the community energy sector in Wales, Forman [56] examined energy justice as an outcome of procedural and distributional justice. Through semi-structured interviews and participatory workshops with stakeholders from 28 energy community projects, the author challenged whether community energy was able to strengthen energy justice in terms of shared local ownership and participation. Analysis revealed the positive outcomes particularly in distributional energy

<sup>1</sup> We made an exception for two cases ([27,54]), as these sources from grey literature have been cited as particularly important examples of measuring social impact in ECs [9].



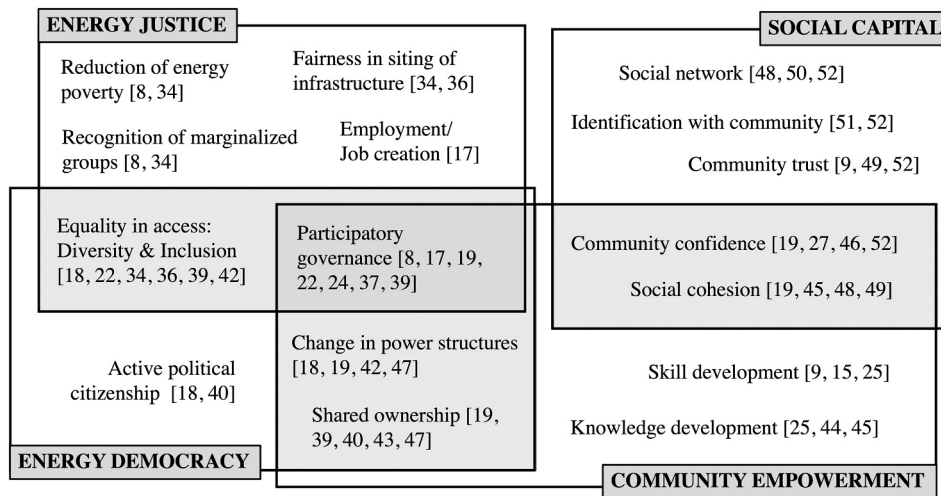


Fig. 1. Visualization of the proposed overlaps in constructs of social impact.

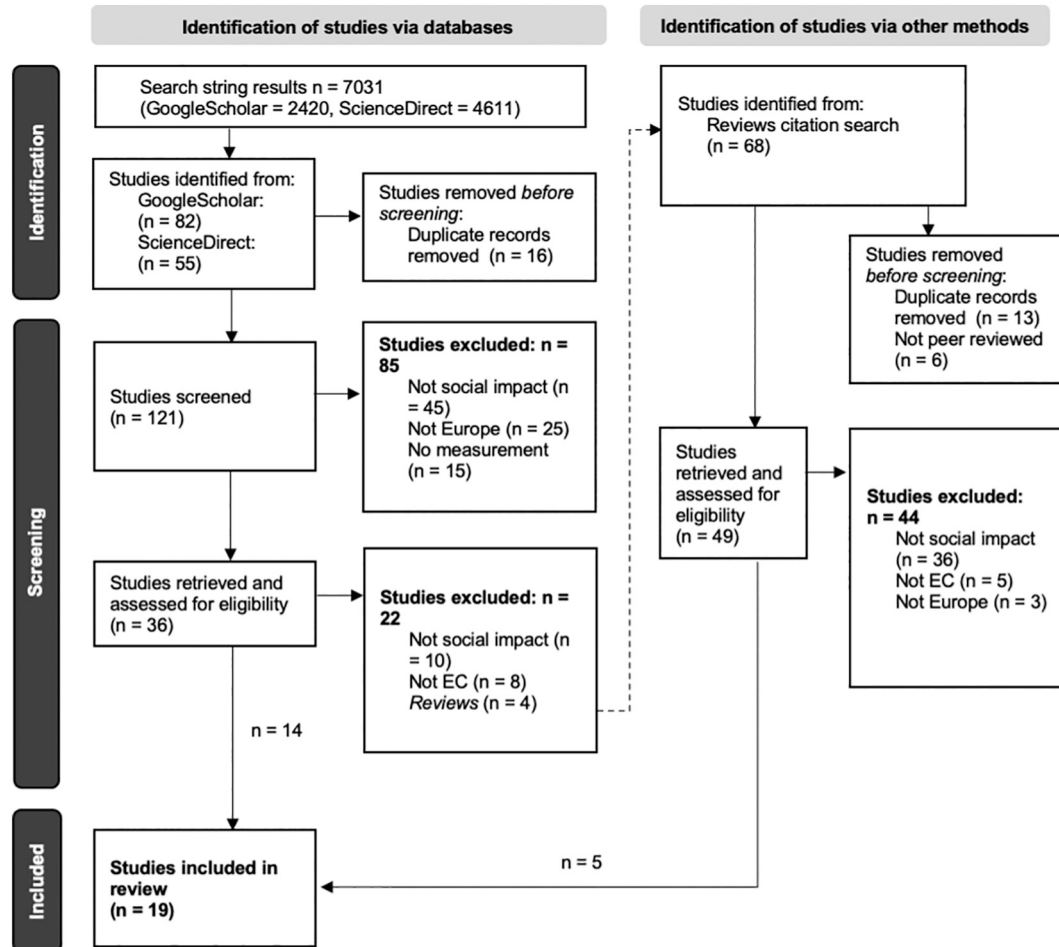


Fig. 2. Flow diagram of systematic literature review, including criteria for exclusion. Based on PRISMA [53].

justice through local communal benefits such as development of employment and support of community activities and groups. On the other hand, there was still more potential with regards to affordability of energy. For procedural justice, the results demonstrated tensions between a broader participatory governance through citizens on the one hand and a threat of loss of control from people leading the projects on the other. Furthermore, equality in access to participation and

information was undermined in some cases. Similar results were found by Lacey-Barnacle [57], who used participant observation data and ten in-depth interviews to examine energy justice in a UK case study of Bristol's civic energy network. Next to procedural and distributional justice, the author took recognitional justice and restorative justice into account. While the former shed light on the acknowledgement of marginalized groups, the latter described remediation as reaction to

**Table 3**  
Research methods of energy social science, based and adapted from [55].

Methodology	Short description
Experiments and quasi-experiments	Potential testing of causal effects, through randomized assignment of participants and control of other influencing factors. Also includes controlled before-after studies and various types of matched comparisons, as well as quasi-experimental studies in the form of 'natural' experiments in pre-existing groupings.
Literature reviews	Compilation and integration of existing research to identify state of the art knowledge, including different types as meta-analysis, systematic review and narrative review
Surveys and data collection	Data collection through survey or questionnaire in sample to gather information from a target group, used for descriptive statistics and/or correlative tests between variables
Data analysis and statistics	Statistical testing to examine quantitative relations either through analysis of new data or analysis of secondary data
Quantitative energy models	Based on simplified mathematical models which should represent and forecast aspects of energy systems
Qualitative research	Typically explorative, can include different methods such as interviews, focus groups or observations to gain more in-depth perspectives
Case studies and cross-case comparisons	Deep analysis of specific cases and contextual conditions of these cases, which can include both quantitative and qualitative in-depth assessment of single or multiple cases

Note that we will exclude 'Quantitative Energy Models', as this does not include any form of social impact measurement. We also excluded 'Literature reviews'; these are reflected through the studies screened in our systematic procedure.

perceived energy injustice. One of the main injustices identified in the interviews related to the fairness in infrastructure siting, as the first low carbon energy infrastructure was deployed close to a marginalized community area. Critically, this was related to lack of consultation, participation and recognition of the local community, which led to reinforcement of injustice in the first step. To counteract these developments, the second low carbon energy infrastructure was used as a chance to demonstrate restorative justice for the community: These included a higher participatory governance and a more equal access to information and decision-making, also related to infrastructure siting. Through these actions, restoration of community relations was reached.

With a lens on two successful community energy transitions, Munda et al. [58] examined the perceived energy (in-)justices of the successfully enclosed energy transitions in Samsø (Denmark) and Feldheim (Germany). They differentiated procedural justice from a process- and distributional justice from an outcome-perspective. Through semi-structured interviews and document analysis, both procedural and distributional justice indicators were identified in both cases. For procedural justice, this included consultation and information sharing (Samsø) and high involvement in decision making, also related to infrastructure siting (Feldheim). Distributional justice was reflected through financial benefits through shared ownership and provision of lower energy prices (Samsø) as well as long-term energy price security, job creation and increased social cohesion (Feldheim).

Taking into account socio-economic benefits, Okkonen and Lehtonen [59] estimated the local impacts of community owned wind power in Scotland through employment and income statistics. Their analysis, using data from the Scottish government, showed positive impact during the construction phase of community wind power projects in terms of increase of the regional economy and job creation. Throughout the operation phase, this impact was found to be considerably lower. Similar results were found in UK case studies examined by Cass et al. [60]: they report local contracting and provision of employment as a standard policy in community energy projects.

Finally, in many cases, ECs did not include marginalized groups or

energy poor households: through survey replies from 71 ECs, Hanke et al. [22] assessed member diversity, access to decision making and recognition of marginalized groups. Critically, in terms of gender, in 42 cases of ECs, only 16.2 % members were female, and within 696 ECs in Germany, 83.3 % of project boards were exclusively occupied by male community members [22]. Furthermore, the majority of ECs reported to not address underrepresented groups (58 %) or energy poverty (76 %). When assessing citizen participation in renewable energy plants owned by citizens, Fraune [61] found that on average, ownership rate, investment volume and presence in leadership positions were all significantly lower for female participants than for male participants.

In summary, both qualitative and quantitative studies on energy justice could be found, but the direction of the results was not purely positive. In fact, while some of the studies demonstrated greater participation in decision-making, and the potential for job creation and reduction of energy poverty, others also showed perceived injustice in terms of distribution of benefits and burdens. Further, there is a variety of evidence that the goals of equal access to participation and specific inclusion of energy poor and vulnerable households were often not met.

#### 4.2. Energy democracy

Focusing on participatory governance and inclusive equality in access, Radtke [14] used a survey to investigate participation and democratic principles in numerous ECs. Participation and involvement in meetings was reported at 76–89 %, and in the majority of the cases (69 %), decisions made by the initiatives were perceived as democratic. Interestingly, 60 % of included members were unsure whether they wanted more co-determination. The results also showed an uneven representation of different social groups: the majority of participants were male (80 %), of middle-old age (54 % are over 45), and had a higher than average educational status (57 % with university degree). Most participants identified with the energy project and reported feeling a sense of community, i.e. an increased social cohesion. In a more detailed analysis of the same data [62], the authors demonstrated how perception of democracy and positive social impact differed between demographic groups: younger and more educated participants tended to perceive decision-making in ECs as less democratic. Younger academics also disagreed more with the idea that ECs create a sense of community.

Similar results were found by van Veelen [42], conducting in-depth interviews within 15 community energy groups in Scotland. The author found that while participation in decision-making was seen as desirable, in the end often a mixture of different governance forms, e.g. participatory and representative, was used. This was justified by the necessity to have accountable decision-makers, as well as by the impression that community members did not necessarily strive for more participation. In some cases, this semi-participatory approach upheld or strengthened existing hierarchies in communities, indicating that change in power structures and active citizenship could only partly be achieved, or were in some cases only partly desired.

Through problem-centered interviews and participant observation in annual general meetings of 15 ECs in Germany [63], democratic governance principles of ECs along different ways of formality in decision making were examined. The author found that although decision-making was mainly shaped through a democratic process, certain circumstances sometimes led to an overruling of full participatory governance by informal, more top-down driven decision-making. These situations included the presentation of necessary information only within short notice, or with less details than needed. Sometimes, the ECs even demonstrated irregular vote-count or 'shortcuts' in decision-making.

Overall, the studies on energy democracy show that ECs do promote energy democracy due to the underlying democratic principles and shared ownership models, which both form pillars of EC's definition. At the same time, however, a more critical perspective on equality in access and potential difficulties for participatory governance due to

hierarchical and decision-making structures exist. It therefore remains questionable whether ECs really do lead to a change in power structures.

#### 4.3. Community empowerment

Results from qualitative interviews surrounding renewable citizen owned power plants by Schreuer [44] in Austria indicate that processes of empowerment were mobilized throughout the development and scaling up of projects: a replication approach enabled citizens and organizations to use the acquired knowledge, financial resources and developed skill resources to scale up and extend their EC projects. It also fostered participatory governance, and a change in structural resources, reflecting a change in power structures through EC projects.

In a report examining the impact of small scale and community owned hydropower in Wales, Bere et al. [27] explored with a small-scale questionnaire the perceived empowerment and confidence within the communities involved in the project: the majority (64 %) of respondents believed their project would enact positive changes, but only 20–30 % reported increased closeness of community and network, or an improved sense of community spirit. Süsser and Kannen [64] analyzed perceived outcomes of local renewable energy in an Energy community in Germany through document analysis, semi-structured interviews and a household survey. The main reported social outcomes related to a positive impact on social cohesion and collaboration within the community. Additionally, a sense of greater confidence through an enhanced social life and decreased financial threats was reported. Results emphasized an enhanced community pride, and high participation in decision-making.

One of the most rigorous approaches was found in the form of a change mapping method in a case study of a community wind project in Scotland, as a strategy for capturing local impact of ECs [28]. Change mapping methodology was used to assess local impact by (1) establishing a community profile for a comprehensive understanding of the project's context, followed by (2) creating of a project profile to depict which changes were planned and how they would be realized. To demonstrate pathways of change (3), the author used an exploratory survey with community members, in-depth interviews and focus groups within the community wind project. This method uncovered a positive impact on skill and knowledge development, particularly for the project team and board members. Education and training was also provided to the wider community. A transparent and fair participation in decision-making processes counteracted potential negative impacts on social cohesion.

Summarizing, the studies on community empowerment paint a positive picture for ECs: They led to more social cohesion, development of knowledge and skills as well as community confidence. At the same time, however, most studies within this section were related to very specific individual cases, which may limit the generalizability of the results.

#### 4.4. Social capital

One of the most rigorous approaches to measure social capital was found in [51], where the authors assessed the difference in social capital between two forms of renewable energy cooperatives with a survey: they measured trust, social identification and network and compared these between an energy cooperative with mutual benefits versus a cooperative with public benefits.<sup>2</sup> Social capital differed between them: social identification and network were significantly stronger for communities with public benefits. Trust did not differ between the groups. In community energy projects in Scotland, awareness and support as well as a renewed sense of purpose in community were reported by

approximately half the surveyed members ( $N = 52$ ) of different community groups; the majority agreed that the committee of the project learned new skills related to project management and renewable energy issues [54].

Positive social impact for social capital was also reported by Callaghan and Williams [46] based on qualitative interviews, which found an increase in community confidence and an improvement of social networks through community ownership of renewable energy projects, also through the creation of community spaces and more interpersonal meetings.

Examining stakeholder related process- and outcome dimensions in community energy initiatives in seven European regions through structured interviews, Ruggiero et al. [65] found that the initiatives were positively associated with reduction of energy poverty and job creation. Additionally, the authors described a stronger sense of community identity, and an increase in skills particularly for the project leaders. Critically, there were also cases of increased conflict or distrust within projects.

While there is less research specifically on social capital as category of social impact for ECs, overall the studies show a positive tendency: ECs have the potential to strengthen the social network and lead to more community trust and identification. Nevertheless, aspects like skill development are emphasized particularly for project leaders in comparison to the wider community: together with prior results on the reinforcement of existing hierarchies, this has to be considered critical.

#### 4.5. Classification of evidence

In summary, predominantly qualitative research and case studies have been so far employed to assess social benefits of ECs. While results from these studies demonstrate the perceived positive social impact of ECs for knowledge and skills, democratic principles, empowerment of communities and social cohesion or pride, a quantitative assessment beyond small surveys or rigorous evidence, including some form of counterfactual, is rare. Additionally, not all evidence supports the positive slant of EC social impact: in some cases, more involvement and participation, often seen as the basis of social impact, is not necessarily desired by members; and equal access to participation is more myth than reality. ECs instead show a tendency to empower the already empowered [20,44].

The overview in Table 4 summarizes the reviewed evidence on social impact, sorted by year of publication. It contains a classification of the concrete constructs of our social impact definition that we were able to identify in the studies. Additionally, it classifies the research along categories of evidence and sample size. To visualize the state of research and methodology within the integrated categories of social impact, we further provide an evidence gap map in Fig. 3. This helps to demonstrate where (a) research gaps exist, and (b) which methodologies should be expanded in social impact research of ECs.

As the evidence overview and gap map demonstrate, from a methodological perspective, most research in the field of social impact is assessed qualitatively or in the form of case studies, and with restricted sample sizes. It should be critically noted that both case study methodology and qualitative research are often collected within individual cases, making generalization difficult. Also, if quantitative evidence is found, it is correlational, building on onetime surveys and partly on data collection with small samples. Finally, almost no (quasi)-experimental evidence and no longitudinal studies were found. All this restricts the capability to draw causal conclusions.

We find an overrepresentation of studies from Northwestern European countries, as compared to Eastern Europe and Southern Europe. Also, the state of research is more advanced for some constructs of social impact than for others: we find a more frequent assessment of participatory governance and equality in access for EC members, while constructs like community trust or recognition of marginalized groups seem under-researched.

<sup>2</sup> Mutual benefits refer to organizations with a mutuality principle, i.e. focus on benefits only for their own members, while public benefits refer to community organizations, i.e. benefits that go beyond the members [51].

**Table 4**  
Social impact literature overview.

Year	Authors	Geographical scope	Social impact constructs	Methodology	Sample size	Ref. no
2010	Gubbins	Scotland	Knowledge development, skill development, community confidence	Surveys & Data Collection	N = 52 survey participants	[54]
2010	Cass et al.	UK	Employment/job creation, shared ownership	Case Studies	N = 42 interviews N = 10 cases	[60]
2014	Radtke	Germany	Equality in access, shared ownership, participatory governance, active citizenship, identification with community, social cohesion	Surveys & Data Collection	N = 2826 survey participants*	[14]
2014	Callaghan & Williams	Scotland	social network, community confidence	Qualitative Research	N = 21 interviews	[46]
2014	Ruggiero et al.	Scotland, Germany, Finland, N. Ireland, Sweden, Ireland, Norway	Knowledge development, identification with community, employment/job creation	Qualitative Research	N = 41 interviews	[65]
2015	Bere et al.	Wales	Knowledge development, skill development, community confidence, social network, social cohesion	Surveys & Data Collection	N = 25 survey participants	[27]
2015	Fraune	Germany	Equality in access, shared ownership, recognition of marginalized groups	Surveys & Data Collection	N = 71 citizen owned ren. Power plants	[61]
2016	Schreuer	Austria	Knowledge development, skill development, shared ownership	Qualitative Research	N = 14 interviews	[44]
2016	Okkonen & Lehtonen	Scotland	Employment/job creation	Data Analysis & Statistics	N = 11 Community wind projects	[59]
2017	Bauwens & Defourny	Belgium	Community trust, identification with community, social network	Experiments and quasi-experiments	N = 4061 survey participants	[51]
2017	Forman	Wales	Equality in access, participatory governance, employment/job creation	Qualitative Research	N = 51 interviews, 18 workshop participants	[56]
2017	Süsser & Kannen	Germany	Social cohesion, employment / Job creation, community confidence	Case Study	N = 23 interviews, N = 51 survey participants N = 1 case	[64]
2018	Mundaca et al.	Denmark, Germany	Participatory governance, active citizenship, employment/Job creation, reduction of energy poverty, social cohesion, fairness in infrastructure siting	Case Studies	N = 19 interviews N = 2 cases	[58]
2018	van Veelen	Scotland	Participatory governance, active citizenship, shared ownership, change in power structures, equality in access	Qualitative research	N = 39 interviews	[42]
2018	Brummer	Germany	Participatory governance, active citizenship, shared ownership change in power structures	Qualitative research	N = 38 Interviews, 15 observations	[63]
2020	Lacey-Barnacle	UK	Participatory governance, equality in access, fairness in infrastructure siting, recognition of marginalized groups	Case Study	N = 10 interviews N = 1 case	[57]
2020	van der Waal	Scotland	Knowledge development, skill development, social network, social cohesion	Case Study	N = 12 interviews, N = 33 survey participants N = 1 case	[28]
2021	Hanke et al.	Germany, France, Netherlands, Belgium, Portugal, Ireland, Turkey	Participatory governance, equality in access, reduction of energy poverty	Surveys & Data Collection	N = 71 Renewable ECs	[22]
2021	Radtke & Ohlhorst	Germany	Equality in access, participatory governance, active citizenship, identification with community, social cohesion	Surveys & Data Collection	N = 2826 survey participants*	[62]

\* remark: This represents the same data set. Separate analyses with a greater focus on group differences were performed.

Overall, both energy justice and energy democracy as categories of social impact have been more frequently analyzed than community empowerment and social capital. Notably, the evidence gap map demonstrates availability of evidence for social impact, not evidence for positive impact – more research does therefore not necessarily mean a stronger positive conclusion for this particular category. From this perspective, particularly the constructs of energy justice demonstrate mixed results: contradicting positive narratives, ECs did in some cases lead to stronger injustices through siting of infrastructure [57], missing recognition of marginalized groups [22] and a lack of diversity and inclusion in their access [22,61].

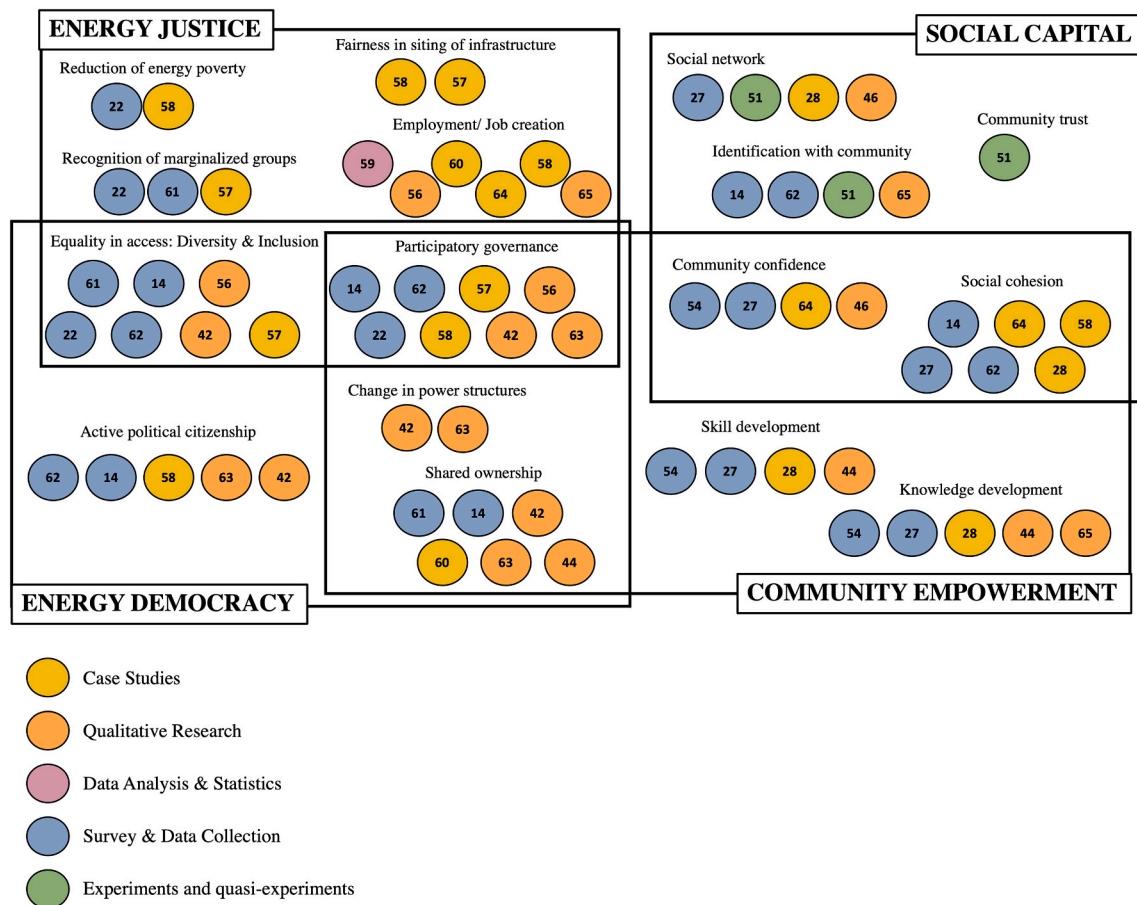
The overview of evidence, together with the evidence gap map, demonstrate the urgent need for (a) evaluating social impact of ECs beyond subjective perceptions in small samples and (b) by using (quasi-) experimental research designs, including counterfactuals, to be able to draw causal conclusions. It requires not only a methodological, but also a stronger geographical variety. Furthermore, as some of the evidence demonstrate potential negative social impact, more evidence is required to examine whether, to what extent and under which conditions ECs do bring the social impact expected of them.

## 5. Discussion

The systematic literature review clearly shows where the literature and evidence for social impact of energy communities falls short in terms of methodology, geographical scope and robust positive effects. The identified gaps in quantitative, specifically longitudinal and (quasi-) experimental evidence, as well as the lack of evidence from the European East and South, show that there is a need for a more comprehensive approach to measurement of social impact. As the narratives of social impact play an important role for the conceptualization of ECs in Europe, it seems necessary to demonstrate this social impact. This would encompass numerous facets, as the conceptualization of the central concepts of social impact shows.

Although approaches for quantifying social impact exist, evidence consists mostly of qualitative measurement and case studies. There are reasons why qualitative methodology is more frequently used in social science research of energy communities: for instance, qualitative methodology can be particularly useful in gaining a deeper understanding of experiences, meanings and processes within social relations that could be reduced through operationalization or quantification





**Fig. 3.** Evidence gap map for the social impact of ECs. Note: availability of evidence for social impact, not evidence for positive impact, is depicted.

[25,55,66]. This goes along with the assumption that social impact is said to have a qualitative nature that is difficult to map through an objective value [25] and that requires an understanding of the process behind the outcomes [66]. Moreover, qualitative research does not require numerical representativeness [66], which can be particularly advantageous in contexts with small samples. However, these points can also be the weakness of qualitative methodologies in capturing the social impact of ECs: due to small sample sizes and individual experiences, generalizability and comparability may be limited [55], and it presents an inductive approach [66], both of which severely limit the capability for drawing causal conclusions.

Still, existing evidence can be used as a starting point for measurements of social impact. Building on Sovacool et al. [55], the use of mixed method designs is recommended. This can integrate different methodological perspectives and overcome the limitation of purely quantitative or purely qualitative methods, which also calls for a more critical perspective with one's own methodology [55,67]. While the evidence gap map clearly shows an existing gap for experimental methods in research of social impact of ECs, one difficulty of this claim lies in the very nature of the issue: ECs exist through voluntary participation, and participation in an EC cannot be randomized in a natural setting. Still, through quasi-experimental designs [55], groups can be compared based on already existing structures. Exemplary methods for quasi-experimental studies for social impact of ECs can be 'difference-in-difference' designs or a non-equivalent control group: i.e. a longitudinal design of two or more groups at two or more points in time, or using a control sample as identical as possible based on observable variables [55]. One could also attempt to build natural experiments by randomly sampling and surveying participants of multiple ECs at different stages of operation, to compare their experiences of social impact of ECs

throughout their life cycles.

More robust methods for measuring the social impact of ECs are particularly important in that the causal assumption that ECs result in a positive social impact also requires evidence of such causality which is usually overlooked. Recently, for example, a spatial data analysis was able to show that areas with higher scores on the European Social Progress Index and Quality of Life Index show a higher occurrence number of ECs [68]. It lacked a discussion of the directionality in a possible causal relation. Causal evidence seems also advisable since our analysis shows that the impacts are not necessarily positive: rather, they can also reinforce existing social inequalities [22,61,62]. Particularly the inclusion of marginalized groups and vulnerable households is a challenge for ECs [8]. For example, most studies on participation show a strong gender bias [14,22,61]. This gender bias is particularly critical as women are more often affected by energy poverty and have reduced access to energy related services or resources [69]. Additionally, most members of ECs are from the socio-economic upper-middle class [57]. If, in line with evidence above, it is board members that benefit most in terms of skill development and knowledge building, the lack of diversity and inclusion within ECs and particularly their project boards can potentially even increase existing social gaps and inequities. Inclusion of vulnerable and energy poor households is often prevented at the individual level, through lack of financial or time resources, or access to information, and through discriminatory structures such as complexity of access options for existing ECs and collective actions [8].

### 5.1. Limitations

We excluded grey literature, such as project reports or policy documents, from our review, as we considered peer review to be a necessary

criterion for rigorous evidence. It is of course possible that further insights might be gained by closely studying this additional section of literature. Secondly, we pre-defined social impact concepts to those we found to be most commonly referenced in prolific previous literature on energy community impacts. This might constrain the results of our review, potentially overlooking lesser researched, less broad, potentially highly impactful concepts. On the other hand, we already find some overlap even across the four selected concepts, so there is a decent chance that any further, narrower concepts would find overlap within the boundaries we defined as well.

Finally, as a general trait of the method of a systematic literature review, it is possible that study selection and exclusion itself was biased due to criteria judgements made by the researchers [55]. We attempt to counteract this by trying to be transparent in the description of our choices and criteria.

### 5.2. Research recommendations

As a conclusion to the evidence reviewed and summarized in our review, we recommend future research to put a stronger focus on rigorous quantitative evidence, including longitudinal and (quasi-) experimental designs. This includes surveying larger sample sizes and the promotion of mixed method approaches to improve on current research of the social impact of ECs. It is such research that allows causal inferences, potentially leading to implementations of ECs that particularly promote social impact. As one example that has been realized in the context of comparing energy usage between members and non-members of energy communities by [70], they used a sample matched in demographic factors that served as a control group.

Current methods (e.g. interviews with highly involved community members) run the risk of sample bias, which can invalidate results: taking into account the impact on the community beyond those highly involved within the project board and management can add actual value [23]. This is crucial for inclusivity and diversity specifically when assessing subjective perceptions of social impact. To encourage quantitative research, a clearer framework to develop and validate measurement tools is required. The operationalization of social impact within this paper can here provide a starting point.

### 5.3. Policy recommendations

As van der Waal [28] already concluded two years ago, “it is unlikely that current government support for CRE will continue just taking the acclaimed social outcomes of CRE as an ‘article of faith’” (p. 2). This demonstrates the need to supply both subjective perceptions and objective evidence for social impact of ECs, not only at the research level, but also at the policy level. Social impact of ECs is anticipated as a benefit of ECs within RED II and EMD by the Commission, so the frameworks that are created must not only assess ECs along their financial and environmental objectives, but also include the social impact.

For research and funding of collective energy projects, clear guidelines should propose demands regarding the measurement and evaluation of social impact, comparable to those for economic or ecologic criteria. This will improve support for ECs with social goals, and can strengthen the agency-beliefs of communities in guiding decisions and mobilizing funding [9].

ECs are often defined by the consequences for sustainability and society that they claim to achieve: policy makers should thus also define ECs by the impact they actually have. For their social role, this requires a non-romanticized definition of ECs and concrete evidence for such assumptions. As Creamer et al. [23] conclude, “Researchers and policy-makers are increasingly well versed in what CRE should mean; looking forward, we argue that it is important to understand what CRE does in practice.” (p. 13).

One of the most crucial points should be the principle of diversity,

and inclusion of marginalized groups and vulnerable households in participation and empowerment, to strengthen the social role of ECs within a just and democratic energy transition [22]. Building on suggestions from Hanke & Lowitzsch [8], incentives could pave the way, financially, i.e. via energy subsidies, access to credit and/or low or no interest loans tied to membership, and educatively, i.e. via coaching and training programs. Incentive structures should also be improved to enhance diversity, for example through tax exemptions for reaching thresholds or access to preferential treatment in administrative procedures. This view is underlined by demanding concrete policies which strengthen stakeholders with lower agency and capabilities in participation [61]. However, in order to evaluate both the necessity and the outcomes of such policies, first, a better evidence base is required to showcase how ECs are delivering their promised social impact.

## 6. Conclusions

Evidence of the social impact of energy communities is still fragmented. The underlying narrative that ECs have an intrinsic social value needs to be reevaluated [9–11]. Within this work, we analyzed concepts of social impact as they have been defined in the academic literature so far within the context of ECs, i.e., energy justice, energy democracy, community empowerment, and social capital. We then clarified their underlying constructs and integrated them. Through a systematic literature review, we structured and classified the existing evidence into an evidence gap map, critically noting that experimental and longitudinal research is almost completely absent in the current research landscape.

The reflection on and provision of measurement constructs that are unified across EC research can overcome certain barriers that stand in the way of an overarching evidence base. But often, it is contextual factors and individual characteristics of projects that make the implementation of impact evaluation via quasi-experimental or longitudinal designs difficult. For example, ECs rely heavily on volunteer work and volunteer participation; and time and financial constraints are common across projects attempting intervention studies. This makes it difficult to demand stringent evaluation standards. Policies and regulations should here aid in ascertaining that projects which receive research grants are held to the highest standards and that social sciences are provided with the means to carry out meaningful evaluations that provide both objective and subjective insights. Until then, positive social impact of ECs can only be assumed.

### Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Mona Bielig reports financial support was provided by European Commission. Celina Kacperski reports financial support was provided by European Commission. Sonja Klingert reports financial support was provided by European Commission. Florian Kutzner reports financial support was provided by European Commission.

### Data availability

No data was used for the research described in the article.

### Acknowledgement

Financial support by the European Union Horizon 2020 research and innovation programme is gratefully acknowledged (Project RENergetic, grant N957845; Project DECIDE, grant N894255). We would further like to thank the Editor and Reviewers for taking the time and effort necessary to review the manuscript. We appreciate all comments and suggestions, which were very valuable in helping us to improve the manuscript.

## References

- [1] European Parliament. DIRECTIVE (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the Promotion of the Use of Energy from Renewable Sources (Recast). n.d.
- [2] European Parliament. Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on Common Rules for the Internal Market for Electricity and Amending Directive 2012/27/EU. n.d.
- [3] A. Caramizaru, A. Uihlein, European Commission, Joint Research Centre, *Energy communities: an overview of energy and social innovation*, 2020.
- [4] G. Seyfang, J.J. Park, A. Smith, A thousand flowers blooming? An examination of community energy in the UK, *Energy Policy* 61 (2013) 977–989, <https://doi.org/10.1016/j.enpol.2013.06.030>.
- [5] G. Walker, P. Devine-Wright, *Community renewable energy: what should it mean?* *Energy Policy* 4 (2008).
- [6] E.M. Gui, I. MacGill, Typology of future clean energy communities: an exploratory structure, opportunities, and challenges, *Energy Res. Soc. Sci.* 35 (2018) 94–107, <https://doi.org/10.1016/j.erss.2017.10.019>.
- [7] D. Frieden, A. Tuerk, A.R. Antunes, V. Athanasios, A.-G. Chronis, S. d'Herbemont, et al., Are we on the right track? Collective self-consumption and energy communities in the European Union, *Sustainability* 13 (2021) 12494, <https://doi.org/10.3390/su132212494>.
- [8] F. Hanke, J. Lowitzsch, Empowering vulnerable consumers to join renewable energy communities—towards an inclusive design of the clean energy package, *Energies* 13 (2020) 1615, <https://doi.org/10.3390/en13071615>.
- [9] A.L. Berka, E. Creamer, Taking stock of the local impacts of community owned renewable energy: a review and research agenda, *Renew. Sust. Energ. Rev.* 82 (2018) 3400–3419, <https://doi.org/10.1016/j.rser.2017.10.050>.
- [10] V.Z. Giorgievski, S. Cundeva, G.E. Georghiou, Social arrangements, technical designs and impacts of energy communities: a review, *Renew. Energy* 169 (2021) 1138–1156, <https://doi.org/10.1016/j.renene.2021.01.078>.
- [11] S. Moroni, V. Alberti, V. Antonucci, A. Bisello, Energy communities in the transition to a low-carbon future: a taxonomical approach and some policy dilemmas, *J. Environ. Manag.* 236 (2019) 45–53, <https://doi.org/10.1016/j.jenvman.2019.01.095>.
- [12] T. Bauwens, Explaining the diversity of motivations behind community renewable energy, *Energy Policy* 93 (2016) 278–290, <https://doi.org/10.1016/j.enpol.2016.03.017>.
- [13] R.J. Hewitt, N. Bradley, A. Baggio Compagnucci, C. Barlagne, A. Ceglaz, R. Cremades, et al., Social innovation in community energy in Europe: a review of the evidence, *Front. Energy Res.* 7 (2019) 31, <https://doi.org/10.3389/fenrg.2019.00031>.
- [14] J. Radtke, A closer look inside collaborative action: civic engagement and participation in community energy initiatives, *PPP* 8 (2014) 235–248, <https://doi.org/10.3351/ppp.0008.0003.0008>.
- [15] V. Brummer, Community energy – benefits and barriers: a comparative literature review of community energy in the UK, Germany and the USA, the benefits it provides for society and the barriers it faces, *Renew. Sust. Energ. Rev.* 94 (2018) 187–196, <https://doi.org/10.1016/j.rser.2018.06.013>.
- [16] Ö. Yildiz, J. Rommel, S. Debor, L. Holstenkamp, F. Mey, J.R. Müller, et al., Renewable energy cooperatives as gatekeepers or facilitators? Recent developments in Germany and a multidisciplinary research agenda, *Energy Res. Soc. Sci.* 6 (2015) 59–73, <https://doi.org/10.1016/j.erss.2014.12.001>.
- [17] N. van Bommel, J.I. Höffken, Energy justice within, between and beyond European community energy initiatives: a review, *Energy Res. Soc. Sci.* 79 (2021), 102157, <https://doi.org/10.1016/j.erss.2021.102157>.
- [18] B. van Veelen, D. van der Horst, What is energy democracy? Connecting social science energy research and political theory, *Energy Res. Soc. Sci.* 46 (2018) 19–28, <https://doi.org/10.1016/j.erss.2018.06.010>.
- [19] D. Coy, S. Malekpour, A.K. Saeri, R. Dargaville, Rethinking community empowerment in the energy transformation: a critical review of the definitions, drivers and outcomes, *Energy Res. Soc. Sci.* 72 (2021), 101871, <https://doi.org/10.1016/j.erss.2020.101871>.
- [20] D. Coy, S. Malekpour, A.K. Saeri, From little things, big things grow: facilitating community empowerment in the energy transformation, *Energy Res. Soc. Sci.* 84 (2022), 102353, <https://doi.org/10.1016/j.erss.2021.102353>.
- [21] J. Beermann, K. Tews, Decentralised laboratories in the German energy transition. Why local renewable energy initiatives must reinvent themselves, *J. Clean. Prod.* 169 (2017) 125–134, <https://doi.org/10.1016/j.jclepro.2016.08.130>.
- [22] F. Hanke, R. Guyet, M. Feenstra, Do renewable energy communities deliver energy justice? Exploring insights from 71 European cases, *Energy Res. Soc. Sci.* 80 (2021), 102244, <https://doi.org/10.1016/j.erss.2021.102244>.
- [23] E. Creamer, G. Taylor Aiken, B. van Veelen, G. Walker, P. Devine-Wright, Community renewable energy: what does it do? Walker and Devine-Wright (2008) ten years on, *Energy Res. Soc. Sci.* 57 (2019), 101223, <https://doi.org/10.1016/j.erss.2019.101223>.
- [24] J. Hicks, N. Ison, An exploration of the boundaries of 'community' in community renewable energy projects: navigating between motivations and context, *Energy Policy* 113 (2018) 523–534, <https://doi.org/10.1016/j.enpol.2017.10.031>.
- [25] S. Karytsas, D. Mendrinis, C. Karytsas, Measurement methods of socioeconomic impacts of renewable energy projects, *IOP Conf. Ser.: Earth Environ. Sci.* 410 (2020), 012087, <https://doi.org/10.1088/1755-1315/410/1/012087>.
- [26] C. Bird, J. Barnes, Scaling up community activism: the role of intermediaries in collective approaches to community energy, *PPP* 8 (2014) 208–221, <https://doi.org/10.3351/ppp.0008.0003.0006>.
- [27] J. Bere, C. Jones, S. Jones, *The Economic And Social Impact of Small And Community Hydro in Wales*, *Hydropower Stakeholder Group*, 2015.
- [28] E.C. van der Waal, Local impact of community renewable energy: a case study of an Orcadian community-led wind scheme, *Energy Policy* 138 (2020), 111193, <https://doi.org/10.1016/j.enpol.2019.111193>.
- [29] R.J. Burdige, F. Vanclay, Social impact assessment: a contribution to the STATE of the art series, *Impact Assess.* 14 (1996) 59–86, <https://doi.org/10.1080/07349165.1996.9725886>.
- [30] F. Vanclay, Conceptualising social impacts, *Environ. Impact Assess. Rev.* 22 (2002) 183–211, [https://doi.org/10.1016/S0195-9255\(01\)00105-6](https://doi.org/10.1016/S0195-9255(01)00105-6).
- [31] F. Vanclay, International principles for social impact assessment, in: *Impact Assessment And Project Appraisal* 21, 2003, pp. 5–12, <https://doi.org/10.3152/147154603781766491>.
- [32] E. Heiskanen, M. Johnson, S. Robinson, E. Vadovics, M. Saastamoinen, Low-carbon communities as a context for individual behavioural change, *Energy Policy* 38 (2010) 7586–7595, <https://doi.org/10.1016/j.enpol.2009.07.002>.
- [33] B.K. Sovacool, M. Burke, L. Baker, C.K. Kotikalapudi, H. Wlokas, New frontiers and conceptual frameworks for energy justice, *Energy Policy* 105 (2017) 677–691, <https://doi.org/10.1016/j.enpol.2017.03.005>.
- [34] K. Jenkins, D. McCauley, R. Heffron, H. Stephan, R. Rehner, Energy justice: a conceptual review, *Energy Res. Soc. Sci.* 11 (2016) 174–182, <https://doi.org/10.1016/j.erss.2015.10.004>.
- [35] F. Goedkoop, P. Devine-Wright, Partnership or placation? The role of trust and justice in the shared ownership of renewable energy projects, *Energy Res. Soc. Sci.* 17 (2016) 135–146, <https://doi.org/10.1016/j.erss.2016.04.021>.
- [36] D. McCauley, R.J. Heffron, H. Stephan, K. Jenkins, *Advancing Energy Justice: The Triumvirate of Tenets*, *Int. Energy Law Rev.* (2013) 107–110.
- [37] K. Szulecki, I. Overland, Energy democracy as a process, an outcome and a goal: a conceptual review, *Energy Res. Soc. Sci.* 69 (2020), 101768, <https://doi.org/10.1016/j.erss.2020.101768>.
- [38] S. Becker, M. Naumann, Energy democracy: mapping the debate on energy alternatives, *Geogr. Compass* 11 (2017), e12321, <https://doi.org/10.1111/gec3.12321>.
- [39] K. Szulecki, Conceptualizing energy democracy, *Environ. Polit.* 27 (2018) 21–41, <https://doi.org/10.1080/09644016.2017.1387294>.
- [40] A.M. Feldpausch-Parker, D. Endres, T.R. Peterson, Editorial: a research agenda for energy democracy, *Front. Commun.* 4 (2019) 53, <https://doi.org/10.3389/fcomm.2019.00053>.
- [41] M.J. Burke, J.C. Stephens, Energy democracy: goals and policy instruments for sociotechnical transitions, *Energy Res. Soc. Sci.* 33 (2017) 35–48, <https://doi.org/10.1016/j.erss.2017.09.024>.
- [42] B. Van Veelen, Negotiating energy democracy in practice: governance processes in community energy projects, *Environ. Polit.* 27 (2018) 644–665, <https://doi.org/10.1080/09644016.2018.1427824>.
- [43] S. Becker, M. Naumann, Energy democracy: mapping the debate on energy alternatives, *Geogr. Compass* 11 (2017), e12321, <https://doi.org/10.1111/gec3.12321>.
- [44] A. Schreuer, The establishment of citizen power plants in Austria: a process of empowerment? *Energy Res. Soc. Sci.* 13 (2016) 126–135, <https://doi.org/10.1016/j.erss.2015.12.003>.
- [45] E. Bomberg, *Mobilizing community energy*, *Energy Policy* 10 (2012).
- [46] G. Callaghan, D. Williams, Teddy bears and tigers: how renewable energy can revitalise local communities, *Local Econ.* 29 (2014) 657–674, <https://doi.org/10.1177/0269094214551254>.
- [47] M.C. Brisbois, Powershifts: a framework for assessing the growing impact of decentralized ownership of energy transitions on political decision-making, *Energy Res. Soc. Sci.* 50 (2019) 151–161, <https://doi.org/10.1016/j.erss.2018.12.003>.
- [48] D.P. Aldrich, M.A. Meyer, Social capital and community resilience, *Am. Behav. Sci.* 59 (2015) 254–269, <https://doi.org/10.1177/0002764214550299>.
- [49] N. Lin, *Building a network theory of social capital*, in: *Social Capital: Theory & Research*, Routledge, 2017, pp. 3–28.
- [50] R.D. Putnam, *Bowling Alone: The Collapse And Revival of American Community*, Simon and Schuster, 2000.
- [51] T. Bauwens, J. Defourny, Social capital and mutual versus public benefit: the CASE of renewable energy cooperatives: social capital and mutual versus public benefit, *Ann. Public Coop. Econ.* 88 (2017) 203–232, <https://doi.org/10.1111/apce.12166>.
- [52] G. Giacobelli, Social capital and energy transition: a conceptual review, *Sustainability* 14 (2022) 9253, <https://doi.org/10.3390/su14159253>.
- [53] M.J. Page, J.E. McKenzie, P.M. Bossuyt, I. Boutron, T.C. Hoffmann, C.D. Mulrow, et al., The PRISMA 2020 statement: an updated guideline for reporting systematic reviews, *Syst. Rev.* 10 (2021) 89, <https://doi.org/10.1186/s13643-021-01626-4>.
- [54] N. Gubbins, *The role of community energy schemes in supporting community resilience* 24, 2010.
- [55] B.K. Sovacool, J. Axsen, S. Sorrell, Promoting novelty, rigor, and style in energy social science: towards codes of practice for appropriate methods and research design, *Energy Res. Soc. Sci.* 45 (2018) 12–42, <https://doi.org/10.1016/j.erss.2018.07.007>.
- [56] A. Forman, Energy justice at the end of the wire: enacting community energy and equity in Wales, *Energy Policy* 107 (2017) 649–657, <https://doi.org/10.1016/j.enpol.2017.05.006>.
- [57] M. Lacey-Barnacle, Proximities of energy justice: contesting community energy and austerity in England, *Energy Res. Soc. Sci.* 69 (2020), 101713, <https://doi.org/10.1016/j.erss.2020.101713>.
- [58] L. Mundaca, H. Busch, S. Schwer, 'Successful' low-carbon energy transitions at the community level? An energy justice perspective, *Appl. Energy* 218 (2018) 292–303, <https://doi.org/10.1016/j.apenergy.2018.02.146>.

- [59] L. Okkonen, O. Lehtonen, Socio-economic impacts of community wind power projects in Northern Scotland, *Renew. Energy* 85 (2016) 826–833, <https://doi.org/10.1016/j.renene.2015.07.047>.
- [60] N. Cass, G. Walker, P. Devine-Wright, Good neighbours, public relations and bribes: the politics and perceptions of community benefit provision in renewable energy development in the UK, *J. Environ. Policy Plan.* 12 (2010) 255–275, <https://doi.org/10.1080/1523908X.2010.509558>.
- [61] C. Fraune, Gender matters: women, renewable energy, and citizen participation in Germany, *Energy Res. Soc. Sci.* 7 (2015) 55–65, <https://doi.org/10.1016/j.erss.2015.02.005>.
- [62] J. Radtke, D. Ohlhorst, Community energy in Germany – bowling alone in elite clubs? *Util. Policy* 72 (2021), 101269 <https://doi.org/10.1016/j.jup.2021.101269>.
- [63] V. Brummer, Of expertise, social capital, and democracy: assessing the organizational governance and decision-making in German renewable energy cooperatives, *Energy Res. Soc. Sci.* 37 (2018) 111–121, <https://doi.org/10.1016/j.erss.2017.09.039>.
- [64] D. Süsner, A. Kannen, 'Renewables? Yes, please!': perceptions and assessment of community transition induced by renewable-energy projects in North Frisia, *Sustain. Sci.* 12 (2017) 563–578, <https://doi.org/10.1007/s11625-017-0433-5>.
- [65] S. Ruggiero, T. Onkila, V. Kuittinen, Realizing the social acceptance of community renewable energy: a process-outcome analysis of stakeholder influence, *Energy Res. Soc. Sci.* 4 (2014) 53–63, <https://doi.org/10.1016/j.erss.2014.09.001>.
- [66] A. Queirós, D. Faria, F. Almeida, Strengths And Limitations of Qualitative And Quantitative Research Methods, 2017, <https://doi.org/10.5281/ZENODO.887089>.
- [67] J. Goodman, J.P. Marshall, Problems of methodology and method in climate and energy research: socialising climate change? *Energy Res. Soc. Sci.* 45 (2018) 1–11, <https://doi.org/10.1016/j.erss.2018.08.010>.
- [68] M.L. Lode, T. Coosemans, Camargo L. Ramirez, Is social cohesion decisive for energy cooperatives existence? A quantitative analysis, *Environ. Innov. Soc. Trans.* 43 (2022) 173–199, <https://doi.org/10.1016/j.eist.2022.04.002>.
- [69] European Parliament, Directorate General for Internal Policies of the Union., University of Twente., blomeyer & sanz. Gender Perspective on Access to Energy in the EU, LU: Publications Office, 2017.
- [70] T. Bauwens, N. Eyre, Exploring the links between community-based governance and sustainable energy use: quantitative evidence from Flanders, *Ecol. Econ.* 137 (2017) 163–172, <https://doi.org/10.1016/j.ecolecon.2017.03.006>.