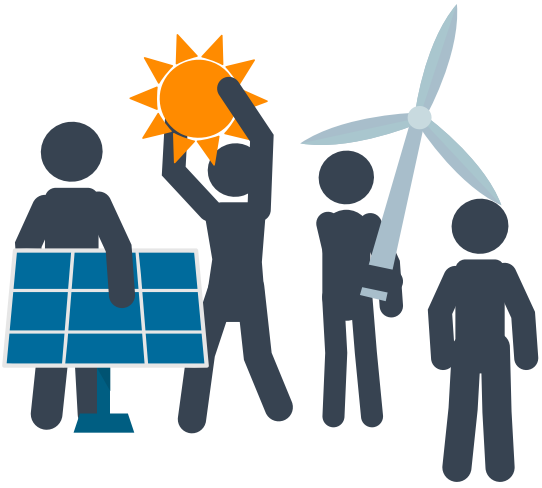
# Energy Communities: Insights from the Social Sciences & Humanities on advantages and challenges



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## ABSTRACT

**Energy communities have the potential to play an important role in low-carbon transitions. There are multiple benefits associated with, and motivations for, participating and encouraging energy communities. However, there are also challenges associated with energy communities including how they are financed, their governance and who is able to participate. SSH research can provide insights to address these barriers and facilitate the development of energy communities.**

## SUMMARY

- Energy communities can support the achievement of the EU's climate ambitions.
- There are multiple benefits associated with energy communities, including developing contextualised energy systems and supporting the establishment of participatory energy systems.
- There are several challenges which need to be addressed, both at the individual and systemic level, to support the success of energy communities.
- Both Social Sciences & Humanities (SSH) and Science, Technology, Engineering & Mathematics (STEM) research is beneficial for energy communities, as there is the need to understand how technologies work as well as how individuals engage with technologies.
- Further research can provide insights to support the development of more inclusive approaches and support mechanisms for energy communities. Insights can help establish more flexible institutions and legislation, as well as understandings of how to translate knowledge between energy communities.

### KEY DEFINITIONS

**Energy communities:** Collective groups of citizens who undertake actions to support the achievement of clean energy transitions [1].

**Prosumers:** Active participants in the energy system, either through self-generation (and consumption) of renewable energy, or through the provision of energy system services such as energy storage [2].

## Introduction

Energy communities have been defined in the EU's 'Clean Energy for all Europeans' package [3], as well as in the Renewable Energy Directive and the Internal Electricity Market Directive [4,5]. Other EU initiatives acknowledge the potential for energy communities to achieve climate goals including the REPowerEU plan [6] and the Solar Energy Strategy [7].

Currently in the EU, there are over 7,700 energy communities which contribute up to 7% of nationally installed renewable capacity [8]. Energy communities tend to focus on generating environmental, economic, or social benefits rather than financial gains [9]. There are several opportunities associated with energy communities including energy efficiency improvements, reduced household bills and creation of local employment [1, 10]. One way in which individuals can participate in energy communities is through becoming a prosumer, whereby a group of individuals collectively comes together to generate (and consume) energy [11]. Although it is important to note that not all prosumers are part of an energy community.

The establishment of energy communities (including those involving prosumers) provides opportunities to empower citizens and supports the democratisation of energy [12]. However, there are also constraints regarding energy communities including how they are financed, their governance and who can participate [13].

Social Science and Humanities (SSH) research has considered the extent to which energy community opportunities are realised, the motivations for participation, the governance structures established, and the barriers experienced. Through SSH research, insights are developed which help identify actions to support the success of energy communities.

This literature brief summarises existing understandings of energy communities and highlights future opportunities for SSH research on the topic. The insights presented are informed by existing academic literature, recent research projects, and interviews conducted with two expert academics[1].

## Current Understandings

### *Significant Findings to Date*

**A range of research has been conducted on the topic of energy communities (including prosumers)**, including identifying their advantages, motivations, and challenges. Existing research is situated at different scales and considers both systemic and individual opportunities and constraints related to energy communities.

Energy communities can support the achievement of low-carbon futures [14,15]. An advantage of energy communities is their localised and contextualised nature. **The practices and technologies of an energy community reflect the particular opportunities (and addresses the specific challenges) of the context in which they are situated** [16]. Context (including affluence and social norms) influences the establishment of energy communities, as shown through the geographically varied spread of energy communities globally [17]. Energy communities can also **support the establishment of more participatory energy systems** through the diffusion of power and responsibility [14,16]. These shifting power relations can facilitate social cohesion and collective action [18], as individuals are able to develop connections through the establishment of energy communities (JB). The sense of connection between individuals, and creation of a collective ambition, can make individuals feel as if they are actively contributing to the energy transition, with this motivating participation [18].

**Research has considered individuals' motivations for establishing and engaging with energy communities, identifying economic, environmental and social motivations** [19]. Individuals who participate in energy communities as a prosumer can benefit economically by selling excess generation back to the grid [2]. Environmental motivations include addressing climate change by establishing more sustainable societies and low-carbon energy systems [16], whilst social motivations include wanting to feel part of the local community [10], sense of ownership and energy independence [20].

However, there are barriers which affect the establishment of and participation in energy communities [21, 15]. These barriers materialise at both the scale of individuals and more systemically.

Participation in energy communities, particularly as a prosumer, requires individuals to have certain resources including access to finance, knowledge, skills, time, and a willingness to take certain risks [22, 10]. Consequently, it is typically more affluent communities and landowners that participate in energy communities [10]. **The varied ability for individuals to participate in energy communities can exacerbate existing socio-economic divides.** For instance, research shows that households unable to afford the installation of domestic Solar PV panels are facing increased energy bills as they are covering the grid maintenance costs of prosumers (that are less dependent on the grid) [23]. There is a need to ensure that energy communities do not impose burdens on those who do not participate in them [15], and that additional support is available to support participation of individuals that currently lack the means to [24].

The EU Horizon 2020 PROSEU[2] project considered the characteristics of prosumers, and incentive structures required to support the mainstreaming of prosumer practices [25]. The project worked across seven European countries to understand the motivations behind establishing energy communities. The project presented recommendations for establishing energy communities, including supporting the practices of individuals and addressing more systemic challenges. **Enabling balanced involvement of all actors, increasing local acceptance, digitalising the energy system, creating space for innovations, and simplifying system integration of prosumers are recommended to support the establishment of energy communities.**

Considering more systemic challenges, **current infrastructures, institutions, and regulatory frameworks can act as obstacles to the development of energy communities**. These systemic challenges can emerge through different 'lock-ins', whereby decisions are made which commit society to certain configurations of technologies and practices. For example, techno-economic lock-in (whereby technologies are introduced into and supported by particular market practices), social and cognitive lock-in (capturing how individuals know how to use and have certain expectations of technologies as well as established social norms and practices), and institutional and political lock-in (rules and regulations have been developed which reflect the current technologies and

1 Interview contributions to the literature brief are indicated through bracketed initials

2 https://proseu.eu/

social practices) affect the development of energy communities [26, 27].

**The lock-in of infrastructures, institutions, regulations, and social norms can reinforce existing power dynamics as they align with the interests of currently powerful incumbents** [28]. Centralised grid systems, such as the UK's national grid, are an example of lock-in which affects the development of energy communities. Infrastructures, institutions, and regulatory frameworks have co-evolved alongside the centralised energy system that is composed of a smaller number of large power plants. As such, the current infrastructural and institutional configuration does not align with or reflect the needs of a more decentralised system that includes a larger amount of smaller generating technologies such as renewables and energy community practices [29]. Policy-making decisions also influence the actions undertaken and can lock-in certain practices. As an example, UK policy has shifted focus from community energy to local energy with this contributing to the support of institutional partnerships and company-led investments rather than grassroots, citizen-led action [30].

## Emerging Practices

Research is being undertaken to help identify 'best practices' to support the establishment and operation of energy communities, integrating different perspectives from both SSH and STEM disciplines.

Despite a common conception that SSH and STEM research is conducted in silos [25], there are examples of energy communities research being conducted which brings together different disciplines and their understandings (IC). For example, the ScotCLUE[3] project combines modelling techniques and stakeholder engagement activities to support the design, coordination, and implementation of smart local energy communities [31]. **Energy community research benefits from interdisciplinary collaborations as the technical optimisation of energy systems requires consideration of how people interact with these systems, and the governance of energy communities requires understanding of technology installations** (IC). There is a need to support further integration between the disciplines to truly support energy communities and prosumer practices (IC, JB).

There are multiple barriers to the development of, and participation in, energy communities, including a lack of access to resources, finance and knowledge [32]. These barriers are more pronounced for some cross-sections of society, often due to broader societal structural inequalities. Research has acknowledged the impact of these (systemic) issues, with efforts undertaken to accommodate varied experiences to support participation.

**Research is identifying ways to support the participation of different socio-cultural groups in energy communities, providing practical resources and alternative approaches.** For example, the EU H2020 W4RES project[4] focuses on gender and localised energy generation [33]. Drawing upon eight case studies in eight European countries, the project has identified actions to support the participation of women in localised energy. Recommended actions include business advice and training, gender-based hiring quotas, dedicated promotional events and encouraging women to pursue an education in STEM disciplines [33].

Methodologically, pilots and living labs have been used within SSH research to understand the experiences of energy communities. **By analysing energy community models and practices within the context of a living lab it provides insight into what works and what does not work from a practical perspective (IC).** The EU H2020 funded NEWCOMERS[5] project focuses on ten energy community case studies in six European countries, identifying practical recommendations on how they can be supported. When developing these recommendations, consideration was given to regulatory, institutional, and social conditions [34]. Based upon this research, it highlights the need to consider technological components, social aspects, and governance mechanisms to support local energy initiatives.

The Energy Communities Repository is a European Commission initiative which supports the development of energy communities by sharing resources related to 1) data collection and analysis, 2) technical assistance, and 3) best practices [35]. **The intention of the Energy Communities Repository is to assist local actors with setting up and advancing clean energy projects driven by energy communities [35].**

## Future SSH Priorities

Considering the potential role of energy communities and prosumers to support low-carbon transitions, and building on current understandings of the topic and emerging practices, this section outlines further areas of inquiry.

Future research needs to better understand how barriers and systemic challenges manifest and affect the development of energy communities in order to overcome them. SSH research supports knowledge sharing and facilitates different experiences to be considered when developing energy communities. **Insights developed through SSH research can support the development of approaches and support systems that acknowledge, and overcome, the barriers and challenges identified.**

Furthermore, there is the opportunity to learn from experiences of implementing policies, particularly with reference to how policies are experienced by target audiences (IC). These understandings can be drawn upon to support the development of energy communities. Future work on energy communities and prosumers could consider how a space for reflection could be incorporated into implementation processes. **By incorporating reflection during the implementation processes, particularly if different characteristics are considered, it may support the development of more inclusive and flexible environments for energy communities that support participation.**

When developing energy communities, future research needs to consider how actions undertaken at the local scale are influenced by other actors and institutions situated at other scales. As such, t**here is the need to (1) understand how to encourage engagement, (2) establish the resources required to facilitate progress, and (3) identify stakeholders that can support processes related to the establishment of energy communities and prosumer practices**. The identification of support and resources needs to extend beyond the individual to consider systemic obstacles to engagement

3 https://ore.catapult.org.uk/stories/clue/

4 https://w4res.eu/

5 https://www.newcomersh2020.eu/

and participation. As such, there is the need to move beyond planning for energy communities and promoting them to providing the support and resources required to implement them.

## Takeaways

### Takeaways for the European Commission

- In seeking to promote energy communities, support measures need to be available, not only from a financial perspective but also capacity building and the development of enabling environments with supportive actors (such as municipalities).
- Further research on energy communities and prosumer practices can provide applied insights on how to support and encourage participation in these localised energy configurations. For example, funding calls could be developed which cover topics such as gender in energy communities, or political systems and energy communities.
- There is the opportunity to incorporate reflection on the implementation processes when developing new policy and regulations. By bringing in reflections, policy can adapt to different conditions, which in turn creates a more flexible environment that may increase participation.

### Takeaways for Stakeholders and Businesses

- The establishment and operation of energy communities requires individuals to have equal opportunities to participate. There is the opportunity for those with appropriate resource and capacity to provide support, such as alternative finance and training.
- Information about how individuals can participate in energy communities, including details on how to engage with technologies and administrative processes, needs to be accessible. A national contact point where expertise is bundled could be established.

### Takeaways for the SSH CENTRE project

- Collaboration between SSH and STEM researchers is beneficial for developing understanding of energy communities. SSH CENTRE can support this collaboration through "*WP2 Epistemic laboratories for the EU Green Deal*".
- Engaging with different stakeholders provides opportunities to understand how they can support the development of energy communities. For example, the engagement with EU policy stakeholders in "*WP4 Citizen engagement strategies for Horizon Europe policy communities*" could provide useful insights.
- The presentation of results and outcomes can increase engagement with and support for energy communities. Presenting results from the SSH CENTRE project in such a way could improve stakeholder engagement with the project's outputs ("*WP6 Dissemination, Communication and Exploitation*").

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