



Research article

Renewable energy community and the European energy market: main motivations

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ABSTRACT

With the implementation of the EU's key climate and energy policy objectives, there is a transition to a new energy system where renewable energy sources are pushed and where new technologies need to be developed and adopted. The energy transition may result in deeper participation of individual consumers or citizens in community-based initiatives. Those communities operate collectively in the energy market producing RE or in local networks, based on local collaborations. The development of energy communities is not the same in all member state. Moreover, it is noted that their development is different depending on the European country. The aim of this paper is to collect data, using a survey, to study and to better understand what the citizen energy initiatives are, their main features and the motivations of individuals to participate on it. The citizens participation is a crucial point for the development of this type of communities. The main motivation for participation in these communities seems to be concerns about environmental and climate impacts. We also note that in these communities the trust is very important for the development of any RE project.

1. Introduction

The success of the energy transition wave will only be possible if it includes citizens' acceptance and support. Community energy projects present themselves as an “*emergent phenomenon*” ([1], p. 674), and these provide plenty of opportunities for citizens to actively participate not only on the community but also in the energy market. Therefore citizens may not only participate as energy consumers but may take on various roles within the energy market, including deciding on the form and extent to which energy is produced [2]. With these new roles opportunities are created to engage and support new developments on the European energy market [3].

Despite their environmental benefits, renewable energy (RE) projects have effects on the community. Thus, power communities must ensure involvement with residents to secure support for their projects. This community involvement in energy projects may attract funding, not only from local residents, but also from investors who feel confident in investing in part due to this local involvement [4, 5]. In the literature, we

may find that local energy communities are defined as “*organizations, initiated and managed by actors from civil society, that aim to educate or facilitate people on efficient energy use, enable the collective procurement of renewable energy or technologies or actually provide (i.e., generate, treat or distribute), energy derived from renewable resources for consumption by inhabitants, participants or members*” ([6], p. 298).

The definition of Renewable Energy Community (CE)¹ present in the new directive for the Renewable Energy Directive (RED) ([7], p. 103), intends to ensure an improved common understanding of what a community of RE is. Thus, it is confirmed the definition of conditions of equivalent competition within the Member States, preventing any abuse by pseudo-energy communities. From this point on, this will be the definition used. So, from Article 2:

“*Renewable energy community*” means a legal entity: (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; (b) the shareholders or members

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of which are natural persons, SMEs or local authorities, including municipalities; (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;”

The motivation for citizens participation may be diverse. Citizens are more likely to participate in RE projects if property models are based on cooperative norm principles, such as voluntary membership, democratic control (one member/one vote), limited profits (the main goal is social or environmental) and distribution of surplus proportionate to investment [8, 9]. It is found that in several European countries, the locals investors tend to support more often RE projects run by social enterprises and cooperatives, than by large investors, as these projects tend to be smaller and focused on environmental aims [10]. In several countries, such as the UK, Germany, Denmark and the USA, there is a growing interest in citizens' participation in the transformation to a sustainable energy system [11, 12, 13]. We may highlight the German example as being of particular interest for local and regional analysis, as German transition is a “highly decentralized phenomenon” ([14], p. 258), featuring strong support from local residents and larger local initiatives [14, 15].

In recent years, various aspects of energy communities have been studied [16, 17, 18]. Among these, mostly, through a qualitative approach, we may find the analysis of the theoretical concept, barriers to entry into the energy market and some financial aspects or a legal focus [5, 19, 20]. Therefore, at the top of our knowledge there is a lack of quantitative research on the motivations behind participation, i.e. little is known about citizens' positions on local energy and on the factors influencing citizens to participate in a CE or even to invest their financial resources in these projects [21, 22].

The contribution of this paper is to address this flaw in the literature, understanding what drives a citizen to participate in an energy community. It is also intended to consider the new energy legislation of the European Union and its impact on the future of local energy communities. To better understand citizens' motivations, either community identity or trust should be considered as a determinant for their interest in participating in RE projects. Walker *et al.* ([23], p. 2662) state that “trust between local people and groups that take forward projects is part of the package of conditions which can help projects work and for local people to feel positive about getting involved and about process of project development”. Several other authors add to the importance of trust, the community and social norms [23, 24, 25]. However, it is still not clear what influence these factors, or others, have on the motivation to participate in a citizen's energy community. Thus, we intend to address some of these important issues: Are citizens willing to participate in citizen energy communities? What factors influence citizens' motivation to participate in an energy community?

The rest of the article develops as follows. Section 2 presents the community energy, participation, and motivations. Section 3 presents the methodology and section 4 present the results. Finally, section 5 presents the conclusion.

2. Community energy: participation and motivations

Community energy is characterized as having a high degree of community involvement in terms of ownership, management and benefits of energy projects [16]. Adding to this, the CE involves energy production, collective acquisition, distribution or conservation initiatives [6, 26]. Energy communities may differ in governance and participation structure, ownership, technology and local consumption [27].

There are currently various types of community energy, such as groups of local individuals investing in RE, wind farms or cooperatives [19, 27, 28]. CE's, which are a specific form of energy communities, are characterized by the involvement of local communities, which may assume investor or contributor roles [27, 29]. The CE's follow the cooperative principles adopted by the International

Cooperative Alliance [9] and cooperatives have a limited return on subscribed capital, suggesting that profit maximization is not the main focus.

CE's, like other types of energy community, are increasingly crucial stakeholders in the energy transition [30, 31, 32]. Boon and Dieperink [6] report that local involvement, participation and co-ownership are very important factors in supporting energy communities. Indeed, citizen participation in decision-making and RE projects may, in fact, increase levels of acceptance of RE sources [33, 34, 35], may promote “energy responsibility” ([36], p. 102) and energy transition [23], support and sensitize the local economy [19] and “create the space for developing and testing models of social innovations” ([37], p. 7545).

Mumford and Gray [38] note that there is a lack of public confidence in large energy companies for the introduction of alternative sources and that the decentralized installation of RE has more supporters if it is done by local citizens and trusted organizations. As an example, Fraune ([22], p. 57) states that the German case is “a reference point in revealing the impact of the larger social, cultural and political context on citizens' capabilities to participate and thus to benefit from citizen participation schemes in RES-E”. It seems important to understand the motivations that lead citizens to invest in RE projects at the local level so that the conclusions may help decision-makers to create effective measures to support for CE.

As mentioned earlier, CE's depend on the participation and involvement of citizens, as volunteers, participants or investors [39, 40]. Different types of initiatives and degrees of participation may be found within the CE [16, 27]. Recent studies have explored the factors influencing citizen participation in RE projects [15, 41, 42] but there is still a lack of significant and systematic research about why different members participate in these energy initiatives.

Table 1 summarize the factors that influence participation identified in the literature. The motivations may be economic, environmental, social, political and technological, and there is also concern about the fundamentals of energy policies, such as decentralization of energy systems and energy self-sufficiency [26, 43, 44]. The factors with positive effect are environmental awareness and the intention of energy

Table 1. Factors that influence participation.

Trust
Some studies focus on the concept of energy confidence [25, 45]. Walker <i>et al.</i> ([23], p. 2657) state that “trust is both a necessary characteristic and a potential outcome of cooperative behaviour” that is, trust is critical to the progress of the CE. Decentralized energy projects require a lot of confidence [46]. However, Walker <i>et al.</i> [23] and Yildiz <i>et al.</i> [47] are the only ones to analyse trust within the context of energy communities.
Social Norms
In general, cooperation is influenced by social norms [48]. When presented with a social dilemma, social norms have a positive effect on cooperative behaviour [49]. The impact of social norms on CE and their influence on social and environmental behaviours have been analysed [37, 50, 51].
Community Identity
Citizens are likely to cooperate in energy communities if there is a social connection between them with their community or with a specific institution [27], as this connection and identification with the community reinforce collaboration and action of citizens [3]. Identification with the energy community supports mobilization [3] and shifts citizens' interests to be self-directed towards the energy community [52]. RE projects can facilitate solidarity with the community, but on the other hand, solidarity can also come from RE projects [3, 53]. The success of RE projects may be due to the concept of making a community a “better place” [27]. This fact was analysed by Haggett and Aitken [54], who found that community identity is very important and can promote community-based action.
Environmental Concern
Several studies have examined the determinants of environmental attitudes or concerns, and how they influence decision making [51, 55]. Among the motivations for participating in a CE are environmental reasons [1, 3]. Boon and Dieperink [6] show in their study that environmental awareness has a positive effect on supporting CE.

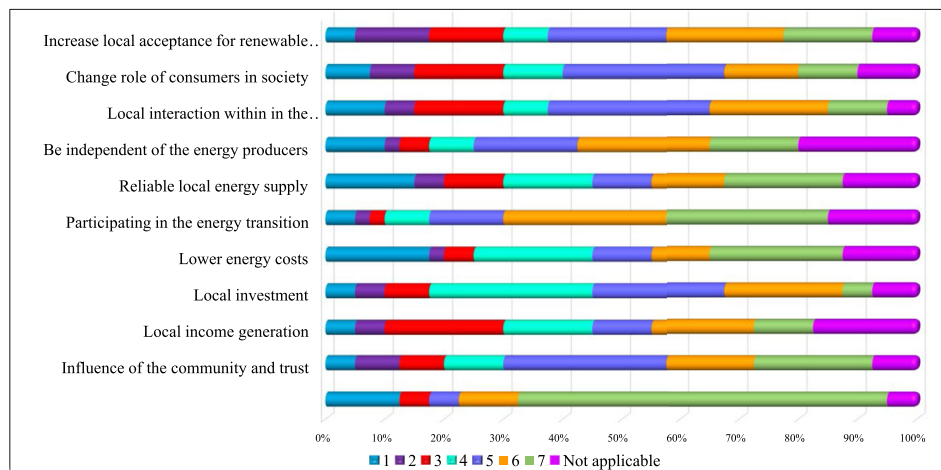


Figure 1. Motivation of members to join the CE.

independence [6]. In general, the involvement of citizens may depend on risks, costs and outcomes for citizens and society.

We may, therefore, conclude that there are two fundamental aspects impacting on the participation in a CE: on the one hand, development in different places at different time with different actors and therefore different contexts; on the other hand, participation on different RE projects are motivated by *different motivations*.

3. Methodology

To study citizens' motivations on CE participation, we conducted a quantitative analysis on the replies of a survey on European countries. The data was collected in an online survey.

The use of an online survey allows us to get more detailed information on CE compared to other methods. This methodology was used in former studies to analyse several aspects of energy communities. Surveys are used quite frequently by researchers and represent a solid empirical method [45].

Thus, our methodology and the construction of the survey was based on a systematic review of existing bibliographic references on energy communities, the EU and national energy legislation, directives, and policies were carried out. Our survey is developed after Schwark [56] and Bohnerth [57] and adding other issues namely relevant to southern European countries. For our research, we use only some questions of a longer survey about CE. Our survey contains 101 questions, drop-down choice, multiple answer choices and questions to be answered using Likert scales. When using a Likert scale, it is intended to present a series of dimensions of attitudes, where the participant should be stated, for each of them, if and to what extent they agree. The questions chosen for our research,

- × *What motivates your members to join/found the cooperative/community? Please select one or more responses from the list below and indicate in the adjacent field the on the scale of 1 to 7 how important it is (1=not important; 7=very important).*
- × *Does your cooperative/community provide non-monetary added value to your community? (region and members)*
- × *Please state whether you agree or disagree with the following statements:*
 - ✓ *"Trust plays a crucial role in our cooperative/community"*
 - ✓ *"Due to the democratic structure, it is sometimes difficult to make decisions"*
 - ✓ *"There can be conflicts between older and newer members of the cooperative/community because they have taken own different risks"*

4. Results

This chapter² presents the results of the online survey. More than 400 energy communities were contacted by email, and the survey was sent in English and Portuguese. After that emails were sent to remind members of the energy communities that did not respond to the survey. The researcher's email address was provided throughout the search so that further research was possible. The survey had 115 participants accessed the survey, 110 responded that they agreed to participate in the survey. From the 110 participants, only 99 continued to respond, 32 female participants (32%) and 67 male participants (68%), with an average age of 40 years old.

From all the participants, 36 are part of the management/direction (37%), 34 are other members (35%) and 27 have no opinion on community energy (28%). The most represented countries are Portugal (27%), Spain (19%), and Belgium (22%). Concerning the age of the CE, the oldest CE represented was established in 1898 and the newest in 2019.

CE's have a mixed membership structure and this type of business opens up to the possibility for various and new actors of the energy market to work together [58].

The reasons for taking part in an CE, but also for founding an CE, vary and are quite different, although several trends may be detected. There are three different reasons that may explain the membership in an CE. First, CE's attract people who prefer and follow an environmental and sustainable lifestyle, as these organizations invest in RE. Traditional energy sources, such as coal and gas, are not a viable investment for the CE as those sources are capital intensive. This type of organizations sees an increasing number of members. Another reason to become a member of an CE is the members' self-efficacy, that is, people get together and carry out RE projects and those projects that would not come true without these efforts. Finally, the financial aspects of being a member of an CE are clear, as all CE's offer some type of income for initial investments and provide electricity from the RE source. Consequently, being a green investment is an important motivating factor for becoming an CE member.

On the other hand, it appears that the reasons for establishing an CE are quite subjective and individual and may not be generalized on the conclusions of the survey. Since survey respondents are often involved in creating a CE, the reasons for becoming a member are coincident

² Data in Excel format will be shared with those who wish to replicate the results of this research.

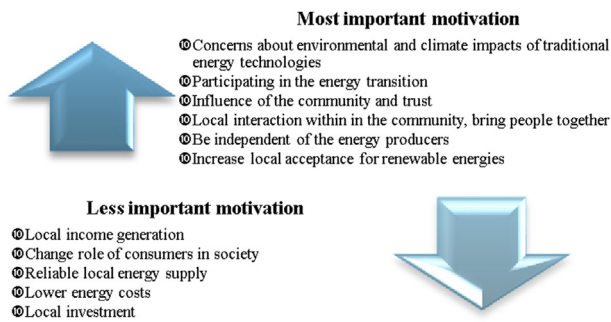


Figure 2. Motivation by order of importance.

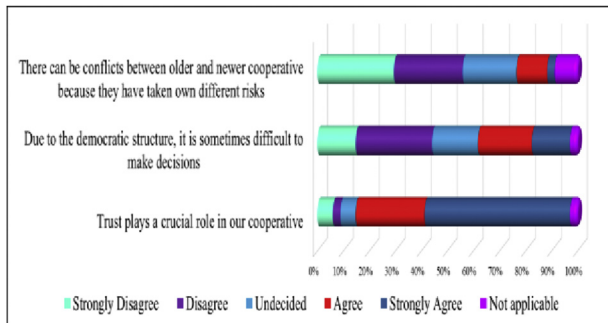


Figure 3. Answers to the question: “Please state whether you agree or disagree with the following statements.”

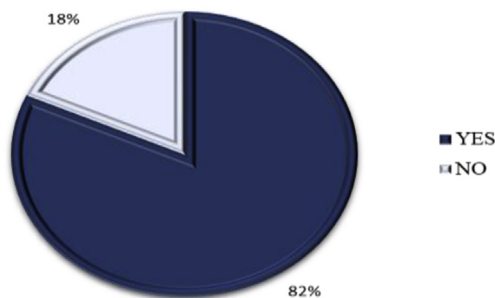


Figure 4. CE provides non-monetary added value to the community.

with the ones for setting up a CE. However, we can see three distinct reasons. First, a specific event can lead to the creation of an CE, for example, Chernobyl or a political decision in favour of RE. Second, a political decision in favour of RE and citizen participation can lead to the creation of an CE since the creation of such an organization becomes easier with the support of political decisions. Finally, another motivation for setting up an CE is the feeling of belonging and participation,

that is, a participatory approach should lead to a greater reception from RE. Another reason for creating a CE may be due to disagreement about the fact that the energy market is dominated by large companies, as some studies point out [31, 32].

Figure 1 shows the results on the several motivations for participating in an CE. It should be stressed that very often the respondents pick all the motivations. Over 78% agree that the main reason is “concerns about environmental impacts of traditional energy technologies”, this is due to the general concern of citizens with environmental and climatic impacts. Following “participating in the energy transition” with 68% agreeing, although the energy transition itself is an abstract concept to somehow motivate a citizen to participate in an CE and “be independent of the energy producers” was chosen by 55% of the participants. Theoretically, it was expected that “lower energy costs” and “local income generation” would be considered as main motivations for the adoption of CE, but in our results, that is not the case and it seems that participants do not think that financial motivations are the most important. Regarding “influence of the community and trust” with 63% agreeing and “local interaction within the community, bring people together” with 58% agreeing, are considered important motivations, which is in line with previous studies [3, 25, 27]. Although participants point out to different motivations for joining an CE, they may be classified as features of an environmental and sustainable lifestyle. Thus, it may be said that as motivations for joining an CE seems to be connected to their lifestyle.

Looking, only at the three categories with higher rate on the Likert scale (5, 6 and 7) and the three lowest categories (1, 2 and 3) and considering the number of response, the motivation are presented in order of importance on Figure 2.

Assuming the theory presented above, we asked respondents what they thought of the following statements: “Trust plays a crucial role in our cooperative”, “Due to the democratic structure, it is sometimes difficult to make decisions” and “There can be conflicts between older and newer cooperative because they have taken own different risks”. Figure 3 shows that trust is crucial to increase citizens' willingness to participate in CE. Therefore, trust can be seen as a prerequisite for the development of RE projects, which is in line with research by Walker *et al.* [23], Yildiz *et al.* [47] and Bohnert [57]. On the other hand, respondents disagree that the democratic structure of the CE makes decision-making difficult and that there may be conflicts between new and old CE, with is in line with research by Bohnert [57].

We ask participants if CE add non-monetary value to the communities in which they are located, Figure 4 shows that 83% of participants agree that CE bring non-monetary value to the communities in which they operate, for example, through joint participation and responsibility in a common project, thus leading to an enhanced sense of community.

In addition, we asked participants to describe the benefits and contributions that CE bring to the communities in which they operate. These are summarized Table 2.

These benefits and contributions should also be considered as motivations for members to join a CE as individuals assume these are the expectations they have when they decided to participate.

Table 2. Contributions and benefits to the community.

Contributions	Benefits
<ul style="list-style-type: none"> × involvement in social activities × dissemination of the new energy model × collaboration with social organizations in the dissemination × energy guidance × social and green action activities × awareness, promotion, and information on renewable energies. 	<ul style="list-style-type: none"> × increased local employment × improvements in education × a pathway to collective participation in the transition to a just and carbon-free economy × social integration (library creation) × financial (for example, possibilities for local artists to display their works at the CE facility) with the local community.

5. Conclusion

In our research, we aim understanding what may motivate citizens to participate in a CE. In fact, participation in an energy community is developed by the identity of the community, as well as, by the community collaboration [27], thus creating a perception of the community [48], strengthening participation.

We have found that social norms, through concerns about environmental and climate, are a determining factor in the motivation to participate in CE. Indeed, energy projects have the potential to “*promote new social norms*” ([35], p. 240) concerning RE. Previous studies have shown that trust influences participation. In fact, our data indicate that trust seems to promote and is crucial for participation in community energy. A point to be stressed in our conclusions is the fact that the reason “*lower energy costs*” and “*local income generation*”, it was forecasted as a relevant motivator, and, in fact, in our sample, it does not confirm these and even it seems to be pointed out by the participants as one of the least important factor.

It is clear that citizen recognize that CE's add non-monetary values to the communities in which they operate. Among these values are the promotion of energy transition, energy guidance, and social and green action activities.

In short, we may conclude that citizens are willing to participate in an CE, as long as they recognize that it brings benefits to the community where the RE project will be installed and to the environment. In future research, it may be important to infer differences between countries concerning motivations to participate in CE. This difference may justify different developments for CE across Europe, even if we have the similar policy and legislation, based in European directives. It may be also interesting to add the perception of barriers to the adoption of new RE projects to this conclusion.

Declarations

Author contribution statement

Susana Soeiro & Marta Ferreira Dias: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

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Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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