They've got the Power! Exploring Inhibitors and Facilitators for the Empowerment of Renewable Energy Projects in Germany

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Abstract

With the climate crisis progressing there is an increased need to reduce greenhouse gas emissions and find creative solutions for their largest contributor: energy consumption. Renewable energy communities are a citizen-led approach to promote the energy transition through active participation, community decision-making, and sharing the subsequent benefits of using renewable energy. Despite the meaningful contribution of energy communities and the need for renewable energy sources, they only account for a small part of communities when compared to the entirety of Germany. Up to this day, there has not been sufficient in-depth understanding of the factors that empower and hinder initial and long-term energy community participation. Therefore, this exploratory study aimed to investigate the facilitators and inhibitors of energy communities in Germany by utilizing semi-structured interviews. The subsequent thematic analysis revealed that the themes of trust, relationship quality, and collective identity are especially relevant before participating in energy communities. Additionally, compliance and peer pressure, and persuasion were themes that often influenced the decision-making process. For sustained participation, fairness, conflict and experience of success were significant components for the participants. This coincides with previous research in group processes but expands to the relevance of a sense of community, diffusion of innovation theory as well as conflict management. Overall, the themes appear to be interrelated and depend on whether the energy community is a limited liability company or a cooperative. Therefore, it is suggested for future research to further explore the relationship among the themes, the difference between different kinds of energy communities, and what implications further theories offer. With the obtained information, energy communities might be aided in their establishment and long-term continuation and empowered to further fight the climate crisis.

During the preparation of this work, we used Microsoft Teams to transcribe the interviews. After using this tool, we thoroughly reviewed and edited the content as needed, taking full responsibility for the outcome.

Introduction

Climate change severely threatens biodiversity, the environment, and humankind's survival, which can be seen in recent catastrophes like the life-threatening floods in Zambia and Ecuador or cyclones in Myanmar and Bangladesh (World Food Program USA, 2024). In order to mitigate the effects of climate change, several attempts towards sustainability have been made by governments. The United Nations established the 17 Sustainable Development Goals in 2013 (United Nations, n.d.) and in Europe, for example, the 'Green Deal' was established by the European Commission with the goal of being the first climate-neutral continent by 2050 (European Commission, 2021). Their subgoals for this include the reduction of greenhouse gasses by 55% as well as planting 3 billion additional trees by 2030. Since energy is the largest contributor to greenhouse gas emissions, the European Commission put forward an energy transition plan that entails the shift towards low-carbon and renewable energy sources (Joint Research Center, 2022). However, with only 22.5% of overall energy consumption stemming from renewable energy in the EU, Europe still must improve by 20% per cent to reach its subgoal for 2030 (Directorate-General for Energy, 2022a).

Besides the measures that governments around the world take, some individuals and public groups take action themselves and aim to increase sustainability and protect the environment by creating their own projects. Energy communities have been created by groups of people to produce, consume, and organise renewable energy sources (Atias, 2023). Therefore, this type of community is characterized by a collective and citizen-driven approach to the energy transition that encourages individual investments and acceptance of sustainable and renewable energy to subsequently share the benefits (European Commission, n.d.). The concept of energy communities is fostered by the idea, that sharing knowledge and attributing an active role to the citizens facilitates innovative progress and advancements in sustainability (Directorate-General for Research and Innovation, 2015; Sovacool, 2014). Some practices of energy communities include creating and using renewable energy sources like photovoltaic systems and biogas plants, creating sustainability groups inside the community, or promoting policies under the Green Deal.

The characteristic practices of communities not only have benefits for the environment but also promote economic independence and advancement in research. Sovacool (2014) outlined several benefits of energy communities: First, by making the community an active part in shaping their energy usage, their belief in democracy is fostered. Energy communities offer the opportunity for citizens to voice their opinions and thus be

directly represented in environmental and technological decisions. Next, the citizens might observe difficulties in practice like the distribution of rewards or how to deal with setbacks. This can be beneficial to the overall program concerning future advancements in energy communities. Lastly, it is cost-effective to include the public as they are directly involved in the process and can share their experience as an active participant, there are fewer additional costs for investigations (Sovacool, 2014). Moreover, it is reported that energy communities facilitate economic growth inside the community. In the long run, communities have the opportunity to become self-sufficient and reduce their energy costs significantly while creating new job opportunities (Van Der Schoor & Scholtens, 2014). This becomes especially important for rural communities that are not as well connected to the grid and ultimately makes them more flexible and independent (Koirala et al., 2016).

Besides financial benefits, the creation of energy communities has implications for the social structure in a village. Energy communities facilitate social cohesion, and the identification of their members with the community, either through building the energy community together from the start or by increasing the time spent together through informational meetings or community meetings (Brummer, 2018). By building an energy community together and finding common ground, the members of the community experience a feeling of trust in their other community members and empowerment for joint action to achieve their common goals like counter-acting climate change (Caramizaru, n.d.).

Coy et al. (2021) identified empowerment as "the process of an individual group or community increasing their capacity and contextual power to meet their own goals, leading to their transformative action" with community dynamic, emerging alternatives and social influence as main drivers inside the community. These processes are not only beneficial for the practising energy community but also influence the overall acceptance of renewable energy by society (Hewitt et al., 2019).

Despite the social benefits, the urgency for renewable energy and a faster energy transition to mitigate the effects of climate change, there were only 9000 recorded energy communities in Europe in 2022 (2022b). In order to achieve the Green Deal goals, and achieve Sustainable Development Goal 7, substantially more participation needs to be generated, especially long-term. However, we do not have sufficient in-depth understanding on which social factors enable and hinder people from taking part in an energy community and how they coincide with social psychology and group theories or deviate from them. This highlights the potential need for an adjustment in the theoretical framework of energy communities.

In the context of this problem, a qualitative study to investigate the causes of the problem via interviews has been conducted with the following research question: "What are social facilitators and inhibitors for the empowerment of energy community participants?"

Theoretical Framework

In this domain, previous research identified that personal pro-environmental attitudes and financial motives promote active participation in energy communities as well as overall pro-environmental behaviour (Steg et al., 2015; Stern, 2000; van der Werff & Steg, 2016). Adding to this Sloot et al. (2019) propose that the formation of energy communities is not merely reductable to an individual's pro-environmental identity but involves a person's connection to other community members pre-membership, their decision process, achievement of common goals during participation as well as several other social factors.

Social Capital Theory

For investigating which social factors lead to the empowerment of energy communities the three-part framework of social capital offers meaningful insights. The term social capital was coined by Jacobs (1961) and refers to a community's resources in terms of strong networks to promote trust, cooperation, and collective action. On this basis, the three-part framework of social capital was developed, resulting in the components (i) structural social capital, (ii) relational capital, and (iii) cognitive social capital.

First of all, structural social capital refers to the number of network ties inside a community or social unit (Nahapiet & Ghoshal, 2009). Structural social capital can be described based on the measures density, connectivity, and hierarchy that belong to a community. This part of the three-part social capital framework is especially important because the extent of network ties influences the spread of values and opinions according to Nahapiet and Ghoshal. Secondly, the relational capital depicts the quality of relationships inside a community and is based on Granovetter's term "relational embeddedness"(1992). It implies that relationships arise through several interactions over time that are characterised by positive attachments. Consequently, those personal relationships shape an individual's social motives like sociability, approval and prestige as well as overall behaviour (Nahapiet & Ghoshal, 2009). Lastly, cognitive social capital describes the mental resources a community shares. This involves shared norms, interpretation of values, and how they create meaning (Voss, 2017). In their study (Caferra et al., 2023) applied social capital theory to determine participants' willingness to participate in community energy projects in contrast to previous studies that only took economic and bureaucratic factors into account. Within their research, they were able to identify two social factors that encouraged participants to join: connection

through family members and a common social channel that is based on trust and interactions. Caferra et al. concluded that the quality of relationships therefore not only influences the initial participation but also active long-term involvement (2023)

Social Identity Theory

One relevant factor that predicts participation in a social group is the degree of identification an individual has with their community. This can be explained with social identity theory based on the work of Tajfel and Turner (2004) which encompasses different processes for instance social categorisation and within-group assimilation. This leads individuals to categorise themselves in social groups based on distinct attributes and subsequently derive a part of their self-concept and adapt their norms to consider themselves as a part of that group. If the identity of a group is especially salient, an individual perceives themselves as an ingroup member that internalises a group's norms, attitudes, and behaviours (Masson & Fritsche, 2014; Tajfel & Turner, 1979). Consequently, individuals self-stereotype and assimilate their norms, attitudes and behaviours accordingly to remain part of the group.

Due to the important connection Social Identity Theory has to group processes and community action, the theory has been proven useful in being applied to social movements such as the Tamil Resources Conservation Trust (Chabay et al., 2019; Sloot et al., 2019) Community energy projects share several characteristics with social movements like the connection with other community members and having common goals (Bell et al., 2005; Sloot et al., 2019) Thus, Social Identity Theory has been regularly used to gain insights into environmental movements as displayed in a study by Schulte et al. (2020). They established a "strong link between a person's identification with a transformation-oriented group and their intention to participate in collective actions organised by this group". This is also supported in a recent study by Goedkoop et al. (2022) who investigated personal and community factors (specifically group involvement and group identification) that facilitate involvement in energy initiatives. Therefore, if a pro-environmental community identification is salient, people are more willing to participate in community action projects like energy communities.

Trust

As part of creating a common social channel, interpersonal and social trust are significant factors when it comes to community participation in renewable energy communities. Interpersonal trust refers to "confidence in another person (or between two persons) and a willingness to be vulnerable to him or her (or to each other)", while social trust refers to citizens' trust in institutions, authorities and companies and willingness to be vulnerable (Ma et al., 2019, p. 1). In order to identify the role interpersonal and social trust

plays in community renewable energy, Walker et al. investigated the relationship between trust and working collectively, consensually and effectively concerning establishing energy communities (2010). They concluded that both types of trust have a distinct role in creating cooperation and communication which are essential for building a community energy project. Especially, when it comes to the initiators of a project and local citizens, trust is important to move the project forward while the involved parties feel positive (Walker et al., 2010). Similarly, a study by Von Bock Und Polach et al. (2015) that took place in two villages in Germany depicted trust as a pivotal source for cooperation and the development of energy communities.

Social Comparison Theory

When members of a community have to make a decision regarding their participation in an energy community, Social Comparison Theory explains how people influence each other. Festinger describes the focal point of his Social Comparison Theory as the tendency for people to resort to other people's opinions in times of uncertainty about their own opinions and abilities (1954). This can either consist of upward comparison, where individuals compare themselves to others who are perceived to be better off or downward comparison, where individuals compare themselves to others who are perceived to be in a worse situation.

By now, several studies indicate that comparison to others influences an individual's self-concept as well as motivates future behaviour (Bruchmann, 2017; Samek et al., 2020). Those insights have been utilized in the context of pro-environmental behaviour, more specifically to create social comparison-based interventions that facilitated people to recycle more (P. W. Schultz, 1999), have a more mindful water consumption (W. Schultz et al., 2019), and decrease their electricity consumption (P. W. Schultz et al., 2015). Furthermore, those studies highlighted, that upward- as well as downward-comparison are equally useful tools in establishing more pro-environmental behaviours (Bruchmann, 2017). This is due to the fact that the motivation to repair their self-image as well as maintain or improve their self-image ultimately leads to self-enhancement. Hence, people in potential energy communities might compare themselves with each other and are inclined to participate, if they compare themselves to others that are participating or publicly display their non-participation.

In summary, the aforementioned theories from social psychology give some insights into potential motivational factors of the empowerment of energy community participants. Nevertheless, there is little in-depth knowledge of facilitators and inhibitors of environmental initiatives that encourage long-term participation. Therefore, this study investigates the

research gap based on social psychology to adequately address the research question through an interview study.

Methodology

Participants and Design

This explorative study utilises semi-structured interviews to gather deep insight into the group processes and participants' perspectives on the inhibitors and facilitators of energy community participation.

The participants were chosen based on a non-representative convenience sample, as the study depends on the willingness and time of the participants to take part in the study. The participants have been contacted via e-mail that was accessed through an online list of German energy communities. As a result, the interviewees were all either chairmen, heads of municipalities or managing and representing the community in another way instead of regular citizens. Overall, the response rate was 27.2%. In total, there were 10 participants (n=10) with one of them being female and 9 of them being male. Moreover, the age of participants was between 58 and 74 with a mean of M = 65.8 SD =4.9. The nationality of all participants was German as well as their native language. All interviewed participants gave verbal informed consent and therefore no one needed to be excluded from the sample.

The communities the interviewees lived in were in different parts of Germany and can be described as diverse. Concerning their specific location, the majority (40%) of interviewees were part of energy communities in Baden-Wuerttemberg, two interviewees came from Schleswig-Holstein (20%), while the remaining participants inhabited villages in Hessen (10%), Rhineland-Palatinate (10%), North-Rhine Westphalia (10%), and Bavaria (10%). Thus, the participating interviewees predominantly came from villages in the south of Germany. The number of citizens in the villages ranges from 330- 11.000 with community energy participation ranging from 34% to 98%. Based on their nature the energy communities can be divided into two types: limited liability companies (LLC) (30%) and cooperatives (C) (70%). A limited liability company has characteristics of a corporation as well as a partnership which minimizes the financial risk for its members, investors, and external companies (Industrie- und Handelskammer, n.d.). On the other hand, cooperatives are a group of at least three people that aim to implement the interests of their members with their principles of self-help, responsibility and self-administration (Bundesministerium der Justiz, 2023). Members of a cooperative share the risks of their initiative by being their own investors, shaping the ideas and ideals of their community and being their commercial partners. This is described under the identity principle of cooperatives.

Procedure and Materials

After the participants agreed to a meeting, they received the participant information sheet (Appendix A) and a time and place for an online meeting via Microsoft Office was agreed upon. The study started with a greeting and an introduction to the study, its objectives, and the process of the interview. Before asking the participants any topic-related questions, they were asked if they consented to the interview being recorded and processing of their data. Then, to gather the participants' demographic data, questions regarding their age and gender were asked (Appendix B). Next, the participants were asked pre-established questions (Appendix B):

1. Can you tell me the basic information about your energy community?
2. Can you tell me about what led you to participate in an energy community?
3. What do you think led other people to participate in an energy community?
4. How would you describe the relationships inside your community before becoming an energy community?
5. When the energy community started who were the people responsible?
6. How would you relate your connection and activities to being a successful energy community?
7. How do you feel the effort, costs and power needed for the community project were distributed among the members of the project?
8. Can you think of reasons why people close to your neighbourhood who were aware of your project did not want to participate in an energy community?
9. Do you know of any community members that stopped participating?
10. Has there ever been a situation before or during the energy community project where there was a conflict inside the community?

These questions sometimes were supported by probes like *"Can you think of an(other) example?"* to collect enough data. After all questions were answered sufficiently, the interviewees had time to say everything they still wanted to mention. Finally, the participants were thanked for taking part in this study and the interview was ended.

Data Analysis

The transcripts of the interviews were analysed using qualitative thematic analysis to identify, analyse and create themes within the data. For this, the interviews were transcribed verbatim and read multiple times. The next step was to generate initial codes that represent interesting ideas and concepts throughout the different interviews. Afterwards, the codes were grouped based on reoccurring patterns and revised several times to ensure depth and

detail in each possible future theme. Subsequently, the overarching themes are created out of the adjusted codes in relation to the research question. These themes were subject to revision and were adapted to form the final name of the themes. As there are only ten participants, the inclusion criterion is that an aspect of a theme needs to be mentioned at least two times by different interviewees or in detail by one interviewee. The creation of the themes was deductive as the theoretical framework already influenced the creation of the interview questions as well as gave preconceived themes that are expected to be found. It is used to give personal and meaningful answers to what empowers and disempowers members of energy communities.

Results

Eight themes in relation to facilitators and inhibitors for the empowerment of energy communities were developed. The thematic analysis resulted in the themes Relationship quality, Trust, Collective Identity, Fairness, Persuasion, Compliance and Peer Pressure, and Experience of Success which are further displayed in **Table 1**. The themes were ordered based on the phase of participation they occurred most in. Therefore, Relationship Quality, Trust and Collective Identity are assigned to the pre-membership stage, Persuasion and Compliance and Peer Pressure to the decision-making process, and Fairness, Conflict and Experience of Success for the long-term continuation and participation in the project. Especially the themes that are connected to the pre-membership state were frequently mentioned, while the themes assigned to the decision-making stage were comparatively less observed. In addition, the themes of long-term continuation and participation arose more frequently again. Some themes also appeared way more often in some interviews like Collective Identity in interview 3, and Persuasion in interview 1.

Table 1

Frequency of occurrence for each code per interview

Interview	1	2	3	4	5	6	7	8	9	10	Total
Relationship quality	4	3	2	2	4	4	6	4	1	1	31
Trust	8	3	1	4	1	1	1	5	3	1	28
Collective Identity	3	2	15	9	6	5	3	1	2	-	46
Persuasion	10	2	2	3	1	2	2	-	1	1	22
Compliance and Peer Pressure	3	-	-	1	-	-	1	2	-	1	8
Fairness	-	2	2	2	2	1	2	2	1	1	15
Conflict	6	2	7	3	6	-	4	4	2	4	45
Experience of Success	3	2	2	1	4	4	-	2	2	-	20

Relationship Quality

During the interviews, it became more evident that the experience of positive relationships inside a community was beneficial for creating energy communities and was described as "friendly" (Interview 7, paragraph 83) and "like a family" (2, 32). Especially during the initial creation, positive relationships like friendships were considered beneficial for building the project. When asked about the initiators of the energy community project, interviewee 1 stated: "First of all they were neighbours." A similar situation was encountered by interviewee 4 who went to workshops with his friends to get information about building energy communities (4, 6).

One factor that was perceived as influential by the participants in fostering relationship quality was the level of the citizens' involvement through regular meetups and local activities. As examples, the participants identified "riflemen's festival" (2, 32); "theatre club and fire brigade association" (3, 23); "neighbourhood club" and "clubhouses" (4, 20) that offer meeting points and workshops for multiple generations. Moreover, this active social life was regarded as the building block for social cohesion: "We have a lot of different activities on our agenda which on one hand leads to a pretty good group cohesion and on the other to an overall good social climate." (4, 23).

In general, the interviewees valued the typical closeness of small villages: "Without the special connection we had as a community [before we started the project] inside our village, we would not be where we are today." (3, 140). This statement was further supported

by Interviewee 4: "We have an intact and active village community. And based on this, let me say, teamwork that already existed, our cooperation as an energy community emerged." (4, 13). Subsequently, even when the community faced hardships, they could count on one another due to their positive relationships:" Whenever you need help, you just know that there is always someone that will be there for you." (7, 37).

On the other hand, two interviewees mentioned that positive relationships do not play a tremendous role in the existence of their energy community: "We do not have many meeting points in our village and it is rather distanced. We know each other but we are not friends in any way. That way there are also fewer fights and everything runs smoothly." (10, 17). Despite being small villages, those interviewees valued efficiency in their project and were indifferent about the overall relationship quality.

Trust

Another theme that arose during the interviews for facilitating initial participation in an energy community was the level of trust between the different actors. One of the interviewees mentioned that some of the citizens did not believe in the abilities of the potential biogas plant operator instead of the previously used electronic companies: "You have to have basic trust in the plant operator and say: "He will not let us down." I mean, you have contracts but in the end that is only a piece of paper. It is important to have a good feeling and know that you can rely on someone." (2, 52). This comment was further supported by four other interviewees, for example, another interviewee pointed out: "We are completely dependent on the biogas plant operator... He has to feed his biogas plant so we can heat our homes in winter." (2, 17). This mistrust led to some people not initially participating: "Some people said: "I do not trust him, I don't care about it", and then did not participate." (1, 33) and "We had people that consciously decided not to participate […] because they did not trust the system [the biogas plant operator and the technology]." (9, 20). In general, trusting in a new technology was difficult for many citizens: "We had a lot of sceptics before the project started that asked:" Is the system even working? What if […] we cannot heat during winter?" That is why we also have back-up systems that still rely on wood and oil." (7, 95). Nevertheless, the energy communities found means to generate trust.

Over time, it was mentioned that evidence of trust by the main operators encouraged participation. One Interviewee mentioned an incident when his energy community faced technological problems with their biogas plant and how the community perceived the biogas plant operator's work: "You know you can trust someone when technology fails and he [the biogas plant operator or other responsible people] takes on the task responsibly and fast […]

and everything worked out in the end." (2, 81). Another way to give evidence of trustworthiness is by explaining that the initiators do not only act out of self-interest. Some citizens we preoccupied with thoughts of being taken advantage of and only being a means of generating more money for others:" Then we pointed out:" The biogas plant operator has been doing this for five years and heat is created anyway […] and if he wanted to, he could earn a lot of money but we want to create the lowest heat energy prize possible. And a cooperative approach is perfect for that." (1, 31). Interviewee 3 shared a similar experience where he pointed out that the biogas plant operator is not the only one that can benefit:" We had people criticizing:" He [biogas plant operator] only want to earn a fortune", […] but we made it clear to them that they can invest money in the future [to generate money long-term as well]." (3, 108).

Additionally, trust was an important factor in following word-of-mouth recommendations by peers. In this context one interviewee mentioned: "You could regularly see it, if one person said yes to the project, the person beside them also agreed. They trusted each other and told themselves "Okay, if we are doing this together, it should all work out" (8, 136). Especially, when those word-of-mouth recommendations stemmed from already trustworthy considered persons, initial participation could be facilitated:" You need [known to be] trustworthy people that spread the word. If you have someone that is not active in the community and is not active, he will not reach the people […]." (4, 133). Therefore, trust is a significant factor in a multitude of ways.

Collective Identity

In many energy communities, shared goals, values, beliefs, and traditions facilitate a connection between the citizens: "We are all in the same boat." (1, 99). Therefore, group identification appears to be especially high, the smaller the village is as the head of the municipality of one village explains:" With a lot of people you also have way more opinions and beliefs. The more compact a village is, the higher the citizen's cohesiveness, and - very importantly – also the identification. "I live in [name of the city], it is my village and I want to become active here." This decreases the more citizens there are." (3, 67). Besides size, there are also shared factors that contribute to identification with the community.

First of all, every interviewee mentioned that the generation of income is a shared goal of every citizen in the community. For example, one interviewee said: "The first and most important factor is always money; what do I need to invest? How much money can I make long-term?" (3, 91). Some communities, however, invest the excess money into projects for the citizens or redesigning their environment:" For Christmas, every child under 18 receives

Christmas money, […] and we are currently working on a new outdoor pool." (2, 47). Moreover, the shared goal of protecting the environment and fighting climate change was mentioned:" Some people are merely doing it for a good feeling, for protecting the environment." (2, 14)

When it comes to shared values, many interviewees agree with the importance of sense of community for maintaining and improving their energy communities. For example, one interviewee mentioned: "[We share] the interest in living here in peace in a good community, that is basically the subordinate goal, that is more important than everything. This connection is at the core of what we do." (2, 40). Additionally, other shared values across several interviews include "Honesty, "Reliability", and "Integrity" (4, 68).

Lastly, an example of how tradition facilitates a collective identity is the village with the first easter egg market in Europe: "Those are days [of the easter egg festival] when you are especially proud to be from [Name of the village], even when you cannot paint easter eggs yourself." (4, 64). When prompted what this means for the community, the interviewee mentioned "Yes, I would say it brings the people closer together, if you can say it like that." (1, 99).

Altogether, shared values, goals and traditions are seen as contributors to a shared identity, which was a meaningful contributor to the creation of those energy communities. However, at the same time, some interviewees talked about an increase in collective identity after the formation of their energy communities: "Let's say, someone buys a house here that already has a connection to the local biomass-fired heat network. He will not remove the connection and then he is already part of the community." (2, 109). Likewise, another interviewee described the change in social structures due to energy community formation: "[…] And you know that it actually changes the social structure of villages because they are getting closer together because they have a shared project that they build from the ground and made it work, which they continue to work on and want to develop […]." (3, 61).

When prompted about whether fairness played a role in initial participation for citizens, the interviewees highlighted that envy concerning money often led to people not participating: "I do not even know where the rumour came from but someone said that we are only investing all our money, so the biogas plant operator becomes rich." (7, 107). In order to reduce envy among the citizens, one interviewee reported: "We have two information events so everyone knows exactly about the processes and how they can get involved, how to generate money without claiming that they did not know it." (10, 33).

Persuasion

In order to have as many people as possible participating in their energy communities, the stakeholders like the heads of municipalities, boards, and representatives of companies created means to persuade the people who voiced concerns before and during the project or lacked information. For this, all energy community boards created informational events to convince their citizens with explanations, experts, and arguments:" Before anything was set, we made an informative event, invited experts […]." (5, 31). According to one interviewee, this led to great interest and citizens asking: "How can we implement this here?" (4, 17). Another way of convincing the public with information was the use of social media and apps. All of the interviewees identified that they had Whatsapp groups to spread information and benefits:" We have a Whatsapp group with half of the village […] and more and more people want to join. This has always been good for promotion and it remains that way." (4, 77). A factor that was considered as specifically persuasive was the benefits in terms of money:" The better and more plausible the calculations were, the more people spread the word and thus more people joined." (7, 47). Therefore, the energy community boards needed specific people to spread the word even more.

The interviewees reported that leaders who approached people were especially important for convincing people who were still unsure:" […] I was sitting in every kitchen, every living room of the people that could potentially join us." (3, 70). Similarly, one interviewee reported: "We walked through our streets, talked to the people asked whether they wanted to join, what kind of heating system they have […] and I calculated it [the heating price with community energy] for every single one of them" (1, 41). This also led to "some people joining later" (1, 33). Nevertheless, this was considered "depressing" (3, 79) by the leaders, as not every single person could be persuaded. However, there is still need for leaders because "if no one initiates it, nothing is going to change" (3, 130).

Additionally, role modelling of people that were considered important by the public was regarded as persuasive:" What was very positive in our case, [was] our local chairman who had just bought a new wood-fuelled installation and still joined our local heating network." (4, 28). It was further elaborated by Interviewee 4 that "the signals someone with a key role sends [to the public] encourages the others to really think [about renewable energy], […] and push us forward." (4, 28). Another example of role-modelling is:" In our village I have a special role as the head of municipality, right? […] You always have a special relationship [to the citizens] when you have a function like this. And if you have a sustainable attitude as the head of the municipality, you also have a particular influence on your

citizens." (3, 134). Next to informative events, leaders and role models, there were also more direct measures to persuade the remaining citizens.

Compliance and Peer Pressure

There were several instances in which people joined because of the direct or indirect influence of peers or to comply with a direct request. When prompted whether there were other means of persuasion, one participant talked about a specific incident:" We could only connect those people (to the grid), that had enough participants in their street. There was an approximate value for houses per 100 metres, and sometimes it happened that people went to their neighbours and said:" You should join us so we have enough people to join because it is a good thing to do." So it was not just the board but a lot of citizens that already joined who wanted to convince them." (1, 73). Therefore, many people complied with a direct request by their neighbours and joined the energy community.

Furthermore, it was identified by interviewees that peers had a detrimental influence on one another: "You could directly observe it: if someone decided to join, their neighbour also wanted to join." (8, 136). In another energy community, the launch of the entire project was uncertain due to many people being indecisive about whether they wanted to join or not. During an information event, one of the board members consequently said: "Okay, who wants to join and who does not? If we do not have more than 30 participants, we are not going to realise this project." (8, 34). After a few people raised their hand to join, many others followed according to the interviewee:" And in the end, everyone suddenly agreed and wanted to join. That was previously not at all detectable." (8, 34).

Despite the generated participation being created through compliance and peer pressure in some cases, every citizen remained a part of the energy community long-term:" Everyone is still enthusiastically part of the community." (4, 74).

Fairness

Once the decision is made in favour of creating an energy community, the time cost and energy distribution between the different actors play a tremendous role in the continued existence of the energy community. In general, during the first years, the energy community boards were heavily occupied which led to dissatisfaction and sometimes even withdrawal: "During the first years, the director was strained because he was basically solely in charge for the whole project. He then almost left the project." (6, 48). This was also pointed out by another interviewee: "The beginning of such projects is always very demanding […] During the developmental state the work distribution is definitely unfair […] If you want to start a project like this you need to be convinced of the good cause [otherwise you would not

manage it]." (3, 98). In one incident interviewee 6 experienced, they tried to re-establish fairness by reducing the director's workload: "Now we have two people that are responsible [for that work] and now it is way fairer and the atmosphere also improved a lot" (6, 49). Therefore, fairness affected the relationship between the board members.

Despite evidence of unfairness during the developmental phase for some participants, many participants pointed out that "the distribution is based on abilities" (7, 59) and "everyone contributed with their own talents and means" (10, 7), for example, people working as accountants took over the administrational parts of the project. Overall fairness was rated as a priority and moderators are needed so "no one is overwhelmed or not challenged enough" (10, 15).

Conflict

In several villages, conflicts either inhibited the initial creation of energy communities or prevented citizens from joining them. Especially, when personal conflicts arose or already existed with the biogas plant operator or farmer, citizens were unlikely to join: "There were some people that had reservations against the farmer and did not join because of that." (1, 25). Another example of a pre-existing conflict was one between the board of a village and a citizen:" The two people could not be in a room together without a fight. At that time, the project died and was only picked up later." (7, 33).

When asked about how the community dealt with conflicts to continue their energy community project, the responsible people, like the head of the municipality, focussed on solution-based interventions:" […] and we wanted to build a sewage sludge system but we had a citizen initiative whose people were scared because 'sewage sludge' is heavily negatively connotated. […] We had several meetings with concerned people and talked to them in a discussion round. Then we also discussed it in the municipal council as well as to single persons directly. In the end, the criticised part of the project was cancelled so we did not have to deal with it anymore." (6, 31). Overall, it was considered beneficial to give the citizens a say in every matter:" In order to make this work, we need to be a team and find compromises as there will always be differences." (6, 39). However, problem elimination could not convince all people to change their minds concerning joining the energy community.

Experience of Success

When it comes to which factors encouraged people to stay in the energy community project long-term, it was the experienced level of success and the pride connected to it. One interviewee elaborated: "[Success] is an important factor […] it encourages the citizens and

affirms the decision they made. Therefore, the experience of success is very high." (2, 87). Sometimes success is even celebrated in energy communities:" As soon as we manage to solve [a problem] we are meeting up for a beer, look each other in the eyes and say:" We have all the competencies that are necessary to solve problems." That is a beautiful moment." (4, 133). Especially the fact that success is due to group efforts is appreciated, according to interviewees: "If you made something work together, you get a good feeling. It is more meaningful to be successful together." (6, 85). In general, the experience of success also leads to a positive atmosphere among the citizens: "The citizens are ecstatic about it [our success]." (3, 142). Besides a positive atmosphere, the level of achievement also affected how the communities viewed themselves.

Regarding the feeling of success inside the communities, many interviewees reported a feeling of pride:" We never regretted what we did and we are proud that we did it." (2, 75); "I believe that people are proud to no longer use fossil fuels […] and now they [the citizens inside the EC] can say to their neighbours that they are role-models" (1, 104). The feeling of pride was especially prevalent when the energy communities gave tours through their village, were interviewed by the media or could otherwise show their sustainable lifestyle: "At this point, we have visitors from over 130 different countries that we guide through our energy parks and give them information […]. Things like that definitely make you proud." (5, 21). Moreover, pride was also a motivating factor to influence others: "Because of that [pride] we also planted wildflowers around our biogas plants. That way we send a signal that if we can do it, the others should also do it." (10, 33).

Conclusion and Discussion

This exploratory study aimed to investigate which social factors facilitate or inhibit the empowerment of energy communities in Germany. For this, semi-structured interviews with ten energy community participants were performed that were transcribed and then analysed using thematic analysis. The outcome of this analysis was the identification of eight facilitators and inhibitors, namely, Trust, Relationship Quality, Collective Identity, Persuasion, Compliance and Peer Pressure, Fairness, Conflict, and Experience of Success.

After analysing the interviews, it can be determined that the factors that empower the participants of energy communities as expected based on Social Identity Theory and Social Capital Theory are collective identity, trust, and relationship quality. Even though those themes are important throughout the whole process of creating and maintaining energy community participation, they proved particularly valuable for the initiators and initial citizen participation. This is due to their functioning as building blocks for all community activities,

including the creation of energy communities. Especially, Collective Identity factors like activities, and shared values and goals were regarded as detrimental to achieving a sense of community between members and stakeholders. Based on the Sense of Community Theory by Jason (1997) it is argued that the psychological sense of community facilitates participation in social groups (Chavis & Wandersman, 1990) consistent with the findings of this study. Conversely, a meta-analysis by Talò (2018) suggests that a sense of community only has a moderate effect on initial participation due to many other social factors that need to be taken into account for determining community activity. Thus, community activity can be regarded as only one part of a complex system of social factors like trust and relationship quality that need to play together to enable participation.

Moreover, for the decision-making process, social influence in terms of Compliance and Peer Pressure and Persuasion, played a role in some instances. This was expected based on the Social Comparison framework which proposes that people compare themselves to others when they are uncertain about their actions (Festinger, 1954). What was unexpected was the interviewees' categorisation of participants based on how fast they adopted the new technologies like solar panels that are involved in creating an energy community. This coincides with Rogers et al. (2014) Diffusion of Innovation Theory which describes this process in more detail by categorizing people into five adopter types: (i) innovators, (ii) early adopters, (iii) early majority), (iiii) late majority, and (iiiii) laggards. All of those adopter types pass through a so-called innovation-decision-process consisting of five steps that do not need to follow each other consecutively: (1) Knowledge; (2) Persuasion; (3) Decision; (4) Implementation; (5) Confirmation.

According to Rogers, the spread of an innovation further depends on the number of channels a community has in the form of relational connections, activities, media, and other ways of communicating information which also connects it to the previously mentioned themes Relationship Quality and Collective Identity. Furthermore, Roger's theory suggests that exposure to innovation influences an individual's adopter type. This is reflected in this study, as certain areas like the north and south of Germany have especially high exposure to renewable energy due to the available landscape, better conditions for gaining high yields and advanced support from their federal state (Agentur für Erneuerbare Energien, n.d.). Those areas therefore have a higher concentration of energy communities and visible renewable energy (Rauner et al., 2016). In this context, this might lead to a shifting baseline in the south and north of Germany as the conditions for renewable energy are more suitable, and easier implemented which leads to a higher exposure that influences the norms and acceptance

concerning environmental issues (Soga & Gaston, 2018). Therefore, the decision-making process is shaped by social influences as represented by the created themes but expands to the categorization of individuals' adopter types, their exposure towards renewable energy, and how it is communicated throughout the community.

Moreover, the themes of Fairness, Conflict and Experience of Success arose as especially relevant for the long-term continuation and participation in energy communities. Aspects of distributional fairness as described by Bal et al. (2023) like time, cost, and energy distribution were often rated as necessary among the interviewed energy communities. Empirical studies even showed that this also influences individuals' attitudes towards renewable energy projects (Huijts et al., 2014, 2022), however, the degree of distributional fairness varies greatly among the participants of the energy communities. This difference is explainable based on the energy communities' nature, specifically whether their origin was a cooperative and citizen-led or a limited liability company. A cooperative is characterized by being owned solely by its members which also leads to a work distribution among them. Since the work for an energy community is voluntary without rewards besides a little compensation, this led to a certain level of unfairness as well as indications for leaving the project. A study by Wu et al. (2022) highlights the necessity for a reward system that is equivalent to the time, money, and energy investment everyone makes. If applied correctly, a reward system can increase participation and add to a positive atmosphere around volunteers which ultimately reinforces them to stay in the project.

Moreover, the concept of conflict frequently arose and affected participation. Conflicts appeared due to misunderstandings, stress, perceived lack of fairness, trust and negative relationship quality which coincides with the work by Herbes et al. (2016). This highlights the importance of the building blocks of an energy community to avoid future conflicts or aid the conflict resolution process. According to Herbes et al. (2016) workload distribution was the most influential conflict factor for cooperatives due to constant work overload, lack of rewards, and missing communication with the other volunteers, which was also the case for the participants from cooperatives in this study. Another relevant factor is the difference in individual motives for participants to join an energy community. Those motives range from promoting the energy transition, decentralized independent energy supply, and economic benefits to community work which can lead to conflicts in heterogenous groups when a decision can be made based on either idealistic or economic factors. However, conflicts do not have to have negative effects but can be an opportunity to practice cooperation (De Dreu & Beersma, 2005). In order to successfully overcome conflicts

Herbes et al. (2016) identified the following instruments: moderated workshops with role plays and perspective taking, identifying the different goals withing the community and creating a manual for handling common conflict situations that the majority agrees upon. That way conflicts can be handled adequately do encourage long-term participation and minimize the risk of losing participants.

Lastly, the experience of success turned out to be very important for sustaining participation in energy communities. Especially striking was the indication that there is a relationship between community activity, long-term participation, and financial resources for an energy community's success, while the experience of success also fosters the aforementioned factors. To encourage overall participation even more, it further appears to be useful to incorporate community benefits instead of individual benefits (Hoffman & High-Pippert, 2010). This was also implemented by some energy communities in this study and had a similar effect, which makes the experience of success a significant contributor to energy community participation.

Strengths and Limitations

The present study offered a unique and meaningful in-depth insight into participants' perspectives on being part of an energy community. The findings not only reflect the conclusions of previous research but are also able to allocate inhibitors and facilitators according to the steps towards long-term energy community membership. Consequently, it enriches the foundation of creating a framework for energy community participation, which could possibly influence the way energy communities are promoted and facilitated.

Nevertheless, the study has limitations that need to be considered in case of replication. First of all, the interviewees often were important stakeholders like head of the municipality inside the community and therefore have an obligation to their village and the way it is perceived. Hence, social desirability can be a confounding factor that made the interviewees represent themselves and their community in a more desirable way to the interviewer by, for example leaving out information about perceived undesirable behaviour (like conflicts) or exaggerating perceived desirable views and behaviour (like community activities) (Latkin et al., 2017).

Furthermore, due to their role as important stakeholders, their perspective might be limited as they are already convinced of the project and its benefits despite sometimes not being an active part of the community themselves. Due to not being an active part, the interviewees sometimes had to guess or not answer the questions. Subsequently, it cannot be ascertained that the outcomes of this study reflect the opinions of the whole community. In

order to improve the accuracy of the interviewees' statements and make the study more representative, it is recommended to include regular community members in the sample as well. Hence, a stratified sampling method is advised.

In Addition, in some energy communities, certain themes arose way more frequently than in others. This led to the total number of themes being higher in some cases like in the case of the theme Persuasion in interview 1. In order to ensure that this theme can still be regarded as a strong pattern for energy community participation, this study should be replicated with a greater and more diverse sample size. That way it can be ascertained if the themes that occurred frequently in only one interview in this study could still be part of a general framework for energy community participation.

Lastly, even though the participants were often asked if the researcher understood them correctly, it cannot be guaranteed that the codes and themes are accurate interpretations of the participants' meanings. To ensure that the codes are actual representations of the anticipated variables, an inter-rater reliability test should be made (McHugh, 2012). That way the credibility of the themes would improve.

Recommendations for Future Research

For future research in the domain of energy communities, it is advised to further investigate social inhibitors and facilitators to sustainably empower energy communities, as they have been identified to contribute to the establishment and continuation of those projects. First of all, new research should investigate the role information-spread theories like the Diffusion of Innovation Theory have in adopting renewable energy sources. In this study, some participants already mentioned that they encountered social diffusion and different types of adopters, however, investigating this process might offer meaningful insights into energy community group behaviours as well as recommendations for specific target groups like laggards. That way, overall participation over a diverse group of people might improve.

Moreover, as the themes in this study mainly found out more about facilitators, it would be beneficial to also focus specifically on inhibitors. In order to do this, it would be interesting to specifically investigate failed energy communities and what barriers they faced during the establishment or continuation of their project. This could be especially insightful as themes occurred frequently in the pre-membership and long-term continuation phases. Additionally, individual ex-members could also give deep insights as well as people who live close to an energy community but decided against joining. Building upon that, an intervention based on a framework on how to incorporate more facilitators as well as how to deal with inhibitors could help struggling energy communities to keep their projects.

Finally, there is a need for a holistic concept that incorporates economic, bureaucratic as well as social factors for the creation of energy communities. Energy communities are a social system that are not only faced with community challenges but also economic and bureaucratic. Therefore, the interplay between those factors needs to be taken into account to support the long-term continuation.

Conclusion

The aim of this study was to identify social inhibitors and facilitators for the empowerment of energy community participants to add towards a framework. For this, eight themes were discovered, namely, positive relationships, trust, the role of collective identity, persuasive techniques, social influences like compliance and peer pressure, and shared experiences of success. These results show that different social antecedents and factors aid initial and long-term participation. With empowered long-term participation in energy communities comes a tremendous reduction in greenhouse gas emissions, which in turn protects biodiversity, the environment, and the survival of humankind. We cannot solely rely on the government to save us from the climate crisis but need to act as empowered, independent and self-sufficient as the energy communities in this study to build a future we want to live in.

Appendices

Appendix A

Participant Information Sheet

Creating Resilient Energy Communities

Dear participant,
thank you for being interested in participating in this study. Before continuing with this study, you need to understand what participation will involve. Please take time to read the following information carefully and think about the content. If there is anything unclear, you can ask us for more information. Take time to decide whether you want to take part
Study Background
This study is conducted by Sarah Nienhaus and Helene Vogel under the supervision of Peter de Vries from the Faculty of Behavioural, Management, and Social Sciences at the University of Twente. For our bachelor thesis, we are examining what motivates people to take part in energy communities long-term and to which social benefits this leads. While there are no immediate benefits for the participants of this study, it is hoped that this project will encourage the growth of energy communities
What you are being asked to do
If you decide to take part in this study, you will be invited to an interview. Overall, those interviews are expected to last between one and 1,5 hours.
Your Right to Withdraw and Withhold information
To analyze your answers, the interviews are recorded. You will be asked for your verbal consent before the researchers start the recording again. After the transcription of the interview, the recordings will be destroyed, and the obtained data will be stored safely and handled strictly confidential. Therefore, you will not be able to be identified in any report. Participation in this study is entirely voluntary. You can decide to withdraw at any time without giving a reason and any consequences. Moreover, you can have your data withdrawn from the time you complete until the 3rd of May 2024, as your data then will have been analysed and written up.
For further questions do not hesitate to contact the researcher(s) using the details below

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Appendix B

Demographic Data and Question List

Name:

Age:

Gender:

Nationality

1. Can you tell me the basic information about your energy community?
2. Can you tell me about what led you to participate in an energy community?
3. What do you think led other people to participate in an energy community?
4. How would you describe the relationships inside your community before becoming an energy community?
5. When the energy community started who were the people responsible?
6. How would you relate your connection and activities to being a successful energy community?
7. How do you feel the effort, costs and power needed for the community project were distributed among the members of the project?
8. Can you think of reasons why people close to your neighbourhood who were aware of your project did not want to participate in an energy community?
9. Do you know of any community members that stopped participating?
10. Has there ever been a situation before or during the energy community project where there was a conflict inside the community?

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