The Impact of Energy Communities

An explorative interview study on the psychological and social impact of energy communities on their participants and local community

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Abstract

Increased usage of renewable energies plays a growingly important role in counteracting the climate crisis. Energy communities contribute to this by allowing local citizens and communities to invest in sustainable resources together and actively drive the local energy transition. This exploratory interview study investigated the psychological and social impacts energy communities create for their participants and local community. The semi-structured interviews with participants of 10 different renewable energy collectives all over Germany were analyzed using thematic analysis to reveal the following eight themes: "Achievement", "Group Building", "Quality of Life", "Pro-Environmentalism", "Problem Solving", "Security", "Stress", and "Trust". These themes allow for greater insight into the different impacts these energy communities created for their participants and their environment. Some findings that were obtained through the interviews were the increased renewable energy acceptance and behaviors among participants and the surrounding communities, the importance of energy security and decentralization, and the role stress played for participants. The insights that were acquired in this study for one add to the inadequate literature of social and psychological impacts of energy communities, and furthermore lay ground for future research in this field, which is needed to eventually create tangible solutions for the climate crisis. During the preparation of this work the author used the Microsoft Teams transcription function to aid in transcribing one of the interviews. After using this tool, the author reviewed and edited the content as needed and takes full responsibility for the content of the work. No further artificial intelligence tools were utilized by the author.

Introduction

The climate crisis is a major societal problem that we are facing right now, and which can have a huge effect on human security. Through climate change, our society is facing threats such as resource scarcity and worsening of existing environmental, social, and economic factors (United Nations, n.d.). According to the United Nations, energy lies in the center of the climate crisis, not only as a contributor, but also as the key to solving the issue. Renewable energy sources and sustainable living are a center point of facing climate change and creating a more livable earth for everyone. Thus, we should consider these renewable energies, like wind, sun, and water energy, as a major starting point to cut down on damaging fossil fuels and face the climate crisis head on (United Nations, 2023).

Fighting climate change cannot be done by one individual alone. In many places, like the UK, Australia, Belgium, Germany, Canada, and in the Netherlands, local community-based energy initiatives have set foot to take on the challenge of living more sustainably, often by utilizing renewable energies. In short, energy communities allow local citizens to join forces and invest in renewable energies. By empowering citizens to actively drive the local energy transition, these communities become a great tool for restructuring our energy systems and allow local communities to access tailored solutions for their needs and preferences. This empowerment translates into tangible benefits for individuals, including improved energy efficiency, lower bills, and increased opportunities for local green jobs (Bauwens & Devine-Wright, 2018; van der Schoor & Scholtens, 2015; Walker, 2008). According to EU legislation, energy communities are permitted to take various forms, such as an association, a cooperative, a partnership, a non-profit organization, or a limited liability company, but in all cases, it involves people working closely together (European Commission, n.d.).

As already established, energy communities have been founded in many different places around the globe already. Gjorgievski et al. (2021) reviewed the economic, environmental, technical, and social impact of a multitude of different energy community projects from many of these different countries. The paper mostly placed emphasis on the economic, environmental and technical effects of energy communities, and although there were some social impacts, it was also emphasized that there is still a lack of research on social impact of energy communities. Among the papers in the literature review, only few include social or psychological aspects, and compared to the evaluation of environmental, economic, and technical impacts, less emphasis was placed on social or psychological impact of energy communities. Nonetheless, it is important to measure these impacts energy initiatives have on their community and surroundings and the benefits they create for the citizens' well-being.

In addition, some studies have focused their research on the psychological factors involved with energy communities, but these studies are often focused on the willingness of citizens to participate in these projects (Goedkoop et al., 2022; Koirala et al., 2018). Furthermore, it is important to investigate how the other factors like economic, technical, and environmental impacts have improved the communities' lives on a social and psychological level. In this light, the purpose of this study is to investigate the impact renewable energy projects create. The research question is stated as follows: "What is the psychological and social impact of energy communities on the participants and their local community?".

The impact is described as the effect or outcome that results from the creation of an energy community and the benefits or disadvantages it creates for its participants and community. Furthermore, psychological impact is understood as "the effect caused by environmental and/or biological factors on individual's social and/or psychological aspects" (Oliveira et al., 2013). On the other hand, social impact can be seen as the consequences to human collectives that change the ways in which these individuals live, work, relate to each other, or generally cope as a member of the community (Burdge et al., 2003). In the case of this study, we want to explore the effect that energy communities have on their individual participants as well as the society they live in, through a qualitative study.

Theoretical Background

Energy communities rely largely on collective input. Working together in this way allows these renewable energy initiatives to reap the proven benefits of teamwork. These benefits include not only enhanced productivity, minimized mistakes, and fostered creativity and innovation, but also generally improved problem solving in addition to increased well-being of the participants (Middleton, 2023). Specifically for renewable energy projects, it was shown that these result in better decision-making processes, increased adoption and acceptance of renewable energies, positive behavioral change, and larger interest in community-driven initiatives (Schweizer-Ries, 2008; Teladia & van der Windt, 2024). Another study on participation in local community organizations showed increased group-efficacy and heightened group identity among volunteers (Ohmer, 2007). These elements and benefits of group work should also be investigated, as the participation in an energy community involves a certain amount of group work, the impact of this will be thematized in this study.

Psychological impact also involves people's emotions. Regarding emotional change related to energy community participation, studies have shown that renewable energy projects have an effect on the participants' positive emotions such as pride, joy, and sense of collective achievement (Rincón-Rubio & Cedano-Villavicencio, 2023). Although delivering important insight into emotional side of energy communities, this study was conducted in communities that had previously no access to electricity at all. These positive emotions are thus an impact of gaining access to electricity at all, and it was stated that many felt relief in relation to the opportunities that were provided through gaining electricity. In that regard, it should be tested if these positive emotions also apply to communities in Germany, where access to electricity is

already a given in most households, and whether there are other factors that influence these communites' sense of pride, achievement, or joy.

Another impact that was measured in energy communities was economic improvement. In Gjorgievski et al.'s (2021) study, economic benefits included energy bill savings, investment, and operation and total cost savings. It was shown that financial satisfaction is related to personal well-being (Gerrans et al., 2013), in turn it should be an interesting insight if saving money and gaining greater financial stability through participation in a renewable energy project also creates improved well-being for these citizens or how participation has influenced their lifestyle in general.

Participating in an energy community also plays a part in awareness of renewable energies, as well as a rise in renewable energy uptake. (Rogers et al., 2012). Furthermore, other studies showed increased positive attitudes toward sustainable energies after participation in a renewable energy project (Bauwens & Devine-Wright, 2018). Bauwens and Devine-Wright's study additionally found that attitudes toward renewable energy were significantly more positive in urban areas compared to more rural areas. Furthermore, it is also suggested that one pro-environmental behavior can lead to more sustainable behaviors in the future through spillover. In the case of this study, participation in a renewable energy project can lead to participants engaging in more pro-environmental behaviors (Maki et al., 2019; Truelove et al., 2014). Overall, attitudes, awareness, and continued uptake of renewable energies after the participation in an energy community are factors that should be considered.

Another aspect that is important to consider in this study is trust, which is the confidence of a person that they can depend on something or someone else. Trust toward authorities, people responsible for the technology, as well as community trust has been shown to be connected to the acceptance of renewable energies (Huijts et al., 2012) and the willingness to participate in renewable energy projects. Additionally, trust between participants and the stakeholders can be an important factor in the development and implementation of energy communities (Walker et al., 2010). Furthermore, studies found that trust in renewable energies lead to more positive evaluation of their cost, risk, and benefits, and thus more positive feelings in general (Kalkbrenner & Roosen, 2016; Koirala et al., 2018). It is thus important to evaluate the role energy communities play in building trust, since it has been shown to play a role in different dimensions of renewable energy initiatives.

There are also aspects of security related to renewable energies. Due to scarcity in energy reserves and high energy import dependency, the European Union counts as a

vulnerable area for energy supply security (Gökgöz & Güvercin, 2018). On the other hand, Gjorgievski et al.'s study included reliability of energy and higher self-sufficiency as technical improvements of energy communities. Studies have shown that there is a link between energy security and subjective well-being, especially, worries about energy security negatively affect self-rated health (Mayer & Smith, 2019). In turn, more strongly guaranteed energy security through renewable energies should be a factor promoting increased well-being among participants of energy communities, which will be investigated in this study.

In addition, to positive impacts, it should also be of importance to investigate negative aspects participants of community energy projects experience through their participation. For one, stress is commonly experienced among people involved in group projects, often induced by deadlines, or high pressure that is put on the participants. In contrast, in Gällstedt's (2003) study, it was also implied that this stress that is induced over the life cycle of the project can be reduced by different coping strategies, and can, in the end, still be perceived positively and motivating, due to set goals. In this interview study, these findings should also be taken into consideration and the role of stress in the participation in an energy communities will be investigated. More negative effects that could result from energy communities is, for example, the social conflict that could result from the project. Types of conflicts that can result from the emergence of citizen renewable energy projects are the rejection of existing institutions related to energy or critical assessment of existing rules and practices on a larger scale (Cuppen, 2018).

The Current Study

There are many different psychological and social factors that should be considered regarding renewable energy communities. Many studies have already investigated aspects that motivate people to participate in these projects, as well as different elements that play a role in their implementation. Furthermore, there are several facets of group work, renewable energies, or well-being, that should be investigated within the context of benefits that the participation in energy communities creates for the individuals, as well as their community and environment. This study will investigate the psychological and social impacts of energy communities on its participants and their local communities. Considering this, a semi-structured interview was chosen as the best tool to answer the research question. This allows for deep insights into the participants thoughts and feelings, in addition to delving deep into the relationships and backgrounds of the participants regarding their participation in the energy community.

Methods

Participants and Design

The participants chosen based on a non-representative convenience sample included 10 participants of energy communities in Germany. The participants were recruited via e-mail; the contact details were found in an online list of bioenergy communities in Germany. All participants that were available during the planned timeframe for the interviews were selected to participate. Overall, the response rate was 6.4%. The subjects were between the ages of 58 and 74, with a mean age of 65.8 years (SD= 4.9) and consisted of 9 males and 1 female. The participants native language and nationality was German (100%), and they lived in rural areas of Germany (100%). Ethical approval was obtained before conducting the interviews. The types of renewable energies used in these projects included biogas plant (90%), woodchip plant (40%), wind turbine (30%), and solar energy (20%). All participants were part of the organization or board of these projects, and thus acted as the projects' contact persons.

The participants' communities were spread out all over different rural areas of Germany. The majority of these communities were found in villages based in south Germany with most found in Baden-Württemberg (40%), two of the participants were from Schleswig-Holstein (20%), while the rest of the participants were spread over villages in Bavaria (10%), Hessen (10%), North-Rhine Westphalia (10%), and Rhineland-Pfalz (10%). The number of citizens in the villages and towns ranged from 330 to 11,000 and they experienced participation in their projects ranging from 34% to 98%.

Procedure and Materials

Participants that agreed to an interview, were invited to set a date for an online meeting via Microsoft Teams, for one participant it was possible to hold the meeting in person. Before the interview, participants received the participant information sheet (Appendix 1). The meeting started with an introduction of both parties and introduction to the theme of the study and the interview's objectives and process. Before asking any questions regarding the topic, participants were asked for oral consent to record the meeting and process their data. Next, demographic questions about the participants' gender and age were asked. After this, participants were asked pre-written open questions:

1. What are the goals of the energy community? And through which activities are these reached?
2. How would you describe your participation in this community project?

3. How would you describe your relationship to the other members of the project?

4. How would you describe your feelings toward the community work?

5. Could you elaborate on aspects of the project that went less well?

6. Are there things that have improved in the community since the start of this project?

7. Is there anything you particularly noticed about attitudes towards renewable energy among yourself and/or other people in your community after the project began?

8. Are there examples of how the project affected the community's relationships positively?

9. How do you feel about the external actors that are part of the project?

These questions were supported by sub questions (Appendix 2) and probes such as "could you elaborate on this?" or "Could you think of another example?" if needed. In the end, the participants were asked if they would like to mention anything they still deemed important to include or if they had any questions. At last, the participant was thanked for taking part in the study and informed that they are welcome to contact the researcher if they have any further questions.

Data Analysis

To analyze the transcripts, thematic analysis was used. In this method, one identifies, analyzes and reports themes within the data. First, the interviews were transcribed verbatim. Next, general initial codes were generated and identified within the transcripts, using ATLAS.ti, to mark different ideas and concepts. The coding was guided by the theories that were introduced previously, in addition to unexpected statements. Lastly, these codes were analyzed and patterns among them were identified in connection to the research question and the things that were said during the interviews. Codes that could be summed up together under a certain umbrella term were put together in themes. Thus, the themes were closely guided by the content of the interviews. A table including all themes with short descriptions, the included codes, and example quotes can be found in Appendix 3. The resulting themes aimed to give meaningful insight into the social impacts of energy communities.

Results

The question answered in this section is the research question "what is the positive impact of energy communities?". The analysis resulted in the following eight themes: "Achievement", "Group Building", "Pro-Environmentalism", "Problem Solving", "Security",

"Trust", "Quality of Life", and "Stress". The quotes will be referenced to lines in the transcript using a system as follows: (Interview number, Line number). In the following, the results of the interviews will be presented through each theme, in order of the number of quotes per theme, from most frequent to least frequent (Appendix 4).

Pro-Environmentalism

It was strongly emphasized by all interviewees that the reasons for joining the projects and often also their initiation, were not pro-environmental motivation, but purely financial reasons: "the main motivation at that time was to run [the project] economically" (3, 10). Still, a strong effect of the participation in energy communities was an increased amount of pro-environmental behaviors and attitudes. Hereby the most substantial change that was reported by interviewees was the improved attitude towards renewable energies: "everyone has somehow already gained a positive impression and opinion of renewable energies. When they saw that the project worked" (4, 102). Originally, all participants reported that the reason for most people to join their projects, including themselves, was financial incentives. But this change in attitude toward renewable energies was reported by every participant. Especially the exposure to and education about renewable energies played a big role in this change in attitude. One participant noted: "I believe that the moment people experience what is possible in ecological construction or in the concepts of local heating networks, the more people are sensitized and say, OK, oil heating, gas heating, we can forget everything (fossil energies)" (2, 71). Thus, energy communities play an important part in the exposure of communities to renewable energies, which in turn leads to greater awareness, acceptance and more positive attitudes.

In addition to attitudes, an increase in pro-environmental behaviors was also disclosed. For one among members of the community that started to display other environmentally motivated behaviors or invested in other renewable energies: "A lot more private PV systems have been built in recent years. We have several cyclists who then say ok, I'll leave my car behind, I'll also ride my bike to work" (2, 105). Some also noted an increase in electric vehicles, increased interest in more renewable energy projects, or decreased usage of disposable products.

Another new insight was the unconditional acceptance of renewable energies among younger generations. Many stated that, where older generations were skeptical of renewable energies, like wind turbines, because of worries that they would change the aesthetics of the environment, younger people have become used to them: "And when I give tours here with

young people and ask the question about the landscape, "Would you like it if the facilities were gone?", then they don't understand the question at all. It is completely normal that wind turbines are there, for their generation" (6, 31).

Furthermore, the change in attitudes and behaviors was also reported to extend to other communities around the projects. It was reported that many noticed an increase of renewable energy projects in the villages and towns around them after they started their projects: "So we also have surrounding villages and there too, […] they also carried out such a project. This wasn't just once, but probably two or three times" (9, 69). Many stated that they received visitors from other towns and countries like Taiwan, Belgium, or Japan, one participant noted: "I think that the more successful projects there are, and the more successful projects are communicated, the easier it will be for others because you can also rely on existing knowledge" (10, 128). Existing energy communities may create an impact on their own community, as well as the communities around them, and foster increased renewable energy awareness, education, attitudes, and behaviors.

Group Building

Another theme that was extracted from the interviews was the strengthened identity of the groups that were connected through the energy communities. This was often achieved through more community engagement, cooperation, and conscientiousness toward all parties of the project. It resulted in not only stronger group identity, but also greater group efficacy.

All respondents mentioned cooperation to be an integral part of their work on the project and half of the participants expressed that through their participation in the project, they learned the importance of cooperation. One respondent mentioned: "You also learn to work with others, you get to know lots of new people and their environment. […] I also see it as positive because of the learning effect of working with others." (1, 117). Through participation in the energy community, many reported their increased positive feelings toward the people they worked with and the importance of cooperation between team members: "A lot of things are easier to do in a community than if everyone does it alone" (7, 80). This increased belief that cooperation is important also manifested in a strengthened sense of group-efficacy and most participants believed that they could succeed in similar projects with the same group.

This increased cooperation and engagement of the community in some cases led to improved relationships between community members. Some participants stated that through the project new groups have formed in towns where the people were not involved with each

other as much outside of different clubs, based on their hobbies: "New social groups have formed, so to speak, people who previously had nothing to do with each other. They now suddenly have a common interest; they are involved in something and then they have come together. In this respect, new groups have formed in the village, and that is always positive when people come together who have a common goal and do something together" (10, 148).

Furthermore, the engagement of the community in a common project had the effect that the individual members felt reassured, involved, and as if they played a part in the success of the project. One participant expressed: "you also notice that it also changes the social structure a little bit in villages, because they are moving closer together, because they have a common project that they have initiated, that they have made it work, what they are working on, that they are developing further" (10, 61). To conclude, participation in energy projects strengthened the communities through cooperation, engagement, increased group-efficacy, and improved relationships between participants.

Achievement

This theme describes the feeling of success, pride, and collective, as well as personal, achievement all the participants expressed in the interviews. When prompted about the feelings toward the project, almost all participants expressed positive feelings due to the sense of achievement the participation in the project gave them. As one participant stated "In any case it was worth it. We have never regretted it so far and we are also a bit proud that we did it." (9, 75).

This sense of achievement was also found to have different roots. For once, many stated succeeding in the projects in light of the many challenges as the reason for their pride in the project. One respondent mentioned "So my opinion was already positive before, but now it is just as positive in the knowledge that some projects have fallen apart again at the same time. But it worked out for us now" (1, 89). Furthermore, many participants expressed that their sense of achievement came from inspiring others to follow their example and create energy communities of their own: "We also have surrounding villages and there too […] they also carried out such a project. This wasn't just once, but probably two or three times." (9, 69).

Lastly, a point in the conversations was people's sense of achievement regarding the success as a group. Completing and succeeding in a project together as a group was a common factor among all participants that led to their positive feelings toward the renewable energy community: "And it is always a very good feeling when you have achieved something together,

when it worked, and you bring it to a successful conclusion. […] It's just nicer to be successful together" (1, 85). All participants reported a sense of pride regarding their projects which led to them feeling positively about their own achievements and their work as a group. This showed in many expressing a sense of general satisfaction after participating in the project: "It's a good thing if you are committed and it works, it also gives you a certain basic satisfaction" (4, 84).

Problem-solving

This theme describes the ways communities were able to overcome conflicts and setbacks in their projects. This was most often done using compromise and moderation. Additionally, the members' willingness to change their attitudes and fosters fairness among all project members played a part in the success of many projects. Some participants noted the importance of learning how to compromise to solve problems: "harmonious collaboration is actually the most important point. That the group functions harmoniously and that certain coordination is made among each other" (4, 44).

Common conflicts among the participants were discrepancies with authorities and bureaucracy, or resistance from citizens that did not agree with all aspects of the project. Three participants reported conflicts due to envy from citizens that had false beliefs about the distribution of income and gain that was made through the project: "I don't know where this rumor came from, but "the farmer who basically had the idea and is investing in a biogas plant is making a killing and we're financing him", so simply this rejection [that if someone does something on their own, there must be some kind of money maximization behind it and they are] not prepared to finance it, no matter how good this project is" (2, 99).

Another participant expressed that strict moderation played an important part in the success of their project: "That was great. We had the categories. And we also had some very sharp discussions, and there were different camps, for and against. […] we then decided on these prices through votes, for these categories and everything" (5, 21). Learning how to solve problems thus played an important role in the success and longevity of these energy communities.

Security

Decentralization, independence, and energy security also were found to be impacts of energy communities. Half of the participants stated that creating more energy security was an important factor in starting their renewable energy project, and all participants mentioned it as

an important outcome of the project. One participant stated that the investment in renewable energies has made their community virtually resistant to outside energy crises: "when we had the energy crisis here, we had three major crises: energy crisis, energy price crisis, energy consumption crisis. And [our village was not affected by this] because we have relied on renewable energies" (7, 55).

Furthermore, the independence and decentralization of energy and heating systems were reported to be an important impact of creating renewable energy projects. One participant stated that becoming independent from oil companies and fossil energies was a significant goal of their community project: "The other motivation was to become a little more independent of the oil sheikhs, i.e. to take security into your own hands" (3, 10). It was also mentioned that renewable energies are crucial in becoming independent: "And now I switched to a heat pump, […] that's the kind of thing that's most important to me, independence. And if you want to be independent, you can't ignore renewable energies" (3, 156).

It was overall reported that greater decentralization and independence was important to members of energy communities, since it provided a greater feeling of safety: "And it simply gives them a certain feeling of security when they can say that they are running ecologically" (4, 74). Furthermore, another participant stated: "That's why a lot of people look at us a little jealously, yes. One, a colleague, said that at work they would describe our town as the little Gallic village, which is impregnable because it operates and acts independently and brings many things forward" (7, 57). Energy security and decentralization can thus be seen as important social impacts of energy communities.

Stress

Overall, stress during the creation of the planning and building process was reported by every interviewee regarding their respective projects. Additionally, most noted that there were some stressful times, but these were mostly balanced out by periods of content and pride in their achievement: "So the stress level, when I look at everything overall, is relatively low. Only sporadically very high. But overall, over the entire course, the stress level is very low" (3, 128). Stress levels were reported by most to be overall low. One reason for heightened stress periods was reported to be conflict with community members, as mentioned in the problem-solving theme. Many participants stated that the most stress was experienced in relation to pressure from citizens or other participants. As one participant recalled an experience when their system had a problem and they got backlash from angry citizens: "That would be the one

aspect that I would never do again. There is almost no one more angry than someone who doesn't have a warm room. So, there were some wild phone calls" (3, 122).

Most participants stated stress as a part of the early process in the development of the energy project, but most describe it in a positive light: "Stress is an unfamiliar word. Only low performers experience stress. So, joking aside, I see it more as a challenge" (7, 110). In a nutshell, most participants saw stress as a necessary part of every project that was usually balanced out by the positive aspects: "And so there were these moments of stress, but we also have, let me just say, positive aspects, because they have shown time and time again that together you can find a solution and you can do it" (7, 113).

Trust

Trust was not only deemed an important factor in completing their projects by the participants. They also reported that trust was cultivated during the process and has endured beyond the project's conclusion, extending into other areas outside the project's scope: "We know we have now reached a new, better level where we can work together again in trust. And that we now know that we simply must talk to each other" (1, 76). Trust in responsible people of the project was also found to be important for participants: "Then I thought, "That's good." It worked too. [The responsible technicians in the community] really put their efforts down there, and you know that you can trust them if technology fails and any unforeseeable events happen" (9, 81), which gave community members a sense of security. Thus, trust can also be seen as an effect of energy communities, that has benefitted the participants.

Quality of Life

This theme discusses how well-being of participants was increased through improved financial and environmental conditions that have been brought about by their participation in energy communities. In all interviews, participants mentioned financial incentives as reasons for participants to join their projects. Outcomes of this were not only found to be people's improved well-being and feeling of security through more financial stability, but also opportunities for the community to realize more projects: "Despite investing 1.3 million, the cooperative has no debts. It has built up reserves to realize other projects" (3, 116). Others donated their profits: "Because our community for example, we made so much profit last year through Ukraine, […] that we donated, for example, €10,000" (6, 91).

One participant noted that through their project, the living expenses in the community went down, in addition to benefits they pay out to citizens: "This is a real social effect, […] we have capped kindergarten contributions for families, so the community always contributes something, we have reduced the property tax to a minimum, […] before Christmas we pay a so-called Christmas child benefit." (10, 57). Overall, these financial improvements have shown to not only benefit the individual, but also the communities.

Environmental change also was a frequently named as a positive effect of their renewable energy project. For one, participants in Biogas energy projects stated that it omitted odor emissions and made her community more pleasant to live in: "I think we can live in the countryside again thanks to the biogas plant alone. It was such a stinking country […] that just means a lot less stench for us now. […] I would even say that is one of the biggest advantages of biogas plants" (5, 57). Another environmental change was reported in the clearing up of the sky in winter, since the people in the community stopped heating with wood ovens: "So in the village you could see a lot of chimneys smoking. But now you could really see a beautiful blue sky and no more clouds of smoke" (2, 21).

In addition to improved living conditions for citizens that already live in these communities, one participant also mentioned that their town and neighboring communities have become attractive for young families, because of the innovation these places bring forward when it comes to their citizens' amenities: "I heard two to three years ago that this very district has an incredible influx of young families and citizens, they are experiencing real growth now […] many young families and so on, they are all enthusiastic" (6, 106).

These financial and environmental changes have contributed to participants living more comfortably in their communities and having a greater sense of security towards their current and future, which has resulted in greater well-being among citizens.

Conclusion

In conclusion, the findings showed, that for one, participation in energy communities resulted in communal as well as an individual sense of achievement, pride, and satisfaction with their project and themselves. Furthermore, these projects created stronger community ties through increased community engagement and cooperation, and fostered group efficacy among participants. Another impact was found in the growth of pro-environmental attitudes and behaviors among community members, as well as the communities around them. The creation

of renewable energy projects has been shown to promote the awareness, education, and acceptance toward renewable energies and pro-environmental behaviors.

Additionally, the importance of problem solving through learning how to compromise and moderate between different parties in the community has had a strong effect on the success and work in the communities. The creation of energy security and decentralization and independence through community energy projects has increased members' feelings of security and the communities' resilience to outside crises. Moreover, the creation or expansion of trust among the communities was strengthened through participation in these projects and not only enhanced work on the project but their daily lives in the community.

Impacts of collective renewable energy projects have also been found in the improved quality of life for community members that manifested in improved financial situations and security, as well as cleaner and more comfortable environments. Lastly, all participants experienced periods of stress during the project, but also stated that the following periods of success compensated for this stress, which in turn makes stressful periods a challenge for many to overcome in order to achieve their goal and create a successful project.

Discussion

Overall, the results show that there are many different types of effects that participation in an energy community can create for the participants and their local community, most of which were found to be positive, but some also negative. The following discussion will dive deeper into these various findings on the impacts of renewable energy communities.

Group Factors

To start, the findings of this study that are in line with the suggested effects of teamwork and participation in community projects were most noticeably the improved problem-solving skills, that many participants mentioned (Middleton, 2023). It was mentioned that there was critique or discussions among participants, which had to be resolved through learning how to compromise and moderate these conflicts. It was said that harmonious cooperation between participants was an important goal in the communities. Thus, there was a clear impact in the communities' ability to solve problems among their citizens and participants, which will also be beneficial in future projects and life in the community in general.

Additionally, the findings revealed that the participation in the renewable energy project strengthened the group efficacy and group identity among members. This corresponds with

Ohmer (2007) who showed these effects for participation in local community projects. When prompted, most participants believed they would be successful in another project with the same group, which shows their perceived group efficacy and identity. The project gave the communities a sense of identity through a common goal, that they could achieve together. Through working toward this goal together, in addition to showing their success to the communities around them, considering other projects' failure, these communities have formed stronger social bonds and identity. Where there was previously no connection between citizens, a common interest in the project and its success has created a strong group identity.

Trust

In the introduction, it was already suggested that trust would play a role in the success of the energy community. In the interviews it was found that trust had several effects in different parts of the project. For one, as previously established in the introduction, the trust in the people that oversaw the technology in the project gave the members a sense of security. Furthermore, trust was built between the participants while working on the project, which points back to the group building and creation of group identity, during the project. For one, group identity can be strengthened through trust. It was shown that trust can strengthen and stabilize social groups by facilitating cooperation (Balliet & Van Lange, 2013). On the other hand, many participants reported there to have been an already existing sense of trust, due to their village structure, which could have fostered the creation of this strong group identity and efficacy.

Another role of trust lies in the connection to the communities' problem solving and crises they met along the way. It was shown that trust can play a role in successful conflict resolution (Davidson et al., 2004). One example from this study is the mistrust in the authorities and their motives. Trust involves beliefs about the other's motives (Yamagishi, 2011), and is especially important in situations that involve a high level of interdependence (Holmes, 2004). In situations where citizens were hesitant to trust the project initiators' motives for starting the project, building trust among the members of the community was beneficial for the success of the project. And as stated in the results, this trust was long lasting, even beyond the scope of the renewable energy project. Trust thus has played an important role in the communities' improved problem-solving, strengthening of group identity and efficacy, and cooperation. But trust itself was also built between the community members in the duration of the project and has created a stronger community that is more resilient to future conflicts.

Pro-Environmentalism

Overall, all interviewees reported improved attitudes toward renewable energies in their respective communities. In Lenton et al.'s 2022 study, it is also described how collective efficacy can lead to adoption of pro-environmental behaviors, through enforcement of self-efficacy. This was also the case in this study. Through people's success in the collective project, they adopted more personal sustainable behaviors. Many interviewees stated that following the first implementation of, for example, their local biogas plant through a community energy project, more people also invested in their own photovoltaic systems. Thus, a major finding regarding pro-environmentalism is the shift from little interest in renewable energies in the communities, to increased interest and implementation of these energies, thanks to increased awareness and education through the project.

Positive Spillover

A concept that could be seen in many of the participants' communities was the concept of positive spillovers, which suggests that participating in one pro-environmental behavior leads to more such behaviors in the future, especially if these behaviors are similar and intrinsically motivated (Maki et al., 2019; Truelove et al., 2014). Many interviewees expressed witnessing that other participants of their project, e.g., biogas heating, later invested in solar panels. The first investment in renewable energies through the energy community thus lead to a positive spillover that motivated the participants to invest in more renewable energies later on.

Shifting Baseline

Another change that stood out in this study, is the change towards increased normalization of renewable energies among younger generations, compared to their parents and grandparents. Some participants emphasized how before the start of their projects, many were opposed to some renewable energies, like wind turbines, since they would affect the aesthetics of the environment. Even these days this is still a common complaint in some areas, but this complaint is found to be larger among older generations (Rechercheteam Europaeische-Energiewende-Community, 2020).

This was also validated in this study. As one participant mentioned, where people used to worry about the change in their environment before building wind turbines, younger generations, such as students, seem to put no thought into this change. Most seem to perceive

the sight of wind turbines as non-disruptive and natural. Especially in areas of Germany, like Schleswig-Holstein, where wind turbines have long been part of the local landscape (Lerch & Sander, 2023), people might become more accepting toward these energies, compared to areas where they have not been established for as long.

This change in perception can be attributed to the shifting baseline syndrome, which "describes a gradual change in the accepted norms for the condition of the natural environment due to lack of past information or lack of experience of past conditions" (Soga & Gaston, 2018). Because younger people in the areas where renewable energy projects have been established have less to no experience of how their environment looked before, they are less likely to reject these technologies and more likely to see them as a natural part of the landscape. Their expectations of how their landscape is supposed to look has changed in comparison to the generations before them. This plays an important role in the further acceptance of using renewable energies, but also shows that a positive change is already happening, as we are becoming more used to these technologies already.

Sense of Achievement

In the interviews, all interviewees reminisced on their sense of achievement regarding the renewable energy project. Two reasons for this sense of achievement were found to be rooted in the relief that the project had succeeded against the odds of other projects failing, in addition to being a positive example and inspiring more projects in other communities. This can be attributed to social comparison theory, through which they weighed their project's success against other renewable energy projects' failure, and thus gained higher self-worth and more positive feelings regarding their participation in the project (Suls & Ashwills, 1991). In addition, the fact that other communities were inspired by these successful projects again shows how through positive examples, more sustainable behaviors can be stimulated. Through starting one energy community project, many other projects can be inspired, and this effect could play a big role in creating a more sustainable society.

Decentralization and Resilience

Most participants stated that the main incentives of citizens to join their projects were financial reasons. The price of fuel oil and other fossil heating and energy sources have been steadily increasing, and especially in recent years, have reached a new all-time high (TECSON, n.d.). In Germany, especially private households have been suffering from these increased

prices, that were partly influenced by the Ukraine-Russia crisis and Germany's dependence on fossil fuel imported from Russia (Klimaschutz, 2022). The early investment of energy community participants in renewable energies has made them virtually resistant to these rising prices.

As mentioned in the results, communities that had invested in decentralized heating systems like biogas plants, were often envied by others that fell victim to the exorbitant gas prices, while the participants themselves were continuously resistant to the energy price crisis. This not only benefitted the citizens' wallets, as was initially the incentive of joining the project, but the sustainable, decentralized energy system gave them a sense of security that many learned to appreciate. In the interviews, a sense of distrust against "big oil" was already detectable and the need for more decentralized energy solutions became clear again in this study, through the participants' stories and experiences.

In general, decentralized energy solutions are essential in creating enhanced energy security and incorporating more renewable energies, but also creating economic benefits for citizens (Ifeanyi et al., 2024). In addition, this heightened energy security can lead to increased subjective well-being as was established in the theoretical framework. All these factors show how decentralized energy solutions through energy communities like the ones presented in this study create benefits for participants.

The Influence of Stress

One aspect that seemed to be unavoidable during the interview was the role stress played in the participants' participation in their community projects. Stress was mostly induced by conflicts with other community members, such as unsatisfied people, bureaucracy, or problems in decision-making. But as was also mentioned, that for most this stress was irrelevant in the end, and they overcame it, by balancing it out with the larger number of positive experiences they made during the project. It seems as if, for most, this stress was a positive experience that motivated them in the end, and only delivered minor setbacks for their projects.

Indeed, finding positive emotions alongside stress, like reminding oneself of the goals and benefits, and creating positive meaning in these events, can help in overcoming stress (Folkman, 2007). In the case of the projects in this study, all participants that reported great stress also reported it's minimized impact when it was compared to the positive experiences

they made, or when they were able to solve the issue that caused the stress, for example through creating problem-solving methods.

Furthermore, these stressful situations in the projects were able to make the communities stronger in the end. For example, a discussion about the unequal distribution of payment, lead to a mediation process where new problem-solving skills were learned and a measure to solve this issue was created through a democratic process. Through conflict and stress, the community learned to work together, learn problem-solving processes, and mediate their issue, which can create benefits for the community in the future. In conclusion, it seems as if the stress the participants experienced momentarily during the projects, it created long-term tangible benefits for these communities.

A More Livable Environment

Another new finding in this study included that the implementation of an energy community created a more livable environment in these municipalities. As was mentioned, the reduced stench of the environment through cow manure is brought about by the decomposition of the manure's carbon dioxide (CO_2), methane (CH_4), ammonia (NH_3) and hydrogen sulphide (SH_2) in the biogas plant. In comparison to natural manure, the fermented manure thus has reduced odor, leading to reduced stench in rural areas, that was caused by especially the ammonia, that has now been broken down (Landwirtschaftskammer Nordrhein-Westfalen, 2020). This process leads to many people that live in these areas to feel more comfortable, as the stench was often perceived as irritating or even dangerous (Selhorst, 2024).

A further improvement, that was brought about by the increased implementation of renewable energies in the energy communities, is the reduction of wood ovens in these areas, and thus reduced sight and smell of smoke during winter times. It has been shown that satisfaction with the environment, in addition to environmental quality, can influence life satisfaction (Yoon et al., 2023). Considering this, it is important to note that the impact energy communities have on their environment through the usage of renewable energies, also effects the citizens in their communities on a psychological level.

Strengths and Limitations

This study presents some clear limitations. For one there was a clear lack of diversity in the sample of participants. Most participants were over 60, male, and from a similar socio-economic and environmental background. In addition to this, most participants that were able

to participate in the interviews were part of the board or management of these energy community projects. These participants were already part of the creation and planning of the project, and on one hand thus had great knowledge of the processes, technologies and organizational aspects of these projects. On the other hand, there might have been a bias in regard to the success of the project, and the need to present the project as good as possible. The status of these participants in some instances also created a benefit, as they knew the relationships between community members very well and had been living in these villages for a long time, including before, during, and after the project, which created exceptional insights.

A further limitation came with the subjectivity and restraints due the nature of this being a bachelor's thesis. Some more time-intensive and expensive measures were not able to be taken, such as having access to a second coder. Additional measures like inter-rater reliability should be included in future studies to guarantee greater validity but were not possible within the confines of this bachelor's thesis.

Although there were some limitations, this study delivered a general insight into the impact of energy communities. As mentioned beforehand, the literature on impacts, specifically of psychological and social nature, is still lacking in many aspects in the research on energy communities. Still, measuring these effects is important for individuals, but also organizations and institutions, as these insights can be used as publicity and as a marketing tool toward potential participants or other stakeholders. Furthermore, information on these impacts can create greater trust in these projects. Additionally, the insight into positive impacts of these projects could aid in the creation of policies and funding, in addition to showing policy makers the importance of energy communities (Karytsas et al., 2020). That is why the insights made in this study are not only important, but also build a ground for further research in this field, in order to create more insights into the impact of community energy.

Some unexpected insights that were gained in this study were the effect of successful energy communities on their surrounding communities and the way they can inspire more similar projects to be created. Furthermore, these projects played a part in shifting the baseline of how well renewable energies are accepted by society. Another insight that was gained, was the importance of energy communities in energy security and decentralization, in addition to how important these factors are to their participants. It was already theorized before, but during the interviews it became very clear that being save from outside energy crises is not only an important reason for the creation of these projects, but also a great reason for the participants' satisfaction afterwards. A last unexpected finding was the role stress played for the participants,

and how many seemed quite unaffected by it, and saw it more as a natural part of the project or motivation to keep going.

Future Studies

There are some questions the current study was not able to answer. This is where future studies could expand on. For one, this study focused on the impacts of energy communities, but we mostly found positive impacts. Finding the negative impacts and long-term effects of participating in an energy community could also be important to study, in order to eliminate these effects, and create more resilient energy communities. Furthermore, a major point that was found in this study was the importance of decentralization to participants in energy communities. Some of the benefits this created were already explained in this study, but a further study could expand on these insights even more.

Another aspect to expand on could be exactly how energy communities create these improved attitudes toward renewable energies and how they motivate more sustainable behaviors. Future studies could, for example expand on the impact that having a successful community energy project in the area has on the willingness to create an own energy community. Additionally, the points of shifting baseline syndrome and tipping points in connection to energy communities are points of literature expansion in the future.

Additionally, in the future it would also be beneficial to investigate how common each of the identified impacts are and if all members of the projects have the same views on this. Here again, more members of the communities should be interviewed, not only the people that are strongly connected to the planning and organization. Getting more insights from more casual members of these communities would also be important.

Lastly, future studies could investigate whether participating in a renewable energy project makes these communities long-lastingly happier, and which factors, like economic or group-achievement, play the largest factor for this happiness. Also, it would be good to see how the problem-solving skills these communities learned during this project affect them in the future and if they are able to overcome future conflicts with the resilience they built during these respective projects.

Conclusion

This study aimed to give an insight into the positive impact of energy communities. A number of social and psychological impacts were found, including positive emotions, group

building, improved attitudes and behaviors toward renewable energies, learned problem-solving skills, increased sense of security, building of trust, better quality of life, and overcoming of stress. Overall, these results show the range of benefits the participation in a collective renewable energy project creates for individuals and their community. It was also shown how these communities create an environment that fosters increased interest in renewable energies in their respective areas. This increased interest and investment in renewable energies is what is needed long term to face the climate crisis. Only if we all work together, such as the energy communities presented in this study have shown, are we able to create a tangible impact that will benefit our planet and society for future generations.

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Appendix

Appendix 1

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

Name Researcher	E-mail
Sarah Nienhaus	s.nienhaus@student.utwente.nl
Helene Vogel	h.vogel-1@student.utwente.nl
Name Supervisor	**E-mail**
Peter de Vries	p.w.devries@utwente.nl

Appendix 2

Interview Questionnaire

Einleitung
 Guten Tag Herr/Frau X, erst einmal würde ich mich herzlich für Ihre Teilnahme und daher auch zum Beitrag meiner Bachelorarbeit bedanken. Das Interview gliedert sich in mehrere Teile: erst würden wir Sie gerne etwas kennen lernen, dann zu fragen übergehen die sich um die Gründung oder einen erstmaligen Eintritt in eine Energiekommune beziehen und danach zu Fragenübergehen die sich auf positive soziale Effekte einer Energie kommune beziehen. Vorab würde ich Sie gerne noch ein mal darüber aufklären, dass alles was Sie hier mit uns teilen, unter Geheimhaltung steht und jegliches Material nach Auswertung der Daten vernichtet wird und Ihre Identität zu jedem Zeitpunkt geschützt wird. Um Ihre Antworten angemessen zu analysieren, würden wir dieses Interview gerne aufzeichnen, sind Sie damit einverstanden? Abseits davon, dürfen Sie das Interview zu jedem Zeitpunkt abbrechen oder auf Fragen nicht antworten, falls Sie nicht möchten. Sind sie unter den gegebenen Voraussetzungen dazu bereit, das Interview zu beginnen?
kannst du vielleicht auch recorden?

Generelle Fragen
Erzählen Sie gerne etwas von sich
- Ask for demographics: age, gender, nationality, …

Wie würden Sie ihr Bioenergiedorf beschreiben?
Was sind Ihre Ziele mit Ihrer Energiekommune
Welche regelmäßigen Aktivitäten bieten Sie an?

Initial participation
Was hat Sie dazu bewegt einem Energiedorf beizutreten?
Warum glauben Sie dass andere Personen dem Energiedorf beigetreten sind?
Gab es Dinge, die es schwerer gemacht haben am Energiedorf teilzunehmen wie Sie es wollten?
Gab es Dinge die es erleichtert haben am Energiedorf teilzunehmen so wie Sie es sich vorgestellt haben? Was war die größte Hürde?
Was glauben Sie, welche Faktoren fördern es dass Menschen, die schon in einem Energiedorf leben auch ein aktives Mitglied zu werden?
Was glauben Sie, sind Faktoren, die verhindern, dass Menschen in oder nah an Energiedörfern leben ein aktives Mitglied werden?

Group involvement
Als das Bioenergiedorf startete, wer waren die verantwortlichen?
  - In welcher Beziehung standen Sie zueinander?
Wie würden Sie die Beziehungen in Ihrem Dorf beschreiben bevor es zu einem Bioenergiedorf wurde?

- Gab es bereits regelmäßige Aktivitäten?
- Wie sahen diese Aktivitäten aus?
- Gab es einen Bezug zur Nachhaltigkeit?
- Wie viele Menschen würden Sie schätzen treffen sich regelmäßig?
- Wie steht dies im Bezug zur gründung des Bioenergiedorfes?

Gruppen Beschreibung

Wie würden Sie Ihre Gruppe so wie sie heute ist beschreiben?

- Was verbindet Ihre Gruppe?

Welche Werte und Glaubenssätze hat Ihre Gruppe?

Was waren/sind Ihre Ziele mit der Energie Kommune?

Wie empfinden Sie die Zeit, Kosten und Energieverteilung, die für dieses Projekt notwendig ist?

- Finden Sie das fair?
- Warum?

Was glauben Sie wie Ihre Gruppe auf andere (potenzielle Teilnehmer) wirkt?

Group conflict/ non-participation

Aus welchen Gründen glauben Sie dass Bürger rund um die Bioenergiekommune sich gegen eine Teilnahme entschieden haben?

Gibt es Bürger, die nicht mehr teilnehmen?

- Wieso?

Technologien

Welche Technologien benutzen Sie in Ihrem Bioenergiedorf?

- Warum benutzen Sie diese?

Welche Technologien/technischen Hilfsmittel haben ihnen den Einstieg und die langzeit-Teilnahme erleichtert?

- Wie sah das aus?

Teil 2: Interviewfragen: Soziale Auswirkungen von Energiegemeinschaften

Was sind die Ziele der Energiegemeinschaft? Und durch welche Aktivitäten werden diese erreicht?

- Glauben Sie nach Ihrer Teilnahme, dass solche Projekte den Umstieg auf erneuerbare Energien für alle Beteiligten einfacher machen, und könnten Sie ein Beispiel nennen?
- Halten Sie die Teilnahme an diesen Projekten für wichtig, um der Klimakrise zu entgegezuwirken?

Wie würden Sie Ihre Erfahrungen bei der Teilnahme an diesem Gemeinschaftsprojekt beschreiben?

Wie würden Sie Ihre Beziehung zu den anderen Mitgliedern des Projekts beschreiben?

- Nennen Sie fünf Emotionen (adjektive), die die Beziehung zwischen den Teilnehmern beschreibt.
- Wie stehen Sie zu der Fairness zwischen den verschiedenen Projektparteien?
- Glauben Sie, dass zwischen allen Akteuren des Projekts Vertrauen besteht?
- Denken Sie, dass Sie mit der selben Gruppe an einem anderen Projekt wie diesem teilnehmen oder ein anderes Projekt durchführen würden?

Wie würden Sie Ihre Gefühle gegenüber der Gemeinschaftsarbeit beschreiben?

- Wie groß ist Ihrer Meinung nach das Erfolgserlebnis zwischen allen?
- Wie war Ihre Meinung zu Projekten dieser Art vor und nach der Teilnahme?

Könnten Sie Aspekte des Projektes näher erläutern, die weniger gut funktioniert haben?

- (Folgefragen oder -punkte im Zusammenhang mit Konflikten und Konfliktmanagement, unerwarteten technologischen Schwierigkeiten, unerwarteten sozialen Schwierigkeiten, …,)
- Wir wurden diese Konflike gelöst?
- Gab es technologische Schwierigkeiten
- Gab es Streitereien zwischen den Teilnehmern
- Wie würden Sie das Stresslevel in der Verbindung zu dem Projekt beschreiben?

Und gibt es Dinge, die sich seit Beginn des Projekts in der Gemeinde verbessert haben?

Gibt es etwas, das Ihnen in Bezug auf die Einstellung zu erneuerbaren Energien bei Ihnen und/oder anderen Menschen in Ihrer Gemeinde nach Beginn des Projekts besonders aufgefallen ist?

- Ist Ihnen aufgefallen, dass andere Menschen, die vorher nicht vorhatten, dem Projekt beizutreten, jetzt mit der Idee warm geworden sind oder vom „Geist der Nachhaltigkeit" in den Menschen um sie herum beeinflusst wurden? (Spillovers)
- Ist Ihnen aufgefallen, dass andere Menschen durch das Projekt zu nachhaltigeren Aktivitäten inspiriert wurden?

Haben Sie Beispiele, wie sich dieses Projekt positiv auf die Beziehungen innerhalb der Gemeinde ausgewirkt hat?

Wie stehen Sie zu den externen Akteuren, die Teil des Projekts sind?

- Vertrauen, Fairness, …

Ending Questions:

Was würden Sie Leuten empfehlen die an einem Bioenergiedorf teilnehmen möchten?
Was glauben Sie funktioniert besonders gut/schlecht in Ihrer Community?
Wie würden Sie mit anderen Menschen über den Beitritt zu Energiegemeinschaften sprechen?

Gibt es noch etwas, was Sie zuletzt erwähnen möchten?

Haben Sie irgendwelche Fragen?

Vielen Dank für Ihre Teilnahme, und falls Ihnen später noch Fragen oder Bitten zu dem Interview oder Forschungsprojekt einfallen, zögern Sie bitte nicht mir eine Mail zu schreiben und nachzufragen.

Appendix 3
Description of Themes

Theme	Codes included	Description	Example Quote
Achievement	• Group Achievement • Imitation • Pride • Success	Satisfaction related to participation in the project and the group work	"Actually, everyone who took part is very happy. So, it was very worth it." (5, 30)
Group Building	• Community engagement • Conscientiousness • Cooperation • Group identity • Group-efficacy • Improved relationship	Strengthened group identity and group-efficacy	"If we stick together, if we tackle a project together, then we can manage it, then it will be cheaper for everyone, so there won't be this lone wolf approach." (2, 55)
Quality of Life	• Environmental Change • Financial improvement	Greater well-being through improved financial and environmental conditions	"But the financial circumstances for individuals and for the community have completely changed." (10, 144)
Pro-Environmentalism	• Environmental conscience • Improved RE attitudes • Imitation • Pro-environmental motivation • RE Awareness • Spillovers	Positive effect on pro-environmental behaviors and attitudes	"So ecologically, a lot has changed. I think we have all become more sensitive." (2, 103)
Problem Solving	• Compromise • Fairness • Moderation • Problem Solving • Societal Change • Willingness to change	Overcoming conflict through fairness, compromise and moderation	"But the aspect of who gets how much, we then had three categories […] and that was then all talked out." (5, 7)

Theme	Codes included	Description	Example Quote
Security	• Decentralization • Energy security • Independence • RE Supply	Improved feeling of security through more energy security and decentralization	"It is also an incentive to take part in the project if you can help the community break away from the large energy companies and generate energy decentrally." (1, 11)
Stress	• Blaming someone else • Conflict • Envy • Mistrust • Social Pressure • Stress	Participants' attitude toward stress that they experienced through the community project	"Well, I would say it was only positive stress." (4, 95)
Trust	• Trust	Increase of trust between participants	"But the overarching, the framework, it stands, of trust" (1, 81)

Appendix 4
Frequency of occurrence for each theme per interview

	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	Sum
Achievement	19	20	12	15	8	11	24	8	14	9	140
Group Building	35	37	37	19	9	21	36	19	27	12	252
Quality of Life	/	9	14	1	4	6	3	3	3	5	48
Pro-Environmentalism	12	47	59	14	8	32	21	35	16	37	281
Problem Solving	27	22	15	9	14	14	7	7	4	3	122
Security	18	25	21	3	8	8	12	7	5	9	116
Stress	24	16	10	6	6	10	3	1	2	/	78
Trust	9	5	8	7	2	2	7	3	6	2	51