Article

Collective Action with Altruists: How Are Citizens Led Renewable Energy Communities Developed?

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Abstract: Transition to a sustainable future requires not only technical but also societal changes, including changes in behavioral patterns and consumer roles. Renewable energy communities embody such changes: they are mainly residential communities that break with their passive consumer role and produce energy from renewable sources in order to meet primarily local needs. Although the number of these communities has increased remarkably in the last decade in many Western countries, as has the academic attention paid to them, we still have limited knowledge on how they are formed and operate. It is unclear how they get their members to work collectively on a voluntary basis for a common goal; that is, energy production at the local level, and overcome the challenge of free-riding. This article seeks to contribute to a better understanding of the institutional and social context in which these communities operate, as well as of the way they are created and function. Therefore, the research question addressed is: What factors influence renewable energy communities' formation and organization? In particular, the interest is in strategies for group formation, task distribution, collective action, communication, decision making, and problem-solving. This paper addresses the research question through a comparative assessment of case studies in Germany and the Netherlands. It analyzes different communities—of distinct sizes, location, and using various technologies—and assesses the commonalities between them and their general practices that led to the successful project implementation. The results show that, contrary to Olson's expectation about voluntary collective action, renewable energy communities can realize their goals based on the work of only a few volunteers who develop the project without receiving any additional reward and who also accept free-riding. However, the larger the community's size and the complexity of the project, the more likely it is that they need to formally organize the procedure or count on external support.

Keywords: renewable energy communities; group formation; collective action; grassroots; teamwork; social innovation

1. Introduction

The number of local energy initiatives has increased remarkably in the last decade in many Western countries [1], such as the Netherlands [2] and Germany [3]. According to Seyfang and Smith [4], these grassroots innovations not only provide local solutions to the needs and interests of the communities involved, but they are also the bedrock of social innovations. Such initiatives involve the development of new practices, patterns and social actor networks that spur the scaling-up of technological innovations and, thereby, contribute to the energy transition. In addition, local energy initiatives also play an important role in changing consumer behaviors, and they empower citizens to replace existing social structures and eliminate carbon lock-in [1,5–7]. Although the importance of local energy initiatives in the sustainability transition is increasingly acknowledged, we still know relatively little about their formation and operation. In particular, it is unclear how they get their members to work collectively on a voluntary basis towards a common goal.

The literature uses several terms and definitions for capturing the phenomenon of local energy initiatives, from which I chose the term "renewable energy communities"

(RECs). Such entities can be understood as communitiesthat invest in renewable energy technologies and generate electricity or heating in order to meet their energy needs. More specifically I study residential communities that have started and have been managing energy projects; they thus initiated the project, made the investment, and have been operating the technology(ies). This does not exclude other partners neither from the investment nor from project development, but the main initiator has to be the community. These scope conditions are discussed in more detail in the methodology section. Consequently, the research question in this study is: What factors influence the formation and organization of renewable energy communities? To answer this question, first, I formulate sub-questions on the basis of a discussion of relevant theories offered by the literature on collective action, teamwork and grassroots initiatives. Secondly, I provide a comparative case study analysis, where I studied different communities regarding their location, institutional background (two communities in Germany and two communities in the Netherlands), size, and the technology they use, in order to identify the commonalities between these communities and the general practices they applied that led to the successful implementation of their projects.

The article is organized as follows: In the Section 2 I discuss the theoretical background from which the research sub-questions are elaborated on research gaps that the current paper aims to investigate. The Section 3 introduces the four cases that I investigated and the methods that I used for the analyses. This is followed by the analytical section that concentrates on the specific aspects of community creation and organization identified in the theoretical section, including a discussion of the results. The Section 5 then draws some conclusions from this study. In particular, I show that, contrary to Olson's expectation about voluntary collective action, renewable energy communities can realize a project based on the work of only a few volunteers who develop the project without receiving any additional reward for it and who also accept free-riding.

2. Theoretical Background: Renewable Energy Communities as Grassroots Initiatives

Grassroots initiatives are value-driven, bottom-up, community-based, small-sized projects that position themselves against mainstream society and create their own solutions for local problems or for meeting social needs [8]. They are good examples of the co-existence of *Gemainschaft* ("community") and *Geselschaft* ("society") in Weber's understanding, in the sense that grassroots initiatives usually represent the interest and values of local communities, while at the same time they fit into the societal structures by developing not only affectual but also instrumental relationships among their members [9]. Due to their local knowledge and social capital, they are able to bring about behavioral change, first by changing their own practices and seeking to influence other people around them. They thus deliver energy savings or develop niche projects that regime actors do not have access to (e.g., by combating NIMBY) [10]. Additionally, they experiment with innovative technologies and develop social innovations in the form of new consumption and production practices that challenge mainstream growth-based conceptions [4,6,7,11]. Still, despite their strength from using local and alternative conditions to their advantage, grassroots initiatives face several challenges, such as having to rely on volunteers, lacking professional workers and institutional support or long-term funding [1,12]. Furthermore, compared to profit-driven companies that are able to spread risks across their project portfolios, grassroots initiatives take risks on a personal basis, making them more dependent on supporting policies. This then leads to their general feeling of powerlessness with respect to changing policy, market and the cultural environment [13].

RECs constitute grassroots initiatives that are led by gain and normative motivations: to make some profit or avoid increasing energy prices and to protect the environment. They are usually formed in already-existing strong residential communities [14], and their main purpose is to generate energy at the local level, primarily to meet local needs. A distinction has to be made between the residential community that includes all the people living in the same neighborhood and the renewable energy community, which is an investment community formed by (some but not necessarily all) members of the residential community.

Several studies have examined this type of grassroots communities, either positioning them within the transition literature [15], assessing the communities' potential as a social niche to scale up [16,17], studying the motivations behind such activities [18], or addressing the political context that affects them [19]. However, research on the collective action that such communities realize remains scarce. There is a general literature on how people cooperate and work together to create a collective good–as, in this case, renewable energy that benefits all community members–, but this is among the first studies to elaborate in detail on the formation and operation of RECs.

The broad literature on *teamwork* [20–22], which primarily deals with the formation, dynamics and effectiveness of work teams reveals a similar gap. This literature can give insights on teams that work towards the collective good either within an organization or in newly formed voluntary groups. While in the latter case it is assumed that the formation of a brand new team is mainly a struggle to create a structure that sets its goal, distributes the tasks and regulates interpersonal interactions [23], the studies on work teams within an organization [24] already assume some kind of history of structures and interpersonal relationships, which the members take into the new situation and which strongly affects the classic model of group development (forming, storming, norming and performing) described by Tuckman [23]. These studies are important to better understand the formation and dynamics of teamwork, yet they do not provide enough insight into the way grassroots communities work–communities that are formed on a voluntary basis, but in already existing strong communities, where people know one another, the level of trust is high, and normative rules regulating interpersonal relationships exist.

The third theory that could help us to gain more insight into the formation and project realization of energy initiatives is *collective action* theory [25]. Olson [25] assumes that, in case a community creates a collective good that benefits all its members, people as rational actors will not participate in the collective action unless everybody participates equally. In other words, in case all community members benefit from the collective good regardless of their contribution to its production, make people free-ride. However, such considerations also prevent others from participating, and collective action will not take place. Therefore, if the members of a large group–acting rationally–strive to maximize their personal interests, they will not try to realize their common goal. Instead, they will attempt to do so only if they are forced to, or if selective incentives are envisaged for them–on the condition that they are contributing to the costs and to the collective action. (Such incentives would, therefore, not be identical with the group's interest or the collective good. The selective incentives, in this case, could not be, for instance, identical with the share in energy, which is the collective good, but they should be different inducements.)

These findings on collective action are held to be valid for small groups (formed by a few people knowing each other) as well. In that case, negative incentives such as social pressure or the exclusion of free-riders motivate people to participate in the collective action. There are certain small groups, however, that realize collective action even without resorting to selective incentives. These small groups are usually characterized by massive inequality, since there must be group members for whom it is worthwhile to produce the collective good, even if they are doing it alone and paying all costs. For these people, the benefits of the collective good are still higher than the losses resulting from the production. Usually, these small groups are able to stock up on the optimal amount of collective good.

Although collective action theory was criticized by several scholars for, among other things, not taking altruism into account [26–28], it has not yet been studied how collective action is realized if there is a small group of altruists that are willing to produce the collective good for everybody even without any extra benefits or reward. In this case, sanctioning the free-riders is not even necessary, which leads to a whole different dynamic of group formation and operation than what we find in collective action theory.

The aim of this paper is to investigate this special type of grassroots communities that (1) are organized around a rather gain-oriented goal, but led also by normative motives [14]; (2) are formed in already existing strong communities, for which reason the level of trust

between members is high, and the relationships are based on already existing normative rules; and (3) have some of their members willing to produce the collective good even without the participation of all members, and without the possibility of sanctioning at all if they quit or if their contribution is not sufficient. It should be noted here that, in the renewable energy communities in this study, all community members funded their investments, but not all of them participated in the project realization, and the small groups of volunteers who contributed not only financially but also with work to the project accepted this imbalance.

On the basis of outstanding questions pertaining to the three bodies of literature outlined here, I identify five sub-questions to guide the analysis of the results. For the formulation of the sub-questions, I also rely on Elinor Ostrom's [29] work on how self-organizing communities can maintain and cooperate in the use of common-pool resources (CPR). CPRs typically are resources that are not developed by the community (as energy in case of RECs) but that are already available, and the community has access to it. Still, the basic rules captured by Ostrom can be helpful for zooming into the main areas of cooperation:

1. *Group formation.* Ostrom's [29] first principle, "clearly defined boundaries", can be best captured by the circle of membership in case of RECs, but it is unclear who this includes and how they are included. According to Hoffman & High-Pippert [30] the successful involvement of community members in local energy projects massively depends on the initiators' social network and their personal relationships with fellow citizens. In most cases, the initiators of renewable energy projects are well-known and respected community members [31]. Still, there is much less information on *how they involve other members in project development or how they get the permission from all the members for the investment.*

2. *Project development and collective action.* The usual form of cooperation is the setup of voluntary working groups responsible for writing different parts of the business plan, the most crucial part of a renewable energy project development [31]. This includes and goes beyond Ostrom's [29] second principle ("Rules regarding the appropriation and provision of common resources that are adapted to local conditions"), since RECs not only set the basic rules for using the common resource (energy), but they need to also produce it. They need to define who will be partaking in its production (which is not necessarily identical with the entire community), what will be their tasks, and what are the rules that define their collaboration. Thus, it is not yet clear *how the members distribute the tasks between each other, and what are the phases of project development.*

3. *Decision making.* Participation in voluntary grassroots projects does not necessarily involve participatory decision making in all instances. Initiators who actively participate in project development might have stronger willingness for an intense engagement in the decision making than average members who wish for only limited personal involvement [30]. Thus, related to Ostrom's [29] third principle ("Collective-choice arrangements that allow most resource appropriators to participate in the decision-making process"), I investigate: *Who makes the decisions and how? Do they use participatory or non-participatory decision-making strategies?*

4. *Communication.* According to Walker et al. [32], transparency in communication is the basis of trust, which in turn is a requirement for the successful realization of a community-based renewable energy project. In case transparency can be enhanced by the possibility of providing feedback on the generated energy, it then further improves local acceptance and support [33]. That is a crucial point for gaining the recognition of the wider community and, thereby, benefiting from external support for the project (e.g., permits, loans). Ostrom [29] captures this in the following principle: "Self-determination of the community recognized by higher-level authorities." Based on these key notions of successful communication, this study will inquire: *How do*

the members of the project group communicate between each other, with other community members and with external actors?

5. *Problem solving.* Local energy initiatives can face several challenges, such as finding sufficient project funding, being able to recruit enough members, problems with the organization and leadership of the project, receiving sufficient governmental support and getting permits [12]. In addition, they have to cope with local opposition or internal conflicts arising from uncertainty, irrational thoughts or interpersonal problems [31,33–35]. In Ostrom's [29] formulation, it is important for the effective collaboration to develop "Mechanisms of conflict resolution that are cheap and of easy access." Therefore, she also suggests "effective monitoring by monitors who are part of or accountable to the appropriators" and "a scale of graduated sanctions for resource appropriators who violate community rules." However, these two principles might discourage REC members, who work on a voluntary basis, to put their time and effort into a project in the light of possible sanctions for not enough satisfying work. I posit, therefore, that RECs deviate on this point from self-organizing communities that possess common pool resources. Thus, the question here is: *How do project members deal with problems within the project groups and within the community?*

3. Methodology and Case Studies

To gain a better understanding on the factors that influence the formation and organization of RECs, I have examined four communities. As the study's main goal is to find commonalities between the communities concerning the practices they use for developing renewable energy projects, I have conducted a comparative analysis of cases with different institutional backgrounds from two countries (two communities in the Netherlands and two communities in Germany), using distinct technologies (solar PVs, water pumps, wind mills, biomass power plant), and of different sizes (ranging from small communities with few members to large communities with thousands of members). These projects also encompass different organizational forms, such as wind or solar cooperatives, joint solar procurement projects, and small energy companies that produce and supply energy not only for their members but also deliver it to other customers.

The scoping conditions for my research population were: (1) communities in the Netherlands or Germany that invested in renewable energy; (2) the investment is a citizen initiative; (3) the members of the initial investment community (people who bought the technology) live in the same location/region; and (4) all members of the investment community are shareholders in all or at least one of the technologies. I used a diverse case method in my case selection, since diverse cases taken from the population of cases are more likely to be representative for the full variety of cases [36]. The advantage of this method is that a full range of variation increases the representativeness of the results that the researcher finds based on the analysis of the selected cases. Its disadvantage is that, in case the distribution of different cases is not equal within the population but the researcher selects cases from every type of cases equally, it can distort the results. Still, the diverse case method is regarded the most representative method from all small-*n* sample methods [36].

I have conducted 41 semi-structured interviews with community members following an interview guide that consisted of questions about group formation, project development, task distribution, decision making, communication, and the problem/conflict solving methods. In addition to the community members, I have also interviewed private company representatives, municipality officials, and researchers (in one of the German cases) that helped the communities. In each case, I had a contact person who helped me to get in touch with other community members, so I could conduct face-to-face interviews, usually by visiting people in their homes. All interviews were recorded and transcribed, and the interviewees have been fully anonymized for the purpose of this study. The studied communities are the following:

3.1. Jühnde (Germany)

Jühnde is an agricultural village in Lower-Saxony, Germany, with a population of 780 residents. They produce both heat and electricity for 100% from renewable energy resources and cover all the energy needs of the investment community. The core of the energy production comes from a combined biogas power plant that uses methane, which is complemented in winter by wooden chips. The heat is distributed via a local grid to the households. The residents form a very strong and closed community, which makes it difficult for new comers to get accepted. High percentage of the volunteers participated in the project development were residents who were not born in the village, but moved in. Participating in the project was a great opportunity for them to get accepted by the villagers [14] (p. 44–45).

3.2. Freiamt (Germany)

Freiamt has 4300 residents and is located in the south-west of Germany, near Freiburg. Since 2007, the village produces 14 million kWh of electricity from renewable energy sources annually, exceeding the village's electricity demand by 2 million kWh. The electricity is produced from multiple renewable energy sources: five windmills, 240 roof-mounted PV panels on private houses, two small hydropower plants and two biogas plants built in 2002 and 2007. In addition, 150 private houses have installed solar thermal collectors for water heating. All the generated electricity feeds into the national grid. The villagers deem their community to be a strong and independent one that can develop projects on its own. Voluntary work and local projects already had a history in Freiamt, which provided a good basis for the new challenge [14] (p. 46).

3.3. Amsterdam Zuid (Netherlands)

This community is located in the south of Amsterdam: a houseboat area that includes 80 boats. The residents regard it as a village within a city, because the people know each other very well and they form a strong community. The renewable project was developed in three sequential years when people collectively purchased solar PVs that could cover some part of their electricity needs, depending on the household. However, the PVs were set up and operated individually [14] (p. 47).

3.4. Eva-Lanxmeer (Netherlands)

Thermo Bello is a local heating company owned by residents in the district of Eva Lanxmeer, in the town of Culemborg, near Utrechr. About 800 people live in that area. This district, unlike the older parts of the town, came about as a planned ecological project of the local municipality. Their eco-houses are built around common gardens, which people can cultivate together, producing seasonal fruits and vegetables; no cars are allowed. Besides that, Eva-Lanxmeer can boast a very strong community with an intensive social life. People know each other and every *hof* (courtyard) has its own projects and parties that the residents organize. In this case, the district's residents took over the heating system from a drinking water company that generates heat by cooling down drinking water. The heating system was part of the drinking water company's pumping station, which supplied drinking water to the region of Culemborg. The heat production (9000 GJ/year) was provided by an electrically driven heat pump in base load (750 kWth). The required heat was extracted from the drinking water supply. The heat is transferred to the heat network for heating homes and buildings. Thereby, the community could cover not only all the district's heating needs but also deliver heating to other neighborhoods [14] (p. 47–48).

4. Results and Discussion

The analysis of the interviews has followed the sub-questions listed in Section 2. For each sub-question I compared the answers from the different communities in order to see whether I can outline a general practice that communities usually apply.

4.1. Group Formation

In all four cases, the projects were realized in already existing strong communities that had a history of cooperative work and voluntary projects. However, while the Dutch communities consisted of rather environmentally concerned members with high social awareness, the citizens of the German villages were not particularly special in this sense. The commonality across all cases was the strong social network that bound people, as well as having initiators who were respected and popular members of the community.

Nevertheless, in all four cases the occurrence of an external event created a window of opportunity to start a renewable energy project. In Freiamt, investors approached the village and brought the option of windmills to the residents' attention. In Jühnde, the University of Göttingen announced a competition to establish Germany's first bioenergy village. In Eva-Lanxmeer, the project would not have even started without the intent of the drinking water company to sell the heating grid. Finally, in Amsterdam Zuid, the offer of a PV supplier gave the first boost to start a collective procurement.

However, the possibility of starting a renewable energy project is not sufficient: there must also be enthusiastic people who see potential in it and who then initiate the project. The second step is convincing and involving fellow citizens in the project, and the examined communities used different strategies to do so. One example is what interviewee 4.1 explained in Amsterdam Zuid: "*We sent emails to the people, and we also wrote about it in the local newspaper. We used the annual general assembly to talk about the project, and it was still not enough. So, some people went to each boat personally and asked the residents whether they wanted to participate in the solar project. This was the most effective way of involving people.*"

In Jühnde, the University of Göttingen approached the mayor to invite the village to participate in the bioenergy village competition. The mayor saw the potential in it and initiated the project. "*The University came up with this idea. They contacted me and I liked what they told me. So, I started to work on this topic and organized some trips to existing bioenergy plants. I chartered a bus and took some people with me. After we arrived back, we directly went to the local pub to discuss the issue. . . . at a certain point, I asked everyone who was present whether we want to know more about this project.*", explained the mayor (interviewee 2.1) about how the renewable project started.

In Eva-Lanxmeer, the project initiators did not have a smooth start. When the drinking water company approached the local association to offer them the option of purchasing the heating system, they decided to investigate this option further. They presented their findings to the community, but people were divided. Only half of the citizens found the takeover of the heating system appealing, while the other half were rather scared and negative about it. Still, the time pressure was growing to make a decision. Thus, the leading group decided to repeat the meeting every four weeks until they could receive sufficient support to purchase the heating company. According to one of the initiators, the key to success was the enthusiasm of the leading group, which was convincing. He also appreciated their transparency about the probable difficulties.

The initiators in Freiamt also applied all the strategies that we saw in the first three cases. They started the public relations work before the construction of the measurement mast and continued it during the whole process. While they were doing wind measurements, they already sent around invitations to all villagers through the local municipality newsletter to come and visit them up on the hill and get the newest information on wind power. They also handed out sign-up lists where people who were interested could register. After a while, people started to approach them to ask if they could participate. This is how more and more people joined the project. Besides that, they published small articles in the municipality's weekly newsletter, and they also made a brochure, where they portrayed the chances and risks of the investment. Most importantly, they had many conversations with people and several informal talks on different occasions to discuss the project.

4.2. Stages of Project Development and Collective Action

The project development in all cases followed very similar phases. After the materialization of an investment opportunity, a small group of initiators decided to investigate the option of a renewable project. The second phase consisted of informing and involving other residents and, thereby, forming an investment community. In three cases (Freiamt, Jühnde, Eva-Lanxmeer), after receiving positive results in this investigation phase, the core group of initiators organized general assemblies for all residents of the wide community in order to get their approval for the project and create the investment community with the residents who wanted to join. Only in Amsterdam Zuid did the initiators take a different approach. There, instead of meeting people at the general assembly and getting their approval to start the project, the decision was made exclusively by the small group of initiators, and the residents could only decide whether to join or not the collective procurement.

In the third phase, the communities either hired a professional manager, who could organize the project for them, or they organized working groups with some local volunteers and developed the business plan together. The former solution was chosen in Freiamt, where all the necessary transactions were delegated to a manager who knew which turbines are the best and how much they cost, and who already had contacts with suppliers. He took care of the project management while constantly consulting with the villagers about every important step.

In Jühnde, working groups were established already at the initial investigation phase. The core group of initiators took the lead, helped when the work got stuck, and essentially kept the project running. There were 7–9 working groups (electricity, agriculture, location, district-heating grid, PR, etc.), in which members worked on a voluntary basis. Some people worked in several working groups at the same time, and there was a coordinator–usually one of the researchers–in every group who facilitated the group's work. Every Wednesday, all the groups met and reported how far they had gone with their work.

Like in Jühnde, working groups were established for the development of the business plan in Eva-Lanxmeer as well. The initiators set up four working groups (financing, organization, communication, technology) for developing the business plan. There were 4–5 people in each working group and all of them had their own coordinator. However, only the main coordinator received a salary for his job from the drinking water company. The latter was so eager to sell the heating system that they even paid him to accelerate the process. The other members of the working groups worked on a voluntary basis.

In Amsterdam Zuid, the more limited complexity of the project did not require the setting up of working groups. The core group of initiators organized everything and distributed the tasks among each other. As in the other cases, they worked on a voluntary basis.

After, or in some cases even during business plan development, the communities had to set up some kind of legal entity that represented the project towards external institutions in order to receive funds and permits. That also helped the formalization of their investment community and working groups (e.g., regarding who the members are, who is responsible for which tasks, code of conduct).

The only exception again was Amsterdam Zuid, where there was no formal agreement on who was responsible for which tasks within the core group of initiators. However, the lack of coordination led to conflicts within the group. Sometimes, it happened that some people did the same task simultaneously without realizing it, or started negotiating with suppliers without other members' permission and thus lost some other even better offers. Due to those conflicts, some initiators decide not to join the organization of the PV procurement in the following years.

The cooperation with local authorities proved to be essential for the successful development of the projects. *"We had personal meetings with politicians and decision makers from the authorities. Both the former mayor and the municipality council members attended those meetings, and they always supported us."*—interviewee 1.3 told me in Freiamt.

The mayor in Jühnde had contacts with the local government in Dransfeld (a larger, nearby city) and with the regional government in Göttingen. Through state-level representatives he also had contacts with the government of Lower-Saxony, as well as with Germany's federal government. They also went together to Hanover, to the seat of the state's government, and to Berlin for talks with national-level officials. The cooperation with local authorities and government was simpler in Eva-Lanxmeer. There, they received financial support mainly from the local municipality, and they also got a guarantee for a €150,000 bank loan. Besides, a legal adviser helped them during the process. In Amsterdam Zuid, the community did not cooperate with the municipality, because they were afraid of losing their independence in the project development. Yet one of the core group members worked at the local government and had some insider information on what the available subsidies are and how to apply for them.

The last two phases of the projects included the construction of the technologies and their operation afterwards. For the more complex projects, such as in Freiamt, it was necessary to hire somebody who could coordinate the works. Even though it was not the case in Jühnde, they still cooperated with experts, including mainly the researchers from the university, who helped them calculate their heating needs and select the best technology. Besides that, the villagers also hired a district-heating expert. The case of Eva-Lanxmeer was special in this sense, that they took over an already existing technology, still, the administration of the heating company was very chaotic: it was not clear who were the customers exactly and how the tariffs were calculated. The working groups tried to make some kind of order in it, but they also received professional help from the drinking water company. After starting the operations, in all three cases, the established companies (either association or cooperation) took over the maintenance of the technologies that work with paid employees. Only in Amsterdam Zuid was there no need for professional help in the construction and neither for the operation of the technologies. As soon as the PVs arrived the residents helped each other to install the solar panels, which became the personal responsibility of each owner afterwards.

4.3. Decision Making

I have already discussed how the active involvement of the residents into all phases of the project development was essential for the acceptance and the success of the project. My research also found evidence that the same principle is valid for the decision making too. The communities used both participatory and non-participatory decision-making strategies depending on the issue that emerged during the procurement and the implementation of the technologies. On the one hand, all the mayor decisions required about the finances or the business plan were made by the whole investment community, including all the members equally. On the other hand, for a practical and faster project development, small questions were usually decided by the voluntary working teams or the leading group only. Certainly, there were minor variations between the cases.

In Freiamt, the founding members were always involved in the core decision making, which consisted 5–7 people. In most of the cases they just simply informed the other members about the process through information events. However, every time before the core group had to take important steps, they involved all the members in the decision-making. After starting the cooperation with the professional management team most decisions were delegated to them, but with the active involvement of the founding members. In order to keep control over the process and be able to participate in the decision making, an advisory board was set up that included members of the initiators. Later, when the operating company started to function, the structure of decision making changed as well. The managing director/CEO is responsible now for the current business of the company. The advisory board members communicate important matters to the shareholders, and they make sure that they are also informed about any disturbances of the operation who can then discuss the problem with the management and contribute to the solution.

I found similar decision-making process in Jühnde too. First, the mayor invited all residents for a public meeting to decide on the participation in the competition organized by the university. "*During this meeting we presented the project again and gave time and space for questions, remarks and so on. In the end I asked the people who were in favor of the project to raise their hands. There was not a single person of all the 120 present, who voted with 'no'. There is no way to make it more democratic.*"—he remembers (interviewee 2.1). The decision making was well organized and democratic also within the working groups: each of them had a speaker, who represented the will of the given group. These people met once a month to discuss the developments that they were working on that far and they were also allowed to make decisions in the name of the whole investment community. The core group of initiators and especially the mayor himself made the less important decisions alone and the people were rather involved only when big decisions had to be made. After the setup of the operating company, its supervisory board is in charge of the decision-making, but all the important questions are still discussed with the general assembly including all the members of the investment community.

The initiators in Eva-Lanxmeer followed a similar procedure during the planning and development phases of the project. The citizens were asked after the investigation phase, whether the project team should go further and develop a business plan. During the business plan development, the working groups provided advises and the project team (the four initiators) made the final decisions on all the steps that had to be taken. The internal decision-making processes within the project team and the working groups were also regulated. In the project team, everybody had to agree with all the decisions. While in the working groups and also in the board of the working groups the majority of the votes decided. After the establishment of the operating company, the board of the three directors got in charge of the decisions.

The only exception of the shared participatory and non-participatory decision-making processes was Amsterdam Zuid, where, because of the simplicity of the project, neither the initial acceptance of the project or the development of a business plan were necessary. In this case, the two main initiators made all the decisions on the technology, the finances, etc. Moreover, they bought all the solar PVs in advance and took the risk if anybody who had promised to participate quit without paying for the panels. Yet that was the only way to do the transaction, since the purchase of the solar PVs did not require the setup of a company, and the PVs had to be bought at once to receive the price reduction. Fortunately, in the end nobody stepped back.

4.4. Communication

In all four cases, the initiators used a collection of communication strategies adjusting to the different phases of the projects. Distinction can be made between indirect, rather informative communication strategies and direct communication strategies that provided the possibility for two sided conversations. In the first phase of the projects, informing the residents about the current developments was the main purpose usually and it included newsletters, leaflets, emails, articles and advertisements in local newspapers. In the second phase, the main goal was to provide the possibility to give feedback or raise questions. Usually it took the form of information events or face-to face conversations, which gave also a great opportunity for the initiators to convince skeptics and opponents. In any case, transparency about all the details including the difficulties and weaknesses of the project was perceived to be essential to gain the trust of the residents. It ensured that they felt involved and taken seriously, even if they raised critical questions.

In Freiamt, the communication of the initiators took different forms depending on the phase of the project development and the people they communicated with. The first decisions about measuring the local wind-potential and refusing the offers they got from companies were based on informal communication between a few residents who were also friends at the same time. During this pilot project they already decided to inform the people about the recent developments. In the third phase, the initiators continued the

active communication with the residents by organizing village meetings and setting up information stands at local cultural events. At the same time, they had many conversations with the people and a lot of informal talks on different occasions, where the project was discussed. Besides the internal communication, the initiators also decided to get some publicity for the project at both regional and national levels. The suddenly gained media attention was helpful for both lobbying at different governmental levels to gain financial support and increasing people's appreciation of the project.

At the beginning, the communication and awareness raising about the energy project in Jühnde was to a large extent influenced by the researchers of the University of Göttingen. Even the way how my interviewees shared their opinion about the project was very much shaped by the professional information they had received. Besides the initial presentation, the researchers also helped in the organization and communication of the working groups. Transparency was a key communication strategy. Still, the initiators were mainly responsible for the successful internal and external communication, for which they set up a public-relations working group. At the beginning, providing sufficient information on everything and having personal conversations proved to be the most effective way to convince people to participate. The initiators in Jühnde also used the media to get more support and attention from the government. After an unfriendly welcome at the national level they decided to call the media and tell their story. *"We told the media what we had experienced and it was in the newspapers on the next days. . . . After some time, we suddenly received the information that they will fund our project with €1.3 Million."*—interviewee 2.2 told me.

Similarly, to Jühnde, there was a PR working group set up also in Eva-Lanxmeer, which was responsible for both the internal and external communication. At the recruitment phase of the project, the organization of meetings, the distribution of leaflets and brochures were the main communication strategies applied. *"At the end we published the business plan in the Bell news. We also set up a website, where people could find all the information they needed."*—a member of the communication working group told me (interviewee 3.4). Still many residents were skeptical about the feasibility of the project. In order to convince them the initiators organized small information events in different *hof*s and visited people in their home. After the most important decision was made, people were informed occasionally about how the project was developing. Transparency and providing space for criticism and skeptical questions were the most important communication policies also in this project.

Even though the scale of the project in Amsterdam Zuid is smaller compared to the previous cases, still both the external and internal communication followed similar strategies that I saw in the other three projects. The initiators approached the people through leaflets, advertisements, articles in the local newspaper, presenting the project at the general assembly of the local association, but the personal communication with each resident led to the real success also in this case. At later phases the active communication about the steps was a very important factor. *"I wrote a procedure how to do this project, I planned the communication–keeping the people happy with certain successes in order to keep the enthusiasm go."*—shared the main initiator (interviewee 4.1) his tactic with me. Getting the media attention for the project helped the initiators in the negotiations with the supplier. Finally, they found one who did not even charged them for anything above their purchase price for the PVs in exchange for the media attention.

4.5. Problem Solving

In most of the cases, the initiators had to face both external and internal problems. The external problems (local opposition against the projects for reasons that they could harm the environment, endanger local tourism etc.) were usually easy to deal with by acknowledging them and proving that these were less rational fears. The internal conflicts provided more difficulties in the project development. In Freiamt, for example, the fear of failure within the investment community turned out to be the biggest challange for the core organizer group of the project, which is why they tried to create more security by doing

wind measurements and collecting data about the wind quality. The more progress they made with the project the less skepticism there received. The core members were never really skeptical. Of course, there were some doubts, but they always tried to find a solution to all emerging problems.

In Jühnde, in contrast to Freiamt, the community members did not doubt the capability of the core group to realize the project, but there were several other problems that the initiators had to deal with. First, even in this case, there were some opponents within the village who tried to hinder the project by negatively influencing the other residents. To tackle this negative campaign the mayor talked to these people personally. Second, there were some skepticism and impatience also within the investment community. Some people were concerned that it would be too expensive, or the biogas power plant would be noisy or smell bad. In order to convince the hesitant residents, the initiators organized a field trip to a similar, but already operating power plant to see its operation in practice. Furthermore they also asked the opinion of an independent consultant to prove the fears were irrational. Third, some people within the working groups had some disagreement regarding the development of the project. To solve the internal conflicts the researchers helped with the work of the working groups by acting as mediators. "*The university structured the meetings, established points that had to be discussed and defined results that had to be reached. If there were no results, we did not continue the discussion for ages, but everyone had to think about the problem again in his working group and we discussed it again when we met the next time. The structured approach was the most important aspect.*"—one of the initiators (interviewee 2.3) explained to me. Finally, the core group of initiators also had to deal with the difficulties to receive a construction permit and financial support from the government both regional and national levels, which could be solved by contacting the media, as it was already mentioned in the previous Section 4.4.

The initiators at Eva-Lanxmeer had to face similar problems. Like in the first two cases they had to deal with the skepticism of the community about the feasibility of the project. Almost half of the members found it unthinkable that a small group of people could take over such a complex system without having the professional knowledge and expertise. Some others said that it would be too expensive and there would be technical problems too. One way to convince the skeptics was showing the business plan to external experts and another one was involving the skeptics in the working groups, to raise the most difficult questions and find answers for them together. There were some difficulties within the working groups too, when people quit or did not do their job, but taking over their tasks provided a good solution for this problem, and luckily most of the working group members were enthusiastic enough to continue their work until the end.

In Amsterdam Zuid, besides some fears of the community members about the technical feasibility of the project, such as the fear that the roofs of the houseboats were not strong enough for heavy solar PVs, conflicts mostly occurred within the core group of organizers. The source of the conflicts was mainly the lack of clarity regarding the rights and mandates of the members. As they did not write an official business plan and did not have an agreement on the different tasks and rights of the members, it could happen that some members started to negotiate with suppliers on behalf of the community, while others did not know about it. "*There were some problems with the way we coped with the prices and agreements we made with each other. We had a few different offers and some others took other offers a bit later, which were cheaper. We had some conflicts about which offer we should choose, what matters more the deadline or the price. But at the end it turned out that the PVs were already ordered, so we couldn't get the cheap PVs anyway. We didn't really solve these conflicts, we just stepped further.*"—one of the organizers told me (interviewee 4.4). Other conflicts occurred when one of the main organizers decided to purchase the PVs through his own company and take all discount only for himself, without letting the other members know about it. "*I had some difficulties with him, I didn't like that he earned money with this project through his company and he didn't even tell this to us. He got a big advantage as a person and not the people in the neighborhood. That is why in the second year I did it alone and I quit in the third year when he*

came back again."—said one of the disappointed organizers (interviewee 4.2). Even though these conflicts were not resolved in any of the cases, the simplicity of the project and its short-term commitment for the organizers made it possible to realize the it in the end.

5. Conclusions

The purpose of this paper was to study the factors that influence the formation and organization of renewable energy communities. To learn more about them, I studied four Dutch and German communities that are different in size, location and choice of technology to find commonalities that could be valid for RECs in general. I recognize and admit the possibility of alterations of REC project development among the different regions in Europe and outside Europe. While RECs have genuinely appeared in many Western European countries, the tradition of bottom-up organized energy communities is mainly absent in Eastern Europe, and the concept of community-based energy projects arrives as a top-down measure with the transposition of the RED II directives in 2021. Therefore, the conclusions of this study based on two North-Western European countries might not be fully applicable to the communities that are about to emerge there.

My results show that the community location did not matter in terms of group formation and organization, even though many scholars observed the influence of local aspects and situative governance structures on local initiatives [37,38]. In my sample, I found no substantial difference between the two countries despite their different regulations and institutional backgrounds. Even the type of the settlement where the community is located (e.g., village, district of a town) did not seem to be an influencing factor. In contrast, in all cases, the investment community was formed in already existing strong communities, where people personally knew each other and there was a high level of trust among the residents. Moreover, the size of the community and the intricacy of the project (in terms of the ambition level, price, combination and complexity of the technologies) seem to be important factors that strongly influence all aspects of its development.

In both German cases and also in Eva-Lanxmeer, the communities invested in expensive and very complex projects. There, the technologies (e.g., windmills, bioenergy power plant, heating system by cooling down drinking water) were installed in a separate location, had to be connected to the grid (or in one case, Jühnde, even the heating grid had to be built), and supplied energy not only to the shareholders but also to other customers. Also, because of their high price, special governmental funds and bank loans were required. That is why in all three cases the development of a business plan and the setup of a legal entity, and later an operating company, were necessary. Therefore, community members had to work together both in the decision-making and the organization of project development, or else hire an external expert to manage the project.

In Amsterdam Zuid, in contrast, the simplicity of the project–where only solar PVs had to be set up on the private properties of the residents, providing electricity only to its user–neither required a strong cooperation of the community members nor their active involvement in the decision making. They did not have to lobby the government for financial support or to establish a legal entity representing them before external institutions such as local authorities or banks. The core members of this community still actively worked together to organize the project, but in contrast to Jühnde and Eva-Lanxmeer they did not have a formal agreement on the task distribution, rights and mandates of members, or they did not divide the project development into different phases. The lack of structure, however, led to the highest number of conflicts compared to the other two cases. Furthermore, this project was organized in the least transparent way, but because of the simple and individual solutions and low investment risks, it did not impact the success of the project. Probably, in more complex cases this could have undermined the trust among members, which is the most essential factor in high-risk investments.

Furthermore, my results help us to better understand (1) grassroots initiatives; (2) voluntary working teams that are formed in already existing communities, where the members already know and trust one another and the relationships are based on already existing

normative rules; (3) and community-based collective actions built on the work of some altruistic members, who can accept free-riding.

First, the core group of initiators starts to investigate the investment options and sets the goal. Secondly, they involve other community members in working teams and distribute tasks. Based on the already existing norms and rules of interaction within the community, a more formalized way of interpersonal cooperation is also set. However, unlike working groups formed in organizations where members are paid for their job and can be sanctioned for insufficient performance, this is not the case for RECs. If a volunteer in a working group decides to quit, the other members have to accept it and take over his or her tasks. To avoid the complete disintegration of the working group, its members' motivation therefore has to be continuously high. In my cases, that was achieved by the constant involvement and continuous flow of information during the whole project, and by the regular small achievements that showed the project was developing.

This paper has also addressed how a REC realizes collective action when every member benefit from the collective good (the energy that is produced or the profit they receive after the energy is sold) equally, even though not everybody participates in its production. How can the community still carry out the collective action and cope with the problem of free-riding? The answer is that they do not cope with it, they accept it. On the one hand, in all cases there was a small group of altruists who initiated the project and decided to work on it without any specific reward. On the other hand, besides this small group of initiators, large groups hired a manager (an expert) who was able to coordinate the whole process. However, the manager had to be rewarded for his or her work as well. In small groups, the establishment of formal or informal organizations could provide another possible solution. Thus, in order to cope with the difficulties related to collective action, it was indispensable to have a certain form of self-organization and rules of procedure or agreement on the code of conduct to some extent. It was of paramount importance to have set a goal and identify members who are entitled to share the collective goods, even if there were altruistic individuals ready to take the responsibility of organizing activities without aiming at any personal benefit.

I make a distinction between small and large groups here according to their members' capacity to maintain personal relationship with each other. As one of the university researchers who studied Jühnde pointed out, approximately 1000 people is the threshold for working group-based cooperation of community members. Above that number, people may not know each other well enough, and the level of trust tends to decrease. This insight is supported by my cases, since in the biggest community with more than 4000 members (Freiamt) the community hired a manager who was responsible for all parts of project development, whereas in Jünde, Eva-Lanxmeer and also in Amsterdam Zuid the project was carried out by a small group or groups of altruists who accepted free-riding without receiving any additional benefits. The reward of volunteers can take different forms, which might clarify the motivations behind altruistic behavior. According to the same researcher, most people in the working groups in Jühnde were not born in the village, but later moved there. Since this is a very strong and closed community, this was a possible way for them to integrate into the local society. Others liked the attention of the media and the honor and the appreciation of the locals for their work. At the same time, it was good for them to increase the living standards in the community and work together with other villagers.

In my study, I could distinguish three types of projects. (1) Small groups with simple technologies are most likely to be able to manage the whole process alone without external help or formal internal rules and working methods. (2) Small groups with complex projects need some kind of formal agreement on who the group members are, their responsibilities, a code of conduct for the operation of the working groups, and for coping with interpersonal conflicts. At the same time, they also need legal advice for setting up operating companies and to lobby for external funds. (3) Large groups with complex projects are likely unable to organize the project alone, since the people do not know each other that well and the level of trust is also lower than in smaller groups. In this case, the best solution is to hire an

external expert, a manager who could organize the project for them. However, the manager has to be paid for his or her work.

In sum, I can conclude that contrary to Olson's expectation about voluntary collective action, renewable energy communities can realize a project based on the work of only a few volunteers who develop the project without receiving any additional reward and who also accept free-riding. However, the larger the size of the community and the complexity of the project, the more likely it is that they need to formally organize the process or count on external help. Therefore, the formation and organization of RECs depends on community size and the complexity of the technology they want to utilize. Consequently, RECs can very much benefit from the support of non-governmental organizations, as from renewable energy market actors who could collect and provide best practices and additional services to those communities, or even, if necessary, take over the lead in project development.

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