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# Success factors of citizen energy cooperatives in north western Germany: a conceptual and empirical review

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## Abstract

**Background:** Citizen energy cooperatives (CECOs) are an important element for realising the transformation of the European energy system from a central system, dominated by a few market players to a decentralized system with the participation of many citizens, in which energy supply is largely based on renewable energy sources. This article identifies success factors that ensure a working organization that is capable of implementing projects to support the energy transition and improving the well-being of citizens.

**Methods:** The aim of this study is to identify success factors using the example of CECOs in north western Germany through a two-step process. The first step is a literature review to identify success factors of CECOs. Second, 12 semi-structured expert interviews with managers of CECOs are conducted and evaluated by means of a qualitative content analysis. The interviews identified the success factors and barriers of CECOs. The interviews were recorded and transcribed verbatim. The coding process was carried out using a qualitative data analysis software (ATLAS.ti 8.4.5.).

**Results:** The results show that three factors particular should be present, but can influence each other, to lead to successful CECOs: (1) the CECOs require business models with low complexity, as business models that span different stages of the value chain can overwhelm organizational managers. (2) Committed key individuals must be found and promoted. They need the support of the members. (3) Social and ecological principles are the core values of CECOs. The maintenance and strengthening of social–ecological credibility must be promoted in the public perception.

**Conclusions:** The results show that CECOs emerge from a strong social cohesion in a society. In addition, local "key individuals" need to be identified and supported. To this end, the framework conditions (e.g., policy, legislation, municipal support, etc.) must be adapted in such a way that these "key individuals" in CECOs are not overburdened. The analysis of the interviews also revealed that political or regulatory barriers are often cited as obstacles to the implementation of community energy projects.

**Keywords:** Community energy, Citizen energy cooperatives, Success factors

## Background

The global energy landscape is changing. Local, decentralized and community-driven renewable energy projects are increasingly playing an important role in a traditionally centralized energy market [1]. Research on the role of small-scale, decentralized energy projects and their transformative potential has increased in recent years [2–6]. In conjunction with the transformation of the energy sector, a shift of power through democratic

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public and social ownership of assets in the energy sector can be achieved [7].

The involvement of local citizens leads to more popularity and acceptance of community projects [8], decentralized energy production [9] and an opportunity to develop (niche) innovations. It is also able to accelerate the local energy transition under certain conditions (increasing the engagement of citizens and other social groups through changes in thinking, acting and organizing) [10]. There is a possibility to compensate residents for the disadvantages associated with energy projects (e.g. noise from wind turbines) through democratic participation in renewable energy and other infrastructure [11–13]. This transformation of the energy system is seen as an "unprecedented but potentially unrepeatable opportunity" to weaken the influence of the fossil.

industries and their financial and political allies on legislation [14].

Citizen energy (CE) encompass all types of local (energy) cooperation. Essentially, a distinction between two types of CE can be made. The CE communities (CECs) [15] and the renewable energy communities (RECs) [16]. Both initiatives can exist in different organizational forms (e.g. association, cooperative, corporation). The RECs are allowed to produce, store, consume or sell energy (electricity, heat or gas) from renewable sources. By contrast, CECs are only allowed to generate electrical energy.

The European Union (EU) completed a comprehensive update of its energy policy framework in 2019 with the EU legislative package on energy and climate policy—the Clean Energy for All Europeans package [17]. One of the building blocks of the latter is the active involvement of citizens through the concept of CE initiatives [15, 16]. The EU project on the democratization of the energy sector aims to contribute to the rise of energy end-user CE [18]. The concept of decentralization has already led to bottom-up initiatives of energy end-users gaining importance in 2005 [19]. The CE initiatives are decentralized, non-governmental initiatives that are locally or regionally based and involve broad citizen participation to promote renewable energy production and consumption [20, 21].

The cooperative is one of the most common forms of CE initiatives in Europe [22–24]. The CE cooperatives (CECOs) act on the cooperative principles of the International Cooperative Alliance. According to the latter, a cooperative is "an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly owned and democratically controlled enterprise." [25]. In many countries, a cooperative is a legally constituted form of corporation with democratic membership control, constrained profit distribution, and open

membership. Consequently, the authors understand CECOs as CE initiatives that operate under the legal form of a cooperative and carry out energy projects or deliver energy services. The organizations are highly democratic because each member has equal voting rights regardless of the amount of capital contributed. Yildiz et al. [26] point out the high importance of CE initiatives as they represent a synthesis of technological and social change. The CE initiatives present a challenging concept to analyse due to their inherent diversity and complexity compared to the traditional, centralized energy model with undemocratically run concerns [27].

The aim of this paper is to identify success factors of CECOs. In this context, this means the identification of elements for establishing a working organization that is capable of implementing projects to support the energy transition and improving the well-being of the local communities.

To the best of our knowledge no systematic overview of the success factors of CECOs exists. This research gap is closed by a two-step methodological approach. Firstly a systematic literature review is presented. Secondly the results are checked and extended by the analysis of twelve semi-structured expert interviews of members of CECOs in north western Germany. The paper ends with a discussion of the results, a conclusion and the derivation of policy recommendations.

## Methods

The aim of this study is to identify success factors using the example of CECOs in north western Germany through a two-step process. The first step is a literature review to identify success factors of CECOs. Secondly, twelve semi-structured expert interviews with managers of CECOs are conducted and evaluated by means of a qualitative content analysis. The interviews identified the success factors and barriers of CECOs. The interviews were recorded and transcribed verbatim. The coding process was carried out using a qualitative data analysis software (ATLAS.ti 8.4.5.).

## Results

Based on the analysis of existing literature and the analysis of twelve expert interviews, the results of this paper on the success factors of citizen cooperatives are elaborated.

### Literature review

The systematic literature review was conducted between January and March 2020. The literature review includes energy communities in general due to the lack of studies on success factors of energy cooperatives. The main source is the EBSCOHost database "Discovery EDS" and we utilized the search terms "Success Factors"

AND “Community Energy” and “Success Factors” AND “Energy Cooperatives”. Publications from the period 1990–2019 were considered. Selected literature was added during the evaluation and processing of this work that was cited in the literature already found. This additional literature was not listed in the database mentioned above. A total of 130 papers were identified. After filtering the results and excluding papers that did not explicitly address the success factors of CE or referred to CE that cannot be counted as part of the Western Europe region, a total of twelve papers were included in this analysis. The central results are presented subsequently.

Candelise and Ruggerie [28] focused their study on Italy, a country that, along with South Tyrol, is characterized by a relatively low development of energy communities. The Italian region of South Tyrol has a high development of energy communities. They report on the success factors of three successful Italian energy communities. They state that the success of these initiatives is due to their early professionalization (structure and offers/services) (Professionalization) and to the fact that they have been able to reach a large number of members. This professionalization enables the energy communities to operate nationally rather than locally. Their analysis shows that small, locally operating energy communities need the support of local municipalities to obtain land for their projects (Municipal support).

Centgraf [29] explores the challenges and potentials of active engagement in RECs. The internal and external challenges of REC members are highlighted, including the lack of time, missing professionalization (Professionalization) and general problems of RECs (e.g., lack of budget or “networking activities”).

Kahla [30] identifies five different success factors in her study on citizen participation models in the field of renewable energies: economic framework conditions (economic factors), high acceptance towards the project (on site) (social factors), palpable environmental effects (internal factors), regional value creation (professionalization) and favourable legal framework conditions (municipal support).

Karpenstein-Machan et al. [31] identify success factors in the context of bioenergy villages in Germany that have been operating for at least 2 years. One main factor is the availability of resources (agricultural and forestry) to supply heat/electricity to the village. The solutions must be economically viable and technologically feasible (Professionalization). In addition, social aspects (Social factors), such as the number and group of people initiating the project, are crucial for acceptance. New challenges arise in the construction and operational phase that can be reduced by a general contractor implementing the project (Internal factors). Exclusion and abandonment

criteria exist if local conflicts in the village occur or no consensual plant location can be found (Regionality).

Klagge et al.’s [8] study the structures and changes in the German energy cooperative sector. The CECOs benefit from being “the most direct and democratic form of community financing” (Democratic structures). The CECOs are perceived as particularly “trustworthy” due to their democratic structure. They identify that the success of energy cooperatives is closely linked to its regional ties (Regionality; Social factors).

The work of Łapniewska [32] investigates the success factors for the co-ownership of the Berlin electricity distribution grid by BürgerEnergie Berlin (BEB). Four factors for success are derived in this inductive research based on 12 interviews (political [Networking], social, economic and internal factors). The political framework, such as the support from local politicians or changing laws are identified as the most important success factors. Social factors also have an influence, as it is crucial to encourage Berliners to support the initiative. Internal success factors such as the structure of the members and the management culture are also named. Financing the distribution network is not seen as a hurdle because sufficient capital can be raised through a strategic cooperation with a local bank.

The processes for successful civic energy projects were studied by McGovern and Klenke [27]. They developed the “Civic Energy Cycle” to support community initiatives. McGovern and Klenke want to contribute to the professionalization of energy communities and see this as a key success factor (professionalization). The “Civic Energy Cycle” represents a structured process management approach for civic energy that serves as a blueprint for managing civic energy initiatives. They name the different areas: initiation, planning, roll-out and refection and adoption.

Radtke [33] examines the factors that influence citizen participation in community energy initiatives. Radtke generally emphasizes the importance of social factors as a driver for the success of energy communities (social factors). Considering the individual motivations and interests of the members as well as the real conditions within the initiatives, this study identifies three social contexts in which CE initiatives can play an active role. Community energy initiatives are places of identity, community and professional decision-making (democratic structures). An empirical analysis of 85 community energy projects in 2012/13 by Radtke [34] presents the motives for participation in civic energy projects. One of the most important motives for participation is altruism; financial aspects are also an important incentive (internal factors).

Ruggiero et al. [35] investigate drivers and success factors for community energy projects in the Baltic

Sea region. They find that mainly political, regulatory (Municipal support) and financial (Economic factors) but possibly also cultural barriers (Internal factors) prevent the diffusion of energy communities in that area.

Seyfang et al. [2] examine the development of energy communities in England. They show that progress is linked to five factors: group (Internal factors), community, project policy and networking and partnership factors (Municipal support). The “group factor” is the most important. These include a shared vision, the determination and commitment of key individuals, and the skills (e.g., accounting, technical understanding) of the members. “Project factors” are defined as possible problems that arise when a community wants to implement a project. The access to funding is named as the biggest hurdle for implementing projects. “Community factors” are used to describe dealing with local communities or getting broad citizen support (Social factors) for the project. The importance of supportive collaborations and partnerships and networks is summarized under the term “networking and partnership factors”. Community energy groups often work with other organizations such as local governments and other civic groups, businesses, schools, non-governmental organizations/charities and national government agencies. “Policy factors” are also described in this paper as facilitating or inhibiting. It is highlighted that initiatives have been successful when they participate in local government planning and development plans and respond to government consultations or work with a government department.

Van der Schoor et al. [36] study networks formed around local energy communities (networking). The authors conclude that the networks generally have three goals which can be interpreted as success factors: profits are invested in sustainable, regional projects (sustainable), profits remain in the region while promoting innovation (social factors) and management of energy and financial resources are democratically organized (democratic structures).

Volz and Storz [37] state that the fundamental (implementation) structure of cooperatives is a main success factor (democratic structures). A second factor is the basic trust in CECOs, since they can be regarded as low-risk due to a legally required mandatory audit that is seen as a promise of quality (internal factors). However, they also found that successful actors seek creative ways to overcome barriers (professionalization), for example, by collaboration with external partners, experimentation and business model innovation.

The literature analysis shows an overall heterogeneity of the success factors of energy communities. There is no uniform understanding of success factors and no uniform definition of success itself. Some papers present factors

for a successful start of energy community initiatives, others talk about drivers of energy projects. The driving motives of actors and projects are characterized. These different factors are intended to promote different definitions of success. Success, for example, is defined as the successful start-up and assertion of CECOs [8, 27–33, 35, 37] and explicitly the professionalization of CECOs and the processes required [27, 35]. Other works define success as civic engagement which can be promoted [29] and a noticeable contribution to the (decentralized) energy transition [8, 36]. Others define success as the fact that CECOs pursue and achieve the goals they have set themselves [2, 32, 36].

The need for stable cash flow in small CECOs is mentioned primarily. Most CECOs do not have the cash reserves to meet demands for immediate withdrawal [38] and this puts the continued existence of CECOs at risk [39]. The CECOs need loyal long-term members who support the organization financially.

Table 1 shows an overview of the sources described above.

The papers from the literature review name the following eight success factors identified in descending order: Professionalization of structures (7), social factors (7), internal factors (7), municipal support (4), economic factors (4), democratic structures (4), networking (3) and regionality (2).

We conducted a subsequent search for literature on success factors of citizen cooperatives, covering the years 2020 and 2021, with all other search conditions unchanged. Nine articles were found, six of which do not deal with the topic of success factors of citizen cooperatives or only marginally.

Ryszawska et al. [40] note that it is not allowed to establish citizen cooperatives in cities in Poland, and similarly in the Czech Republic and Hungary. Here, the focus is on co-creation with housing co-operatives and other residential communities to develop successful business models [40].

Streimikiene et al. [41] examine barriers to and drivers of the use of renewable energy in rural communities. They identify three dimensions of success factors: (A) strategic conditions, which establish a statement about the general attitude towards renewable energy within rural communities, including the need for community support and personal skills (internal factors). (B) Institutional conditions, which identify favourable political (e.g., availability and continuity of state and local incentives, subsidies, soft loans, tax rebates), legal (e.g., sound decision-making processes, low bureaucratic burden) and economic (e.g., availability of investors and finance, predictable economic efficiency and profitability of RE initiatives) capacities, and physical conditions (e.g., the

**Table 1** Overview of success factors from the literature review

Factor Author	Regionality	Networking	Professionalization	Municipal support	Economic factors	Social factors	Internal factors	Democratic structures
[28] Candelise and Ruggieri (2020)		X		X				
[29] Centgraf (2018)		X						
[30] Kahla (2014)		X		X	X	X	X	
[31] Karpenstein-Machan et al. (2013)	X	X			X	X		
[8] Klagge et al. (2016)	X				X			X
[32] Łapniewska (2019)		X			X	X	X	
[27] McGovern and Klenke (2018)		X						
[33] Radtke (2014) and [34] Radtke (2016)						X	X	X
[35] Ruggiero et al. (2019)				X	X			X
[2] Seyfang et al. (2013)	X	X		X	X	X	X	
[36] van der Schoor and Scholtens (2015)	X				X			X
[37] Volz and Storz (2015)		X					X	X

level of the technological development of RE technologies) [41].

De Crescenzo et al. [42] describe the factors that facilitate more effective citizen participation in financing renewable energy and energy efficiency projects. They highlight that (a) the combined use of cooperative and crowdfunding models is important and (b) the use of social networks plays an important role in project funding [42].

These papers also describe the success factors found in the previous literature.

### Empirical study

An empirical investigation was conducted in the second step to check and complement the heterogeneous results of the literature analysis. This analysis is based on 12 qualitative, semi-structured expert interviews with members of CECOs in the north western German region, conducted between May 2020 and January 2021. The citizen cooperatives surveyed are based in Lower Saxony, Bremen and North Rhine-Westphalia. The geographical selection leads to the implication, that the results might not be transferred to other areas. Nevertheless, the literature in the previous section did not show any significant regional bias. The specific regional influences are not studied further in this paper. Semi-structured interviews were chosen for data collection because they provide a flexible but structured method to obtain a rich data set for analysis [43], while providing an appropriate balance

between consistency and flexibility [44]. In addition, this method allows interviewees to share experiences and feelings, leading to a deeper understanding of the phenomena of interest [45, 46]. The selection of interviewees was made based on a database of CECOs from Germany [47]. The interviewees were usually alone. However, the entire board of directors was present for the interview (three people) in one case and two board members were present in another.

Members of the board of management and supervisory board were chosen as interview partners. A list of the final interview partners can be found in Table 2. The sample presented allows differentiated stakeholder perspectives (e.g., in terms of the number of members, business model and gender) to be gained on the issue of success factors. However, it should be noted that the gender distribution on boards in energy communities is unequal. In a survey by Radtke (2014), about 80% of board members were male [33] Herbes et al. (2021) state in their study that 94% of the board members they surveyed were male [48]; this is also reflected in the sample of our survey. A guiding questionnaire was developed to answer the research questions on the success factors of CECOs. Each interview questionnaire started with a general knowledge question about energy communities. This was followed by open questions on success factors and obstacles to the members' own cooperative. Finally, demographic questions were asked about the interviewee(s) and the CECOs. The interviews took between 40 and

**Table 2** List of Interviewees

Interview	Size (number of members, at the time of the survey)	Business model	Role	Gender
1	0–99	Investment in PV, tenant power	Management board	M
2	0–99	Investment in PV, charging infrastructure	Management board	M
3	300–499	Investment in PV, procurement of green electricity	Management board	M
4	100–199	Investment in wind energy	Management board	M
5	100–199	Investment in PV	Management board	M
6	100–199	Investment in PV	Management board	F, F, M
7	0–99	Project development /management	Management board	M
8	200–299	Investment in PV	Supervisory board	M
9	200–299	Investment in PV, procurement of green electricity	Management board	M
10	0–99	Investment in wind energy	Management board	M
11	500–999	Local heating, green electricity	Management board	M, M
12	2000–3999	DSO, investment in PV and wind energy	Management board	F

F Female, M Male, PV Photovoltaic

65 min. Interviews were recorded after participants had given informed consent and permission. Each interview was transcribed verbatim.

We chose CECOs interview partners that have different business models. We also tried to take into account different founding histories and dates. There are CECOs, for example, that have emerged from existing limited liability companies or other legal forms. The CECOs vary in size, measured by the number of members, and the business model. Most of the CECOs have investments in electricity generation from renewable sources. One of the CECOs operates a heating network, another an electricity network and yet another CECO primarily supports other CECOs in the implementation of projects.

The analysis of the interviews was conducted following the methodology of Mayring [49]. The essential components of the statements are captured inductively by summarizing and abstracting the interviews into 'codes' and later into 'categories' [49]. In the first step, the codes were developed from the individual statements of the interviews after a first reading by a researcher. Preferred codes were those that represent either the actions of the interviewee or the perceptions of the actions observed by the interviewee, regardless of whether they were expressed explicitly or indirectly in the interview [50]. After a reading of the interviews by all three researchers these initial codes were discussed, adjusted and new codes developed. The coding process was conducted using a qualitative data analysis software (ATLAS.ti 8.4.5). All codes were constantly compared and independently cross-checked by all three authors to ensure the reliability of coding [51]. In the second step, the interviews with the original codes were reviewed again and further comments and statements were added to the transcripts and linked to the

respective codes. In the third step, the codes were standardized, clarified and further elaborated. The results were compared and updated between all three researchers.

#### Category A: low-risk business models

The interviews expressed that the general conditions of the CECOs (e.g. few staff, volunteer board members, small budget) lead to the fact that the managers prefer as little complexity as possible in the day-to-day business. The stability of the financial flow is one way of keeping the complexity and the risk of the business model as low as possible. The management of matching maturities is an important factor. The often honorary board members of the CECOs aim at hedging the risk of long-term investment by a long-term commitment of the members:

*"Whoever wants to become a member [...] has five years of compulsory membership [...]." [I5:4]*

The desire for low complexity is reflected, for example, according to a CECOs interview partner, in the area of business models for electricity and heat supply for district supply.

*"We now have a project in which the heat and power supply for an entire neighborhood is provided by a citizens' energy cooperative. But that is also the most complex thing you can do." [I7:2]*

This need for long-term and conservative planning is also reflected in the preference for investments with stable policy frameworks. One interviewee said in this regard:

*"If I plan a major investment today, then, of course, I want to know how that will develop politically for the next few years." [I12:21]*

It generally became clear that the success of CECOs depend on the business model. The latter should be designed to be easy to master, as it is the case, for example, with feed-in tariffs for renewable generation. A success factor is a legal/political framework that is designed in favour of this 'simplicity' of the business model.

#### **Category B: productive exchange with relevant stakeholders**

An important factor for the development of successful CECOs is the productive exchange and co-operation with other stakeholders. This includes the support of municipalities, local energy suppliers and individual regional personalities or mayors.

Good communication from and with stakeholders can, for example, lead to joint actions or improve each other's understanding, which help to realise projects better. One interviewee said:

*"There are isolated construction resistances from the regional utilities. (Through joint discussions) [...] However, a trend is emerging that cooperation is improving, and we are well on the way to achieving this." [I1:16]*

Another interviewee said that exchanges with different stakeholders sometimes lead to new projects or the implementation of planned projects in the first place. Individuals can also be involved through CECOs:

*"When they [wind farm operating company in which the CECOs are shareholders] make wind [energy] [...] they need the farmers, the land." [I11:46]*

Important stakeholders for the initiation of projects for CECOs are the municipal representatives in the communities involved. Therefore, cooperation is sought by many interview partners:

*"[...] [municipalities] should have included such conditions [...], so that citizen participation is stipulated for the wind turbines, for the [wind] farms. [...] Citizen energy should be better integrated [...] and the municipalities had to do that." [I4:16]*

*"It's also about proximity, about permits, it's also about public roads, especially with local heating. And if you don't have the support [...] in the community, with the big local politicians, then I think it will be incredibly difficult to get something going" [I11:11]*

#### **Category C: social cohesion**

The starting point for a CECO appears to be a social network. This can develop, for example, from a pure friendship between people, joint activities in the local sports

club or other joint social activities. In many cases, the radius of action with the social network is also restricted locally. New members can be generated quickly based on existing social networks.

Shared ideas are the basis of collaborative action in civic communities [52]. Successful CECOs arise from the joining of citizens with a common idea or even vision. These CECOs often act with regional solutions to national problems such as the energy transition [53] and invest in sustainable, regional projects [36]. The CECOs, according to the interviewees, are usually local and active in shared milieus:

*"We operate within a radius of 20 kilometres." [I1:36]*

*"It should stay in the communities and in the state. The locally bound members can participate in such a project." [I5:17]*

Social structures can develop well in this local environment. It is stated in some interviews that it is precisely because of the village structures that this "sense of community" arises and that it is possible to develop a "social spirit" [34].

*"So, to a certain extent, there simply has to be a village structure and a sense of togetherness. That's important, otherwise you can't do a community project like this." [I7:15]*

*"They have a sports club, [...] a well-functioning social fabric. [...]. If that is given [...], then you can also implement a project well." [I7:17]*

Another interview partner mentions that the energy cooperative has developed from an existing social network:

*"In the first group, we were about ten people who were interested in it. It was born out of a network of people who knew each other." [I10:5]*

Successful energy cooperatives become a part of the social network and increase the social cohesion. To support this, CECOs can also offer services outside the energy sector.

*"What we have ultimately achieved with our small local store. Everyone realises that if we didn't have the cooperative, things would be worse for us personally and for our comfort of life." [I9:17]*

#### **Category D: principles for the organizational model (social-ecological credibility)**

The CECOs are seen as drivers of a sustainable energy transition through decentralized communities. This built credibility, i.e. the pursuit of one's own values (those of

the CECOs), is an element leading to the success of CECOs.

The CECOs have clear environmental and social principles. Cooperatives are associated, for example, with the terms 'environmental awareness' and 'trust'. A successful CECO must maintain its credibility in a social and environmental perspective. This means that the CECOs carries out its actions and deeds (business models and investments) in such a way that they have a socially and ecologically sustainable benefit (e.g. investments in renewable energies) [54].

The CECOs representatives see climate protection and energy transition as fundamental principles for their actions:

*"It's about advancing the energy transition overall [...] and, of course, that's even more [in] focus now because of the discussion about climate change."* [I4:22]

The clear ecological and social principles lead the climate protection movement (currently: FridaysForFuture) and its networks to support CECOs. We cannot determine whether the activists of these movements are also increasingly becoming members of CECOs, but these climate protection movements are strengthening the knowledge about sustainable energy production and use through their public presence.

*"With many energy cooperatives, through the FridaysForFuture movement or the Parents/Scientists for Future movement [...], [the] issue of climate change has grown tremendously."* [I8:7]

*"We [are] networked in the climate change movement better than average."* [I3:22]

These principles of the cooperative, especially in rural areas, seem to generate trust and allow a close connection with the community.

*"I think, in terms of acceptance, cooperatives are very successful because this cooperative model is really accepted by the people and there are also the cooperative structures behind it and that then also gives a greater trust than [with] limited partnerships [...] where there are actually few control options and few opportunities for insight for the individual partner."* [I10:1]

The instruments used to 'monitor' the co-operative and its actions also lead to a 'trust advantage'.

*"[...] the cooperative principle, as such, has a high level of trust. [...] also through this relatively strict examination and appraisal by the cooperative associations, it just ultimately has an edge in trust some-*

*where."* [I9:8]

#### Category E: commitment of individuals

Citizen energy initiatives are often founded by individuals. According to the interviewees, the initiators ('key Individuals') aim at establishing the CECOs and "keeping it alive". These 'key Individuals' form the 'heart' of each cooperative. One interviewee said that these committed individuals work to the point of physical exhaustion to achieve the CECOs goals:

*"Last year we had a board change and I think it was the first board change without being burnout the reason."* [I3:60]

The high workload may be the reason why citizen cooperatives often have difficulties activating members to take on responsibilities within the cooperative, as one interviewee confirmed:

*"It is indeed often difficult, since we work on a voluntary basis, to find the appropriately committed people who are willing to do this work in their free time [...]."* [I1:31]

The high motivation for the efforts of these key individuals seems to result from the possibility of advancing the transition in the energy sector. Individuals often cannot make such a big impact on existing systems. However, the key individuals want to make a significant contribution. They have a bigger impact with the help of a CECO and its members. The statement of one interviewee illustrates this point:

*"In a cooperative I always have [...] the leverage of power [...] of co-determination."* [I3:1]

Attention was increasingly drawn to the fact that particularly technical and economic qualifications must be present among the members (especially on the board) of a CECO in order for it to be successful. A connection to (local) politics was also pointed out as a desirable characteristic of individual members:

*"So, that means you need someone who has a technical mind, someone who has a commercial mind and, if possible, someone who is also a bit involved in politics, so that all the factors then come together and this community can then really succeed."* [I10:7]

The CECO can only be successful if individuals with the different qualifications show commitment to the development of the projects. The motivation for this commitment is the belief that they can make a difference with their actions. Risks arise from the high workload and represent a lack of professionalization in the

cooperative structure. This lack of professionalization is reflected in the fact that there is often a board with not enough different qualifications. This may lead to technical professionalization, for example, however, the economic professionalization is then less pronounced.

The authors identified a total of 20 codes. In vivo codes were formed during the 'open coding' of the interviews that resemble the success factors found in the literature studied. These are the basis for five categories of success factors. The results are summarized in Table 3:

## Discussion

The analysis of the literature reviewed revealed various success factors (professionalization of structures, social factors, internal factors, municipal support, economic factors, democratic structures, networking and regionality) which were identified through different methodologies. These factors were identified through interviews with members of CECOs [2, 28, 29, 31–34], case studies [35, 36], literature reviews [8, 28, 30], concept development [27] or by drawing on previous work [37].

In our view, there are no anomalies between the underlying empiricism in the literature and the success or success factors derived from it. For this reason, we decided that we could combine the results of the literature review with our survey.

The combination of the success factors identified in the literature review and the five categories from the empirical study allow one to derive overall success factors for CECOs.

We have drawn different connections between different concepts in this paper. Unfortunately, it was not possible for us to describe or prove these connections based on theoretical elaborations within the framework of this work. An investigation of the links mentioned here (e.g. the link between democratic principles and credibility) based on theoretical elaborations may help to understand them better.

### Low complexity

Based on the empirical findings described in Category A and the importance of internal structures identified

**Table 3** Categories and codes considered

Category	Codes included	Explanation
A. Low-risk business models	<ul style="list-style-type: none"> <li>•Return on investment</li> <li>•Financial flows</li> <li>•Conservative (cautious, not impulsive and rather not speculative)</li> <li>•Legal-political framework</li> </ul>	The CECOs are successful, if the political/legal framework is designed in favour of low-risk business models. This means that the business model(s) of the CECOs can be designed to be easy to master. The financial flow must be predictable and only economically safe investments are considered
B. Productive exchange with relevant stakeholders	<ul style="list-style-type: none"> <li>•Municipal support</li> <li>•Multipliers</li> <li>•Constant good investment opportunities</li> </ul>	The CECOs are successful if they collaborate with other stakeholders. This requires support from communities and individual 'speakers'. A social fabric within and around the CECOs is also beneficial. In addition, it is important that a CECO is offered reasonable investment opportunities at regular intervals
C. Social cohesion	<ul style="list-style-type: none"> <li>•Creation of sustainable networks</li> <li>•Demarcated geographically</li> <li>•Niches (presence vs. digital)</li> <li>•Social spirit for the organization</li> </ul>	Regarding successful CECOs sustainable local social networks are necessary for establishing and running energy communities. Successful CECOs operate in a clearly defined geographical area. As the CECOs become part of the social environment, they also provide services outside the energy sector
D. Principles for the organizational model	<ul style="list-style-type: none"> <li>•'Cooperative' creates trust</li> <li>•Enlargement of value creation</li> <li>•Connection to the community of climate protection</li> </ul>	The values associated with CECOs are one element of the success. Certain values are conveyed through the concepts of civic energy and cooperativism. Thus, it seems that trust and environmental awareness are associated with CECOs. However, many CECOs have recruitment problems. Therefore, a connection with the climate change movement may be required for success
E. Commitment of individuals	<ul style="list-style-type: none"> <li>•"Levers of Power"</li> <li>•Community normative goals</li> <li>•Board and member interaction</li> <li>•Objectives in the bylaws</li> <li>•Professionalization</li> </ul>	One success factor for a CECO is a shared common 'vision' by its members. The commitment of individuals with different skills is a must have for a successful CECOs. Motivation is based on the desire to actively participate in the transformation of the energy system. The board members have the power to influence the community but also carry the burden of the honorary work

in the literature review [2, 30–35, 37], one main success factor for CECOs is the low complexity of the business model [2, 8, 28, 30, 35].

The business models of CECOs should be manageable by the voluntary, committed individuals on the board of the CECO. Less complex business models should not be understood as simple in the plain sense. Instead, business models should be kept in such a way that those responsible for the CECO can fully master them. Integrated electricity and heat supply for an entire neighbourhood, for instance, is already the most complex thing CECOs can offer [I7:2]. Herbes et al. (2021) also describe in their work that CECOs tend to use less complex models when looking for new business models [48].

Low complexity means, on the one hand, that the framework conditions, such as legislation or the willingness of the authorities and municipalities to cooperate, are designed in such a way that the business models are understandable and manageable even for the uninitiated. These core competencies can be in the area of project planning and project financing (e.g. [55]), the operation of distribution grids, the sale of regional electricity [56] or other areas of value creation.

Less complex business models can also mean serving niches (e.g., digital solutions) that are not yet covered by traditional energy service providers or producers. However, it is questionable to what extent “less complex” can be achieved.

Digital business models covered or implemented by CECOs should be directed towards exchanging energies within a neighbourhood or district solution. The CECOs could, thus, provide the energy with their facilities and capture, digitize and present the energy flows within these boundaries to the end users. Business models from other areas (e.g., marketing business models that can, for example, have a lasting influence on customer opinion) can also be adapted here.

However, the need for less complex business models shows the limitations of CECOs as actors in the complex and long-term process of energy transition.

#### **Find and support committed individuals**

Committed individuals are the heart of all CECOs. This finding is supported by the category E of the empirical research and is named frequently in the literature review as internal success factor [2, 30–35, 37]. The CECOs often work with volunteer boards (cf. [48]). This frequently makes it difficult to find committed people who will do this volunteer work in their spare time [I1:31].

One problem is to bring together the different preferences of the CECO members. In the cooperative literature, the heterogeneity of members is often mentioned only in passing, reduced to a few dimensions and seen

as a disadvantage for cooperatives [57]. However, member heterogeneity seems to bring some problems with it as the number of members increases. These need to be moderated by ‘key individuals’. Members differ in their personal characteristics, especially in their age, experience, and educational background [58–61]. Different personal characteristics lead to different preferences and interests of the members. Cook and Iliopoulos (2000) describe three frequently discussed cooperative investment problems caused by member heterogeneity that are closely related to members’ personal characteristics [62]: firstly, the insider free-rider problem [63]; secondly, the horizon problem, especially in relation to their age, their planned duration of operation and their corresponding time preferences [63]; and finally, the portfolio problem [57]. Members hold suboptimal portfolios in terms of their risk preferences due to the non-transferability, illiquidity and non-valuability of shares. These problems may increase with the number of members.

The CECOs need two types of committed members. On the one hand, members who take responsibility for the CECOs and the projects are important. These people are often found on the boards of directors and supervisory boards. They are usually the drivers in the search for funding and realisation of new projects. If possible, these members must be positioned in such a way that they can master economic and technical problems [I10:7]. In the past, too little emphasis was placed on the disciplines of marketing and public relations. Herbes et al. (2021) state that these management skills are core competences that are of great importance for future business models [48]. One solution can be to extend the networks to environmental and climate movements (e.g., FridaysForFuture) [I8:7, I3:22]. Communication with these movements can lead to the acquisition of the core competences required.

On the other hand, members who back the decisions of the boards through democratic processes are needed. This second group of members promotes the CECOs through further financial contributions or simple idealistic support [I3:20].

#### **Maintain and strengthen the social-ecological credibility**

The CECOs are fundamentally bound by democratic principles when decision-making. The social-ecological credibility is a main success factor for CECOs. In this context, socio-ecological means that CECOs must pursue both social and environmental goals in their activities. This means that the activities are for the benefit of the members and for the benefit of the ecological environment. The ‘social factors’ were identified in the literature review [2, 8, 27, 30–35].

An important social factor is the “Sense of Community”. There are various definitions of this in the relevant

literature (e.g. [64–66]). McMillan and Chavis (1986) examined the concept of a “sense of community” and came up with four components: membership (the feeling of paying a price to join the community and, thus, having a right to belong), influence (the extent to which the person can influence the actions of the group), integration (the sense of belonging in a community that is rewarding for its members and positively reinforces their participation) and need satisfaction (sharing the same story in terms of identification with the community) [67].

This was confirmed in the empirical study. It is stated, for example, that to a certain extent, it simply takes a village structure and a sense of belonging to realise community projects [I7:15]. This affirmation is summarized in categories C and D.

Social principles encompass democratic voting in CECOs and the use of capital for specific projects that meet the objectives of each CECO's statutes. One objective in a lot of CECOs is the construction and/or operation of (environmentally friendly) renewable energy plants to advance the energy transition: “*It's about advancing the energy transition overall [...]*” [I4:22].

The members of a successful CECO need to share a common vision, however, maximizing the return on capital is not the main objective of all members [32].

A shared vision can be based on “common needs and goals, a sense of common good, a shared life, a shared culture and worldview, and collective action” [68]. Social action can be defined as “participation in social issues to influence their outcome for the benefit of people and the community” [69]. Ideally, these core community values can also be found in the principles of energy cooperatives. According to the International Cooperative Alliance, “concern for the community” is one of the seven principles [25]. This may mean that co-operatives pursue community purpose as a fundamental principle. The survey revealed that the co-operative provides a better living comfort in the community and among the members [I9:17].

Cooperatives represent a different ownership model than capitalist business organizations. Unlike capitalist corporations, they are, in most cases, owned by their members/users and not by investors, even if some members explain their motivation for membership with investment and return reasons [34]. Brummer [70] assumes that CECOs are mainly supervised by informal-social-supervisory mechanisms (representatives of the cooperatives). He mentions here, for example, family ties and overlapping peer groups that regulate in case of critical behavior. The survey of the board members revealed a similar picture: the cooperative principle and the strict examination and appraisal by the co-operative federations provide for an advance of trust [I9:8]. These actions

take place in a social context that function so well that state regulation even seems superfluous.

## Conclusion and outlook for future research

We used a two-step methodological approach to identify success factors of energy communities. In the first step, we analysed the literature on success factors of energy communities in order to identify factors which had already been recognized. Subsequently, we verified existing findings and identified new factors with the help of a qualitative content analysis of twelve expert interviews with managing directors of CECOs. As a result, we can provide a systematic overview of the success factors of energy cooperatives. We have summarized these into three core statements.

Energy communities often act as small interest groups that can be more successful in attracting customers and members through more professional structures and in managing constantly increasing complexity [28]. More professional structures are required to support the committed individuals on the board. Professionalization is also a success factor to enable CECOs to play a role in the increasingly complex process of energy transition.

As professionalization is required for successful CECOs, the major challenge is maintaining the social credibility that is the basis for their success. A long-term success is possible only if all members see the contribution of the CECO to achieve the common goal.

## Policy Implications

New community energy initiatives can emerge from a strong social cohesion in a society. In addition, local ‘key individuals’ must be identified and supported. To this end, the framework conditions (e.g., policy, legislation, municipal support) must be adapted in such a way that these ‘key individuals’ in the CECOs are not overburdened. Herbers et al. (2021) recommend that policy planners should support CECOs (in this work, RECs are examined) in their self-help by creating and strengthening networks where managers from different CECOs can meet and work together on tasks. In addition, opportunities to establish and fund training for CECOs managers should be explored [48].

Government instruments to promote the energy transition, such as energy regulations and policies, can present both opportunities and barriers to the development of CE. There are numerous cases showing how instruments used by local governments to promote community energy supply contradict national policies [1]. The simplicity of business models needs to be supported by legislation, regulations and adapted local support (e.g., expedited permission processes). Political or regulatory hurdles are frequently cited as barriers for the implementation of

community energy projects (e.g., financial support, feed-in tariffs, grid services or fiscal incentives).

## Further research

The empirical part of this work is limited to a relatively small sample of CECOs in north western Germany. While care has been taken in the selection of interviewees to ensure a certain diversity, this is not sufficient to reflect the entire field of CECOs or even all energy communities. It would be interesting to interview the members of CECOs to find out in which role they see themselves within the CECOs, what they understand by success and which influences make CECOs successful. Members are eager to support active 'key individuals', but it remains an open question how to find these special members.

In addition, the impact of initiatives on energy markets has not yet been presented. Using theories from the social sciences (e.g., theories of participation, trust and conflict), we can attempt to shed light on our understanding of energy cooperatives as microlevel social phenomena. Participation and civic engagement are essential conditions for the emergence of vital communities.

We believe that these factors are crucial for the success or failure of cooperatives. Such research is likely to have practical implications for the successful management of energy cooperatives. Trust creates social bonds and cohesion, and further research into its role in energy cooperatives may lead to a better understanding of interpersonal obligations in them. These interpersonal obligations state that whenever people intend to act together, one person has a special position in relation to the actions of the other: each of us owes a duty to the other to fulfil his/her part of the joint activity and acquires a claim on the other's partial performance [71]. This could help to increase project efficiency and mitigate governance problems that arise when different interests and preferences have to be taken into account, which can be avoided through common goals.

We have drawn different connections between different concepts in this paper. An investigation of the links mentioned here (e.g., the link between democratic principles and credibility) based on theoretical elaborations may help to understand them better.

## Acknowledgements

This paper was produced as part of the Interreg (North Sea Region) funded project Delivering Community Benefits of Civic Energy (COBEN). The Authors Ahlemeyer, Prof. Dr. Gries and Prof. Dr. Wawer are members of the COBEN Project Partner Osnabrück University of Applied Sciences. We thank the two anonymous reviewers whose comments and suggestions helped improve and clarify this manuscript.

## Author contributions

Design and data collection: KA and KMG. Analysis, writing, review and editing: KA, KMG, TW and BS. All authors read and approved the final manuscript.

## Funding

Open Access funding enabled and organized by Projekt DEAL. This research was conducted within the "COBEN-Delivering Community Benefits of Civic Energy" project partly funded by the EU Interreg VB North Sea Region programme, grant number 38-2-7-16.

## Availability of data and materials

The authors confirm that the empirical data from the study support the findings and are available within the paper. The transcripts of all interviews are available in German and can be accessed from the corresponding author upon reasonable request.

## Declarations

### Ethics approval and consent to participate

The participants, all of whom were over the legal age of 18 years in Germany, took part in the study voluntarily. They provided verbal consent to participate in the study.

### Consent for publication

Not applicable.

### Competing interests

Not applicable.

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Received: 17 November 2021 Accepted: 7 June 2022

Published online: 29 June 2022

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