DECIDE

DELIVERABLE NUMBER: D1.1
DELIVERABLE TITLE: Guidelines for characterization, segmentation, and group dynamics of collective energy actions

Deliverable due date: 30/11/2020
Submission date: 30/11/2020

decide4energy.eu

DELIVERABLE INFORMATION

Deliverable Number:	D1.1
Deliverable Title	Guidelines for characterization, segmentation, and group dynamics of collective energy actions
Work Package Number	WP 1
Work Package Title	Social science to fostering collective energy actions
Lead Organisation	UMA
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Reviewers	Marten Saareoks (TREA), Claudia Winkler (JR)
Nature	Report
Dissemination Level	PU -Public
Deliverable Date	M6 (30/11/2020)
Draft Number	/
Version history	1.0 in M6 – living document
Version Number	1.0

PROJECT CONTRACTUAL DETAILS

Project Title	Developing Energy Communities through Informative & Collective actions
Project Acronym	DECIDE
Grant Agreement No.	894255
Project Start Date	01-06-2020
Project End Date	31-05-2023
Duration	36 months
Supplementary notes:	/

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EXECUTIVE SUMMARY

This deliverable aims to foster a common understanding of collective energy actions and to review the evidence that exists on how to promote them. It is based on an extensive review of scientific literature, publications from previous projects, original stakeholder interviews and the legislative framework to energy communities including empirical as well as conceptual considerations.

In short, we define collective energy actions as the sum of energy-related behaviours that are intended to promote the common goods of a social group. Further, we segment collective energy actions along the two dimensions we consider most central for defining interventions. First, we distinguish collective energy actions that take place in the context of energy communities of place and energy communities of interest. Second, we identify action phases through which the energy communities progress, from inception, foundation, initial operation, maintaining of operations to upscaling and diversification.

Based on this segmentation, two evidence gap maps, psychological and sociological, show that little strong empirical evidence exists as how to promote collective energy actions. Controlled, quantitative evidence exists on individual energy actions, including in the context of energy communities, rather than collective energy actions themselves. The qualitative evidence mainly focusses on the diversification and upscaling phases and foundation, initial and maintaining operations phases for the psychological and sociological perspective respectively. Little evidence pertained to the inception phase, including how to gain new members outside those already involved.

The most commonly documented factors that can act as both, drivers and barriers to collective energy actions, were economic, administrative, social, personal, ethical and technical. As initial set of recommendations to inspire and maintain collective energy actions, we suggest to a) foster social identities, b) to provide the basis for experiencing self-efficacy and c) to channel collective emotions.

This deliverable is intended as a living document. Recommendations will be tailored to the particularities of the DECIDE pilots for Deliverables 1.2 and 1.3 due M12. Special attention will be paid to how pilots might allow for the generation of novel evidence.

CONTENTS

INTRODUCTION: AN EVIDENCE-BASED PERSPECTIVE ON PROMOTING COLLECTIVE ENERGY ACTIONS

A major goal of DECIDE is to promote the decentralized, citizen-owned and collective generation and distribution of electricity. Within DECIDE, we take an evidence-based social science approach with the goal of identifying effective interventions. The main purpose of this living document is thus twofold. First, it aims to foster a common understanding within the DECIDE project of what collective energy actions are in terms of their sociological-social and psychological-behavioural characteristics (legal characteristics will be delineated in Deliverables 3.1 and 3.2 due M12 and M18). Second, it aims to showcase the evidence base that exists on how to promote collective energy actions. To structure the evidence base, we developed two evidence gap maps: one sociological, one psychological. These gap maps segment collective energy actions into actions of place versus interest and along their stages of development.

More formally, the document is the culmination of the work carried out in WP1 in Tasks 1.1.1, 1.1.2 and 1.2. In Task 1.1.1 a research evidence gap analysis was conducted, with an in-depth examination of existing research, guidelines and previously conducted interventions. Definitions of collective energy actions were clarified from both a psychological-behavioural as well as a sociological-social perspective. Furthermore, literature was sighted with the goal to understand drivers and motivators as well as barriers of stakeholders, both individually as well as in the context of their communities, including an investigation into social norms and social identities. Other macro-level predictors were also researched, as well as contextual factors such as size, dynamism, location, and demographics. Finally, we discuss the synthesized findings specifically for employment in DECIDE and for the trials herein and give

first insights into how DECIDE can capitalize on existing levers to foster and increase the efficacy of collective energy action.

Notably, this document is a living document, meaning that it will be refined as the DECIDE project progresses, with multiple updates throughout the project. Specific recommendations for segmentation and interventions beyond the current more generic ones drawn in conclusion from the literature analysis will be defined as pilots in DECIDE become more clearly defined, in conversation with all project partners.

DEFINING A COLLECTIVE ENERGY ACTION (CEA) AND RELATED CONCEPTS

We start by proposing a definition of the actions DECIDE is trying to promote. We take into consideration the legislative context of Renewable *Energy Communities* (RECs) and Citizen *Energy Communities* (CECs) as well as the psychological-behavioural and sociological-social definitions of collective actions.

*A **Collective Energy Action (CEA)** is the activity of a group of people who have united to achieve a common goal in the energy field. The concrete expression of this goal are types of „common goods".*

Typically, a CEA has the following **goals**:

1   Independence or partial independence from major players in energy supply / energy generation via autonomous generation and management of energy.

2   Strong participation of group members and active role in collective energy-related decision-making processes.

3   Development of innovative approaches and products in the energy sector (social, technological or product/service related).

Further definitions:

Common goods („commons") in the context of energy communities can be defined as material or non-material goods that fulfil certain needs of the group, and that are commonly produced, managed and benefitting the same group of people. Typical commons for CEA are the provision of energy services, environmental improvements such as increased air quality, greenhouse gas emission reduction and an increase in social cohesion.

Social innovation in this context describes the creation/production, distribution, use and management of common goods using new social configurations. A key social innovation for CEA is the transformation of hitherto private goods into collective ones, i.e. owned or managed by larger groups. This requires corresponding structural changes and novel processes.

Community energy initiatives (CEIs) are possible formalizations intended to create CEAs. They are mostly locally oriented and consisting of mainly natural persons. . Depending on the extent to which the CEI defines itself through its locality or common interest, the terms "community of place" or "community of interest[1]" are used.
CEIs usually share certain characteristics and purpose orientation and are committed to a form of organisation that emphasises participation and ownership. The forms CEIs may take are heavily influenced by the national legal framework and may include, among others, associations and cooperatives. If these organisational forms meet certain requirements, they can be considered as **Energy communities (EC)** according to the EU definition ('citizen energy

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[1] Sometimes also called „communities of practice"

communities', see Internal Electricity Market Directive (EU) 2019/944 (European Parliament & Council of the European Union, 2019), respective 'renewable energy communities' see Renewable Energy Directive (EU) 2018/2001 (European Parliament & Council of the European Union, 2018)).

A summary of the context of these definitions can be found in Figure 1. Collective energy action. **.** The **CEIs**, which may take many different organisational forms, undertake the **collective energy actions (CEA)** which produce concrete **common goods**. Often CEAs are also linked to the development of common goods requiring a **social innovation** (see above "intentions" of CEAs).
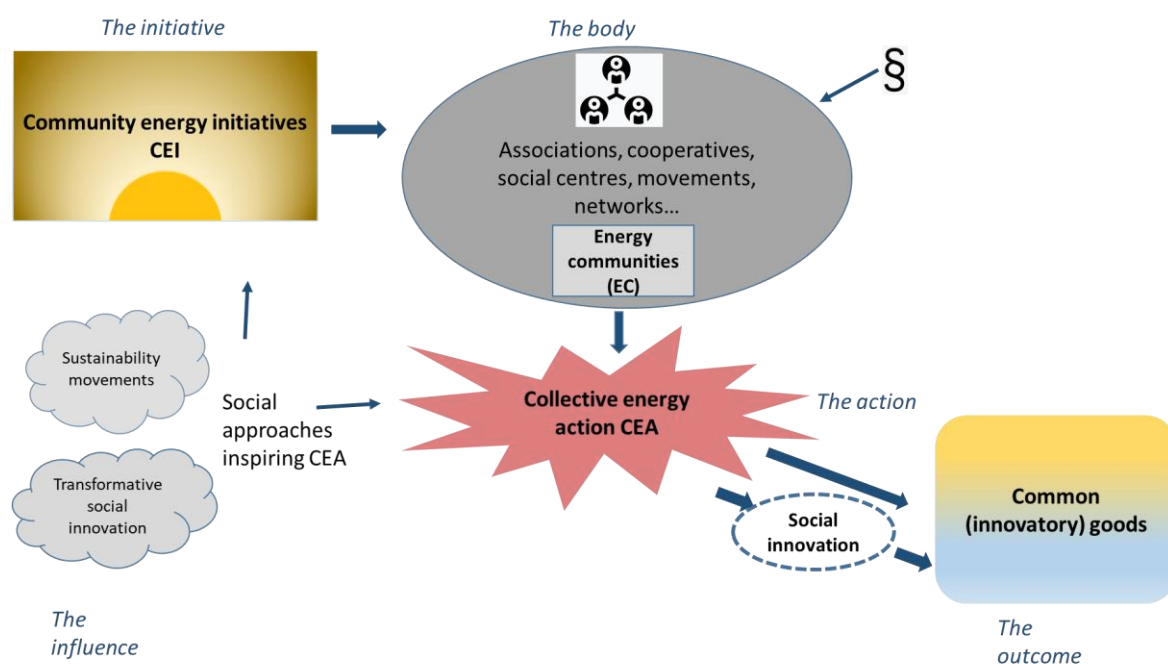

Figure 1. Collective energy action.

The emergence of community energy initiatives of various kinds and their collective actions has been inspired by earlier social approaches, e.g. by *sustainability movements*, which emphasised the grassroots aspect and the local framework for action, or by *social innovation movements,* which strive for institutional change and greater fairness in social and economic terms. Depending on the extent to which the CEI defines itself through its locality or common interest, the terms "community of place" or "community of interest[2]" are used.

DEFINING INDICATORS OF COLLECTIVE (ENERGY) ACTIONS

The definition of CEAs implies certain behavioural and attitudinal indicators. Delineating those indicators from other energy related activities is important to evaluate the success of interventions promoting CEAs from a behavioural science perspective. Across the literature, a large variety of indicators has been studied in relation to what we call CEAs, yet sometimes these are not clearly distinguished from characteristics of CEA members themselves (e.g., Bauwens, 2016). Thus, examples of behaviours can serve to communicate clearly what CEAs are.

A prominent definition summarizes that "a group member engages in collective action any time that she or he is acting as a representative of the group and the action is directed at improving the conditions of the entire group" (Wright et al., 1990, p. 995). That is, most generally and most importantly, a CEA **behavioural indicator must be subjectively linked to the collective goals** by the actor. An individual installing a smart meter with the intention to facilitate the billing procedure of a CEI would be such a behaviour. The very same behaviour performed with the intention of solely saving money would not. Similarly, becoming a customer of an energy action with the intention to protecting the climate or to engage with

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[2] Sometimes also called „communities of practice" (REF needed).

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other people in the action would qualify, while the sole intention to increase personal convenience would not. Thus, central elements of this definition root in social identities and the common group goal.

Among collective actions in general, CEA have so far received relatively little attention and, as our Gap Map will illustrate, little is known about causal determinant CEA behaviours in particular. We therefore integrate evidence for other forms of collective actions into this deliverable.

In the behavioural science literature, collective action takes many forms, ranging from non-violent actions such as taking part in peaceful demonstrations, signing petitions, occupying buildings as form of collective protest or participating in acts of civil disobedience, to more radical forms such as sabotage and violence (Bamberg et al., 2015; van Zomeren et al., 2004). More specifically, behaviours used as indicators for collective action in previous studies were for example engagement of university students against study fees (van Zomeren, Leach, et al., 2010; van Zomeren, Spears, et al., 2010; Zomeren et al., 2008), participation in Transition Town Movement (Bamberg et al., 2015) and gay rights protests (Johnston & Noakes, 2005).

Indicators that might be considered indicators of collective energy actions have mostly been studied related to climate and energy. Measures involve observing a multitude of behaviors and self-reports of social identification and evaluations. Some examples are the intention to sign a petition to promote measures against the climate crisis or the intention to vote for a political party that fights against the climate crisis (van Zomeren, Spears, et al., 2010), the social identification with a renewable energy project (Radtke, 2014), the feeling of ownership with a renewable energy project (Hoffman & High-Pippert, 2010), the support and acceptance of a renewable energy project (Walker & Devine-Wright, 2008), the attitude towards an

energy community project (Bauwens & Devine-Wright, 2018; Veelen, 2017), active investment in an energy community (Bauwens, 2019) or in renewables (Bergek et al., 2013), or the intention to join an energy community (Bauwens et al., 2016; Kalkbrenner & Roosen, 2016; Koirala et al., 2018; Poppen, 2015).

MOTIVATORS FOR COLLECTIVE (ENERGY) ACTIONS AND THEIR DEFINITIONS

The following sections showcase motivators for collective actions and, where available, for CEAs. It represents a summary of the results from the evidence gap map analysis, which are detailed below. We will present a few selected studies that outline the defined motivators. Understanding these motivators is key since they are the basis for designing interventions to promote CEAs.

CAUTION: Reading this evidence, it is important to keep in mind that most empirical evidence for CEAs is based on individuals that are already members of energy initiatives and that is might therefore not be applicable to non-members. Also, most evidence is anecdotal or "correlational" in nature. Interventions derived from this evidence should be considered hypotheses. Thus, for DECIDE it is important to elaborate strategies to reach people outside "the bubble", aiming to upscale CEAs and to create sound evidence for further decision making.

Defining clear identities/Capitalizing on existing identities. Energy communities have been shown to emerge either from already existing communities which already exhibit a social identity, or which have a clear idea of the existing identities before its creation (Dibb & Roby, 2018). In-group identification and salience of social identities has been identified to influence group members in, for example, resource dilemma situations (De Cremer & Van Vugt, 2002). Community identification prevented the overuse of communal water resources even in the

absence of financial incentives (Van Vugt & De Cremer, 1999). At the collective-action-level, social norms and decision observability increased support for renewable energy, even at a financial cost to oneself, when exposed to pro-environmental social norms.

Create a sense of collective efficacy and active participation. A strong participatory process with cooperation and consensual process is recommended (Walker et al., 2010), with the idea to "plug into the local community and keep them informed and involved", in particular when relating to already existing and well-functioning communities. These kinds of strategies can be the base for creating a sense of efficacy, or the subjective perception of being able to execute an effective action (Fritsche et al., 2018). A study comprising 55 localities of different population size in Spain showed that smaller communities have a greater belief in their collective efficacy to develop pro-environmental action than larger communities (Heras-Saizarbitoria et al., 2018). Further, when the individual sense of efficacy is frustrated, collective actions that are perceived as effective can act as a substitute (Stollberg et al., 2015).

Foster collective emotion. Next to identification and efficacy, collective emotions such as fear or anger have been proposed as a major motivator (Zomeren et al., 2008). Three studies induced collective anger to find that it increased collective pro-environmental action intentions and actual signature of a petition (Barth et al., 2015; van Zomeren et al., 2011). Experimentally increasing fear of the negative future consequences of climate change increased people's collective pro-climate action intentions (van Zomeren, Spears, et al., 2010). Collective guilt increased support for pro-environmental groups, while collective pride did not have an effect (Mallett et al., 2013).

Foster community trust. Trust has been pointed out as an important factor towards an individual's willingness to invest resources in community-based renewable energy projects

(Kalkbrenner & Roosen, 2016; Koirala et al., 2018). Trust in project organizers has been found to be correlated with citizens' support for the project, with the conclusion that trust between local people and groups take projects forward and is part of the package of conditions that can enhance the adoption of a community approach (Walker et al., 2010).

Co-create a narrative with clear collective goals. The complex interplay of motivators such as social identity, efficacy beliefs, trust and collective emotions call for a collective narrative. Facilitating the creation of such a clear narrative can have the ability to tie all motivators together (Curran, 2012). Local themes have been found to be the most motivating narratives, with social and community-related aspects being other appropriate narratives (Poppen, 2015; Rogers et al., 2008). Ecological narratives have been found to be a powerful motivator for actual involvement (Radtke, 2014).

Other motivators. Further, motivators derived from non-collective behaviours have also been discussed. Cost saving, participation opportunities, energy efficiency, control, aesthetics, freedom from capital pressures and risk-sharing have been mentioned as other motivators for participation in CEAs and CEI (ECHOES, 2017a). In particular, reduced cost and increased comfort have been identified as key values (BRIDGE Working Group on Customer Engagement, 2019). The BRIDGE project recommends adapting the communication of monetary versus environmental benefits on local conditions regarding peoples' living situation and current energy prices. For example, monetary incentives were observed to be less powerful in wealthier areas. It also recommends striking a clear balance between social inclusion and promoting green values. Arguments for emphasizing non-monetary incentives are that building on environmental values instead of financial and comfort-benefits fosters long-term engagement and integration.

TOWARDS A FUNCTIONAL SEGMENTATION OF COLLECTIVE ENERGY ACTIONS

In this section we propose a segmentation of CEAs. The segmentation is based on existing, formally organised examples of CEAs, considering the legal framework of RECs and CECs and integrating hypotheses and evidence on how to functionally promote CEA behaviours.

Methodologically, a literature research was carried out. We used keyword searches in academic search engines and analysed literature reviews from previous Horizon 2020 research projects. In a second step, relevant references of read papers. Focusing on abstracts, keywords and titles, 193 relevant documents were identified. 47 of these documents contained analyses of collective energy actions and/or their participants. Based on the empirical findings presented above, five main differentiating aspects became apparent. The following sections give a short overview of differences in spatial concentration and size, related to the ideas of place and interest, action phases, degree of organization, original reason for founding and individual differences of actors.

SPATIAL CONCENTRATION: ENERGY COMMUNITIES OF "PLACE" AND OF "INTEREST"

Based on a survey of 4,061 members of two renewable energy cooperatives in Flanders Bauwens (2016) indicates spatially concentrated energy cooperatives, whose members live close to each other and interact more often in person, "communities of place", and cooperatives that are not tied to a specific location, but whose only link is the common interest in the energy action, "community of interest". Bauwens (2016) further defines communities of place as small communities (cooperative with about 2,000 members), communities of interest as large communities (cooperative with about 50,000 members).

In Bauwens' analysis, members of large communities of interest differed from members of a small community of place in terms of the importance they attached to a set of reasons for joining an energy cooperative, the extent of their identification with the project and their environmental attitudes: Members of small communities of place (vs. of interest) rated the production of renewable energies and social norms as more important reasons for joining the cooperative than economic incentives. Further, they were characterized by higher levels of social identification with the project, a higher pro-environmental orientation and a higher interpersonal trust, and they held more positive attitudes towards locally implemented wind turbines and renewable energies than members of communities of interest and non-members (Bauwens & Devine-Wright, 2018). Further, variables were identified that predicted the amount of monetary investment made by a member in the energy community (Bauwens, 2019). Return on investment turned out to be the strongest overall predictor for the size of investment. However, split analysis for members of communities of place versus of interest revealed that members differ in their motives why they make investments. For members of communities of interest, economic incentives (return on investment and low electricity prices) seem to play a major role, while for members of communities of place, social factors (actions of other cooperative members in one's social networks, advice of others) are more important predictors of their size of investment.

Other studies also highlight differences between large and small energy cooperatives. For example, Poppen (2015) finds for German renewable energy cooperatives that members of a small cooperative feel more like (co-)owners and less like investors or customers. They participate more often in general assemblies and their involvement in a local project proved to be the strongest motive for membership in a renewable energy cooperative.

Further, Radtke (2014) reports that small energy cooperatives are often more participatory than larger projects, where members are shareholders but usually do not take an active role. Hoffman and High-Pippert (2010) emphasize the differences in terms of already existing neighbourhood or organizational identities. In their study, the community identity turned out to be even more important than the climate-protective mission of the project: Nearly 60 percent of the energy community's members that were interviewed were recruited by an individual they already knew or an organization they were already part of. Friendships and contacts with like-minded people were also a main reason to stay continually involved in the energy community.

An ambivalent factor that exclusively applies to geographically concentrated collective energy actions is place attachment, i.e. the degree and way to which people consider their surroundings part of themselves. Two case studies by van Veelen and Haggett (2017) explored the role of place attachment for the initiation of and communities' responses to two controversial community energy projects in Scotland. Based on 19 interviews with members, non-members and stakeholders the authors conclude that place attachment can function both as a driver to bring an energy project to life and as a source of protest, depending on the type of place attachment. Individuals build an attachment to a place either based on social and functional properties of their environment (i.e., human-based) or based on the emotional attachment to the place's landscape. In the interviews, individuals with an attachment to human-based characteristics of a place were more likely to support a local renewable energy project, as in this case it was an effective action option to restore the social and functional characteristics of a place which were threatened by rising house prices, the closure of infrastructure and changing demographics. Respondents who developed an emotional attachment to the landscape were more likely to oppose renewable energy projects (which represented a threat to the current landscape). In general, stronger place attachment was

found among landowners. Persons who showed a higher degree of localness (in the sense of active participation in local activities and the establishment of social bonds) showed a stronger social and functional attachment, whereas newcomers were more likely to attach importance to the beauty of the landscape.

Altogether, various findings suggest that the distinction between small locally based and large supra-regional or decentralized energy communities is of great importance. Regarding the differences in motivators and possible barriers, it is advisable to tailor interventions to the group's context in order to effectively promote collective action behaviour. Based on the empirical findings presented above, the size and geographical distribution of energy communities will be used as a distinguishing factor in the further procedure and communities of place and communities of interest will be treated as different types of community.

ACTION PHASES OF CEA

Another obvious difference between CEAs is how far they have gotten towards producing common goods. In an illustrative example, Bauwens (2016) distinguishes three phases, from the foundation to being a fully functioning energy cooperative. It starts with an *idealistic* phase at the beginning of the *foundation* of the cooperative, followed by a phase in which the cooperative starts *producing* its own energy (*energy production phase*) and a *supply* phase in which a larger customer base is built up and more energy is produced. In the case study, cooperatives increasingly become economically attractive producing more energy and serving a larger clientele. Gaining members over the years, communities spread geographically, members no longer know each other personally and only a small part of the members take on organizational tasks.

These phases differ strongly regarding the size of the cooperative, the spatial concentration of members, dominant incentives for joining and political and legal frameworks.

In the beginning it is central to formulate a common idea or narrative of the CEA collective and to make it salient and attractive in people's mind (e.g., Veelen, 2017). Later, formal and organizational issues become central tasks in the planning and foundation phase, followed by the recruitment of new members when first steps were successfully taken (e.g., Kalkbrenner & Roosen, 2016).

From a behavioural science perspective, these phases are reminiscent of action planning models in motivational psychology. For example, in RUBICON-model individuals go through phases, starting with the planning of an action, through its execution, to the review of its success (e.g., Volpert, 1975). Heckhausen and Gollwitzer (1987) divide actions into the four phases they describe as follows. In the *pre-decision phase*, it is decided whether an action is considered a relevant option at all. Information about this option is collected and options are weighed against each other. After choosing one option, the concrete action is planned in the *pre-actional phase*, where corresponding information and efficacy beliefs become relevant. The implementation of the action takes place in the *action phase*. In the *post-actional phase*, the success of the action is reviewed, and potential corrective or further action is prepared.

An analogy to the phases of CEAs suggests itself. This comes along with changing needs for information, motivators, and barriers to implementation in each phase. It therefore seems advisable to segment each collective energy action into its action phase. Adapted to CEA we propose the following stages for the DECIDE project:

1) **Inception**. The idea of implementing a collective energy action must be visible and attractive. A clear narrative, including collective goals and concrete desired behaviours should be defined.

2) **Preparation and foundation.** After the decision to initiate a CEA has been made, preparations and planning need to be undertaken. An executing group should be constituted, and an organizational structure established.

3) **Initial operation**. The preparations are completed, and concrete collective energy actions are implemented.

4) **Maintaining operations and preventing behavioural rebound.** In this prolonged action phase the central goal is to maintain the energy action and to prevent behaviour that counteracts the production of the common goods. These might include behavioural rebound effects or instrumentalization of the CEA for other, non-collective goals.

5) **Upscaling.** In this optional phase, diversification of services, growth in terms of members involved or the inspiration of follower projects can be goals. In this phase, at the latest, the narrative should be revisited and adapted. Should further energy actions be inspired? Should the own action be expanded to include new technologies, or the number of participants be increased, e.g., by including people in other places?

In our further application of these terms, we will assume that energy communities of place and of interest undergo the same phases, but that different factors may act as motivators and as barriers.

OTHER POSSIBLE ASPECTS OF SEGMENTATION

In this section we summarize other potentially relevant aspects differentiating CEAs. Yet, since the evidence base regarding their ability to promote CEAs is less solid, they were not included into the overall segmentation framework.

Initial purpose. Another dimension on which communities differ is their historical basis. In their analysis of existing energy communities in the United Kingdom, Dibb and Roby (2018) point out the heterogeneity of the original reasons for founding communities. While some were specifically founded with the aim to engage in energy affairs, other energy communities emerged from already existing communities that decided to jointly produce/buy/distribute energy after having already existed as separate groups. Differences in the initial purpose of a community may cause intergroup differences in technical and administrative expertise. Its historical structure is likely to influence the group's organizational characteristics (e.g., bottom-up vs. top-down involvement). To our knowledge, there is no evidence that the group history causes systematic differences between process variables or success factors, nor between members' motivation to participate. From Dibb and Roby's (2018) observation no clusters of group types nor a direction of expected relationships can be deduced. Therefore, the segmentation dimension "historical basis" will not be used to differentiate between the groups in the further procedure of the DECIDE project.

Individual characteristics. Another common segmentation approach is via individuals. For example, Poppen (2015) reports in her survey of members of German energy cooperatives that members mainly live in areas which are below the average population density, and with an average annual household income slightly above the German average. Members exhibited an average age of 54 years, and 77% were male. 55% held a university degree, which is clearly above German average.

Other studies reporting socio-demographic characteristics of members of energy communities unanimously support this picture (e.g., Bauwens & Devine-Wright, 2018; Kalkbrenner & Roosen, 2016; Radtke, 2014). Higher educational attainment and age are further predictors of the level of economic investment a member makes in an energy community (Bauwens, 2019). In Bauwens' studies (2016, 2019), which examine communities of place and of interest separately, these effects are found across both community types.

Guthridge (2010) develops a classification taxonomy that classified individuals based on their propensity to implement private energy efficiency measures. More than 9,000 end-users from 17 countries were interviewed regarding their attitudes towards electricity management programs. Six customer segments were deduced (in order of prevalence: pragmatics, scepticals, proactives, indifferents, eco-rationalists), that differ in their preference for energy efficiency programs. The study names attitudinal and sociodemographic characteristics of each segment, which allows for the deduction of tailored recruitment strategies.

Yet, effects regarding the predictive value of socio-demographics or customer classifications for CAE are not clear cut. To our knowledge, there exists no evidence for the predictive value of classification taxonomies based on personal characteristics. As to the demographic variables, there are conflicting results. For example, contrasting the high representation of males, being a woman has been associated with the willingness to get involved in energy communities (Bergek et al., 2013). Also, the positive effect Bergek et al. (2013) report for renewable energy technology ownership stands in opposition to other findings (e.g., Koirala et al., 2018) that people perceive PV ownership as a barrier to participate in an energy cooperative. Due to the mentioned uncertainties, the segmentation dimension "personal

characteristics" will not be used for segmentation in the further procedure of the DECIDE project.

The following table summarizes these findings:

Table 1. Summary of segmentation criterions.

Segmentation Criterion	Spatial	Phase	Purpose	Members' Characteristics
Short Explanation	Differentiation according to spatial concentration of members and/or generation sites: "place" vs. "interest"	CEAs can be ordered alongside action phases: Inception, preparation and founding, initial operations, maintaining operations, and upscaling	A CEA depends on its historical context, i.e. if the it was founded to serve a specific purpose (e.g. autarky, fight climate change) or emerged from an existing institution	Socio-demographic characteristics or members' energy attitude can be used to segmentate CEA.
Core References	Radtke (2014); Poppen (2015); Bauwens (2016 & 2019)	Bauwens (2016); action planning models as in Volpert (1975) Heckhausen and Gollwitzer (1987)	Dibb and Roby (2018)	Kalkbrenner & Roosen, 2016; Radtke, 2014; Poppen (2015); Bauwens (2016);
Main Impact	Social identity	Engagement policies	Initial trust	Main motivators

TWO GAP MAPS OF COLLECTIVE ENERGY ACTION

In this section we use the segmentation of CEAs to systematically illustrate the available evidence. In doing so, we create an *evidence gap map*. This kind of instrument is used to identify existing evidence, and key "gaps" where little or no evidence in the previous literature exists on a certain topic. This will allow again for the closing of some gaps that currently exist in the literature via implemented interventions at trial sites in the future. We propose a gap map with a psychological-behavioural perspective and a second one with a focus on the sociological-social perspective. Partly, the reviewed literature has already been discussed in the previous sections.

One of the challenges of creating this gap map approach was to elaborate the segmentation dimensions. The process of creation comprised of interviews with DECIDE pilot stakeholders on their needs at different stages of development, collecting academic papers, grey and white literature and systematically sorting them by a set of identifiers for CEAs. The process also involved integrating the legal characteristics of energy communities and the analysis of existing ones. As outlined already, a clear pattern emerged as to that energy cooperatives undergo different phases and that their spatial concentrations were defining characteristics.

Further, evidence gaps maps usually focus on "hard" causal evidence for what interventions promote desired outcomes. This evidence primarily comes from randomized controlled trials or experiments. This method involves comparing an intervention to a counterfactual situation without the intervention. This is the only method that can produce unequivocal evidence for the causal power of interventions. Since only very few studies were found of this kind, we also included "weaker" sources of evidence, including correlational data and interviews of

conceptual narrative reviews. The type of evidence constitutes the third and final dimension, besides stages and type of action, for our gap map.

For the horizontal axis, we adopted the phases: (1) Inception phase, (2) Preparation & foundation phase, (3) Initial operations phase, (4) Maintaining & preventing rebound phase, and, optionally, (5) Growth, including the option of upscaling (diversification & gaining customers) or generating offspring (inspiring other projects) (see Figure 3).

For the vertical axis, we adopted a division by the type of action. As mentioned above, one of the most prominent divisions of energy communities proposed distinguishes communities of place and communities of interest. Additionally, because the lion share of research was carried out for individual, that is non-collective, energy actions (e.g., buying and using efficient technologies) we included a category for individual actions. Since individual behaviour is typically not in the focus of a sociological perspective, the sociological-social layer of the gap map replaces the individual action dimension on the vertical axis by social and cultural influences.

For the third dimension, coded as the colour of the pieces of evidence, a methodological division was adopted based on commonly employed practices in psychology and sociology. Here, we included narrative or desk studies (research that explores and conceptualizes human experience and summarizes it based on available textual information), interview and focus group based studies (research that relates directly observed or reported first person qualitative subjective experience), surveys (research that invites participants to fill out a set of pre-formulated questions), as well as experimental lab and field trials (where individuals from populations are randomly allocated to intervention and control group to explore causal relationships).

PSYCHOLOGICAL-BEHAVIOURAL PERSPECTIVE

The psychological-behavioural gap map analysis was guided by theoretical considerations from various models in the behavioural-environmental literature that hypothesize on the origin of collective action and how pro-environmental actions take shape. One such model, the Social Identity Model of Pro-Environmental Action, SIMPEA (Fritsche et al., 2018, c.f. Figure 2), identifies four basic social identity processes: emotions and motivations originating from or resulting in social identity processes; in-group identification; in-group norms and goals; and collective efficacy. These are assumed to be related to appraisal of and responses to large-scale environmental crises, in the sense that they interact in affecting both appraisal of environmental crises, and private and public pro-environmental action.

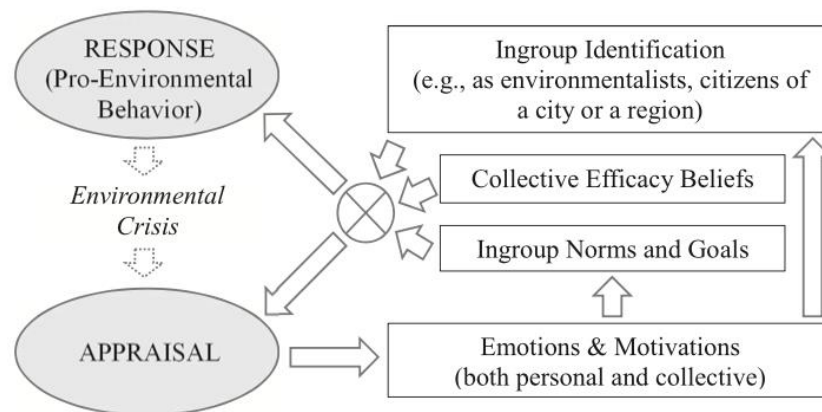*Figure 2. SIMPEA model (Fritsche et al.,2018)*

This and other models are based on the idea that information is usually provided in and interpreted in a social context. Social identity processes also determine this context. For environmental appraisals, this means that in-group norms, collective efficacy and in-group beliefs determine environmental action, both collective and individual (Rabinovich et al., 2012).

Additionally, a global and a regional parallel process have been proposed to be at work. For example, both a global climate identity but also a local group identity can lead to an individual desire for justice and to spending financial and time efforts. The encapsulated model of social identity and collective action (EMSICA) adds further drivers, with anger and feelings of injustice fuelling the expectation of self-efficacy, where adding an identification with a group then leads to collective action (Reese, 2016; Thomas et al., 2012). Similarly, in the Social Identity Model of collective action (Zomeren et al., 2008) group identification, experience of injustice and anger, and efficacy are proposed to lead to collective action.

Some models include more overt cost-benefit analyses into the calculation: they claim that a general existing attitude towards participation, subjective norms in the direct environment toward participation, perceived behavioural control over participation, negative emotions about climate change, group identification, collective efficacy, participative efficacy all need to be taken into account when calculating the final probability of collective environmental action taking place (Bamberg et al., 2015; Rees & Bamberg, 2014). For this model, the participation in local initiatives was investigated empirically in correlative studies with a student sample, a village citizen sample, and green activists, with energy autonomy as the target (Bamberg et al., 2015). Participative efficacy, individual efficacy, and social identity accounted for 80% (student sample), 86% (village sample), and 40% (green activists) of the variance in the intention to participate. Other important factors were for example perceived behavioural control and expected personal benefits.

Based on these considerations, we conducted a literature research 1) via keyword searches in PsycInfo, Google Scholar, and Sciencedirect, and 2) by scanning preceding H2020 literature reviews as well as references of relevant scientific papers. Of the 196 papers that included collective action in the context of energy communities as key words, 47 had collective energy

actions at their core, and 28 included some form of behavioural analysis and were therefore included in the gap map.
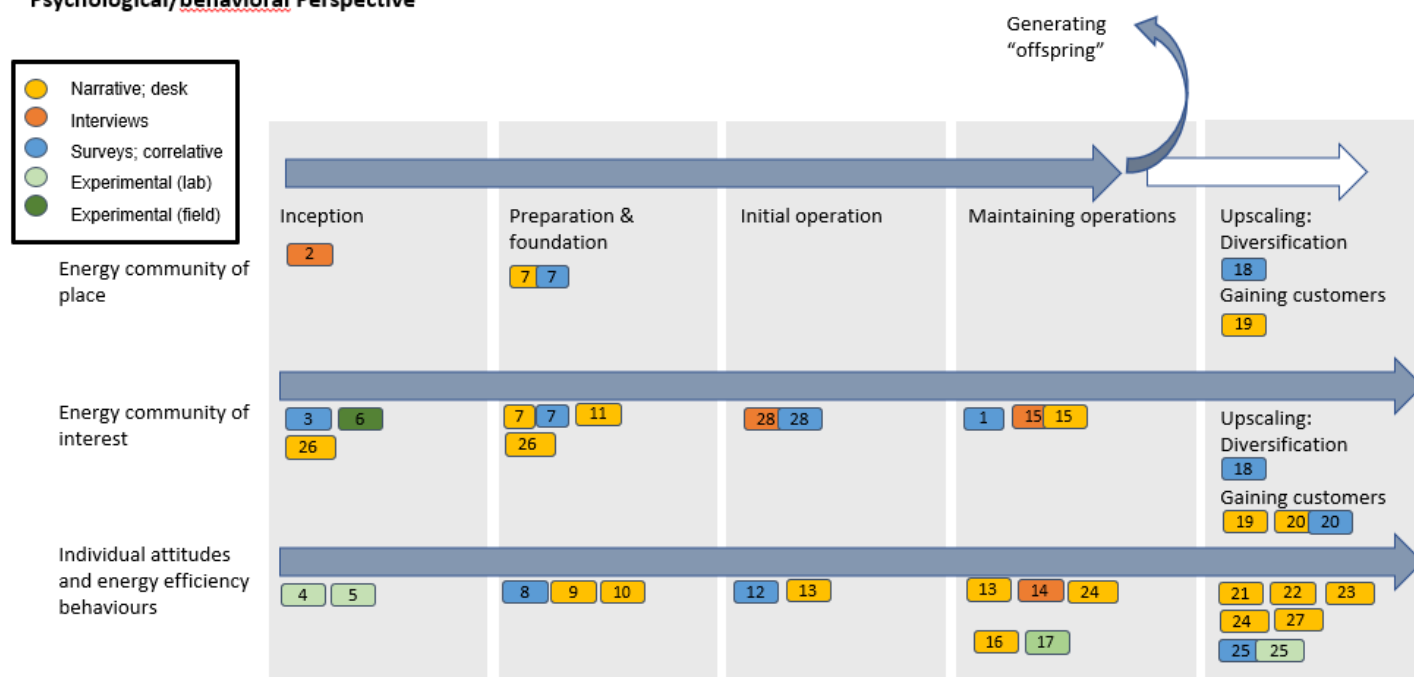
Figure 3. Psychological-behavioural evidence gap map for promoting CEAs as a synthesis of previous findings. Evidence is ordered by the type of action on the vertical axis (from non-collective actions, to collective actions as part of a community of interest or community of place), by phase of the action on the horizontal axis (inception, preparation & foundation, initial operation, maintaining operations, upscaling) and by the type of evidence denoted by the colour codes (from narrative reviews, to interview, to correlational, to lab and field experiments).

In Figure 3, we allocated the selected studies along the flow chart of the different energy community stages and divided them into the concepts of energy communities of interest, of place, or individual action. Finally, after the gap map was completed, we also clustered key behaviours that were investigated in these studies, i.e. we ranked behaviours by degree of

involvement. We considered that different interventions would eventually need to be levered for different behaviours and across the different phases as has already been touched before in this document. The following list contains all identified behaviours that can be shown by individuals when involved in collective energy actions (ranked by degree of involvement):

- Initiate a collective energy action
- Assume active role in collective energy action (e.g., promoter, go to meetings)
- Become member of collective energy action
- Cooperate in demand response of a collective energy action
- Invest money in collective energy action
- Become customer of/participate in a collective energy action

Most research papers we included in the gap map focused on structural factors that are relevant to the foundation of an energy community, particularly the steps of preparation, and assembly of the first participants following the initial inception plans. Very few studies investigated variables for initial operation when attempting to gain new members, and only some targeted interventions that could help incentivize the maintenance of energy communities and to prevent rebound within renewable energy communities. The latter were conducted only on individual levels instead of the community level. More commonly researched was the diversification and participant acquisition phase, though here also, the individual level was the most investigated.

Overall, little evidence was found in the literature for behaviors conducted by energy communities of place; we found energy communities of interest to be more commonly

investigated, though most studies dealt with individual attitudes in the context of energy communities and collective energy actions.

Methodologically, narrative and desk studies made up the largest number of included studies, followed by surveys, which were also mostly conducted on individual attitudes in the context of collective energy actions. A very small number of studies employed experimental designs, and we found only one field study relevant to our gap map.

In terms of content, the literature we reviewed involved, among others, studies on pro-environmental behavior such as intention to participate in energy autarky projects (Bamberg et al., 2015), levels of activism towards an energy project (Cocking & Drury, 2004), the stimulation of investments into renewable energy production (Bauwens, 2016, 2019; Bergek et al., 2013), household energy use (Eberling et al., 2019; Steg & Vlek, 2009; van Zomeren, Spears, et al., 2010), network and exchange (Beggio & Kusch, 2015; Fraune, 2015; Hoffman & High-Pippert, 2010), and end-user engagement in smart-grid projects (ECHOES, 2017).

To give a little more detail, for example, in the domain of individual energy behaviour, the comprehensive literature review of the H2020 ECHOES project comes to the conclusion that collective efficacy, self-categorization and in-group identification are besides social norms, habits and patterns crucial drivers of energy-related choices and behaviours. The project confirms in two meta-analyses that individual-level psychological determinants (i.e., attitudes, intentions, values, awareness and emotions) are related to energy-saving behaviours and that place identity is related to pro-environmental behaviours.

As another important consideration – with an eye towards the trial implementations – in one of the case studies, Straver et al. (2014) emphasize the importance of the cooperation with credible, local stakeholders for the recruitment phase, and the underscoring of the local

character of the project by picking up regional topics and stories, pursuing regional multipliers (mayors, NGOs, business associations and stakeholders), and using local festivities and cultural events. They recommend big communities for viable projects, high participation rates for low-involvement projects. Creating personal relations and building trust over time are further recommendations from their examined pilots.

To summarize: To our knowledge, there is a major gap in the literature on collective energy actions; no field experiments have been conducted with communities of place or communities of interest that investigated collective energy action. Most studies are either narrative or correlational, which means there is currently no knowledge about causal factors. This makes it difficult to draw conclusions about the efficacy of different variables and interventions and how they help to foster collective action in energy communities. Further investigation of the effect of regional or personal relationships between energy action participants would be advisable, in particular contrasting to other drivers such as environmental or financial motivations. Additionally, only little attention so far has been paid to the examination of affective states, while models have certainly included them in their specifications. DECIDE is well positioned to help shed light on key enabling factors, and a careful implementation of experimental trials could help fill these gaps.

SOCIOLOGICAL-SOCIAL PERSPECTIVE

Important social and cultural influences on individual energy behavior and the emergence of energy communities have already been partially included in the behavioral-based theories and perspective (e.g., in-group identity, in-group norms). However, stronger sociological based frameworks, such as the Social-Ecological System (SES) Framework, which was originally designed to study the interaction between ecosystems and social processes and was adapted recently to technological systems such as energy systems, emphasizes the importance of

understanding structural factors, interactions and actors in the emergence and consistence of systems (Bauwens et al., 2016).

The interplay between different levels of structures and individuals is further emphasized by other theoretical approaches. For example, multi-level perspectives (MLP) theory sees three layers of social influences as crucial for the transition of the energy system: Landscapes, regime and niche. Thereby, landscapes refer to the wider (material) aspects of a society, such as electricity infrastructure or demographic evolutions. Regime refers to the structure of cognitive, normative and regulative practices in which a development is embedded. Niche finally refers to the small-scale socio-technical arrangements, which form the energy community itself (emerging technologies, innovative practices, actors' networks) (Gui & McGill, 2018).

Having this in mind, a narrative literature review was performed with focus on social and cultural factors influential for collective energy action. Using Google Scholar, references of relevant literature and personal sources, more than 20 research papers and reviews could be revealed, which identify, test and discuss several of these factors. Parallel to the approach of the behavioral part the research papers were grouped according to 1) central stages of collective energy action, 2) the type of evidence, and 3) the type of action. Regarding the type of action it has to be born in mind that in the sociological viewpoint the mentioned indicators serve more as an explanatory background. Further, instead of "Individual attitudes and energy efficiency behaviours" information is given in which phase certain social and cultural factors (framework) are addressed, since, as for behavioral factors, we also expect for social enablers and barriers of collective energy action to act of different intensity in different phases and for communities of place and of interest. In doing so, the following groups of factors could be identified:

- Group characteristics (commitment of group and key individuals, available time for group activities, availability of necessary skills, internal communication, democratic principles, well-known guiding vision, group identity) (Seyfang et al., 2013; Braunholtz-Speight; 2018; Brummer, 2018; Feola & Nunes, 2014; Radtke, 2014; Sperling, 2017; Schreuer, 2012; Bomberg & McEwen, 2012; Ruggiero, 2019)

- Community spirit (support by local community, local identity) (Brummer, 2018; Li et al. 2013; Sperling, 2017; Wirth, 2014; Schreuer, 2012; Bomberg & McEwen, Ruggiero, 2019; Carrus 2018; Boon & Dieperink, Blumer et al., 2013)

- Network characteristics (commitment, expertise, broad) (Blumer et al, 2013; Seyfang 2013; Ceshin, 2013; Hoppe et al., 2015; Bauwens et al., 2016; Carrus et al. 2018; Boon & Dieperink, 2014)

- Legal and economic framework (Blumer et al., 2013; Seyfang 2013; Ceshin, 2013; Braunholz-Speight, 2018; Brummer, 2018; Li et al 2013; Sperling, 2017; Schreuer, 2012; Bomberg & McEwen, 2012; Bauwens, 2016; Carrus et al, 2018; Boon & Dieperink, 2014)

- Environmental friendly culture/awareness and environmental concerns (Schreuer, 2012; Carrus 2018; Boon & Dieperink, 2014)

- Communication strategy (transparent, broad) (Blumer et al, 2013; Ceshin, 2013)

- Learning process, feedback possibilities (Ceshin, 2013; Boon & Dieperink)

- Experience with cooperative action (Sperling, 2017; Wirth, 2014)

Synthesis of previous evidence: **Evidence Gap Map** for promoting collective energy action-Sociological/social Perspective
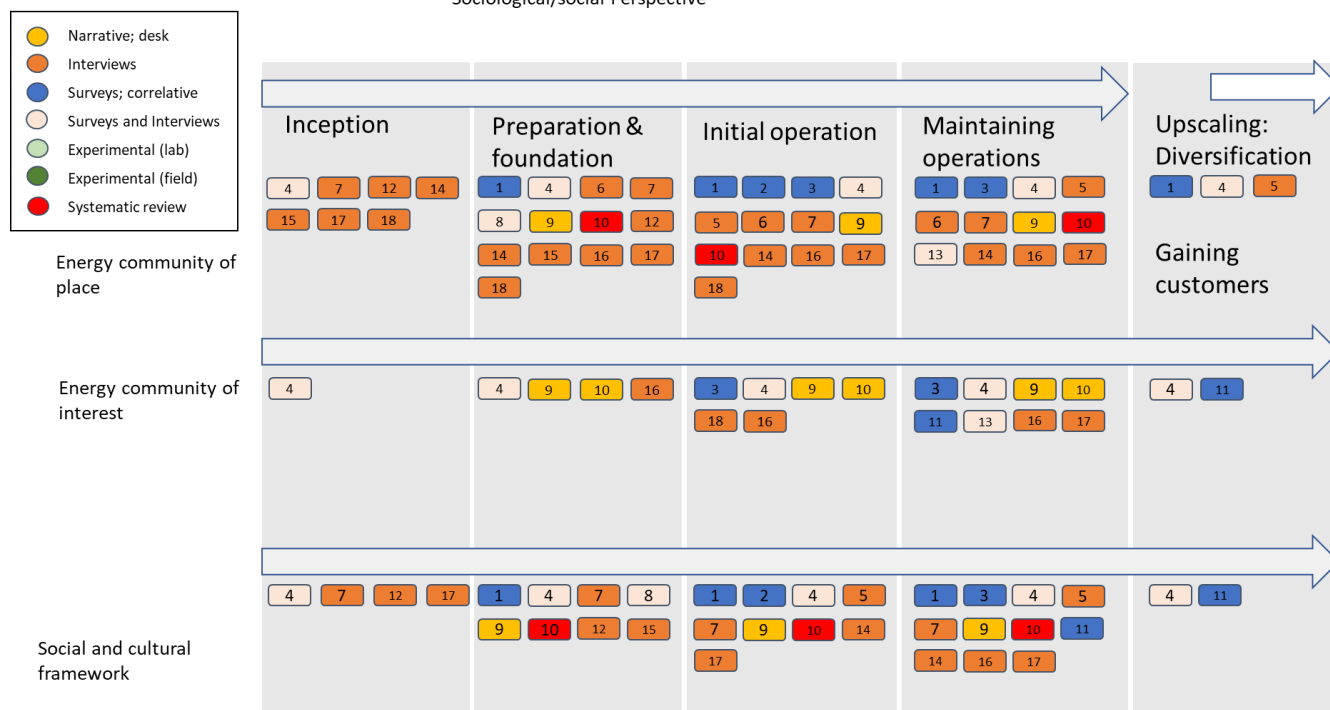
Figure 4. Sociological-social evidence gap map for promoting CEAs as a synthesis of previous findings. Evidence is ordered by the type of action on the vertical axis, phase of the action on the horizontal axis and by the type of evidence denoted by the colour codes.

Notably the first four factors (group characteristics, community spirit, network characteristics and the legal and economic framework) have proven to be of influence in various studies. It has to be stated in general that this evidence very often was generated from exploratory studies, having a priori not formulated any hypothesis and using in depth interviews and document analysis to produce the results. Experimental research results are lacking completely, which may mainly be caused by the fact that sociologists usually don't work with experimental designs. But also other forms of quantitative data collection (especially surveys) are not used regularly, showing again the exploratory character of many of the analysis.

Furthermore, it is remarkable that very often it is not distinguished between different stages of energy communities (from foundation to upscaling), and that several stages are considered all at once in the analysis (indicated in the figure by assigning the same literature number in different stages). Going into further details, the stages of initial operations and maintenance of operations have been considerably more in the research focus than the stages of inception and upscaling. Regarding the localization of energy communities, more attention has been given to energy communities of place than of interest.

To sum up the results: Four groups of factors have been identified as potentially important for the emergence and maintenance of energy communities: group characteristics, community spirit, network characteristics and the legal and economic framework. But in the existing research these factors are often derived in an exploratory way, especially via interviews. Communities of interest and the stages of inception and upscaling so far have been under lesser research attention than communities of place and the stages of initial operation and maintaining operations.

DEEP DIVE INTO DRIVERS AND BARRIERS DESCRIBED IN OTHER PROJECTS

There is a substantial body of literature that deals with drivers and barriers of the success of energy communities, matching the DECIDE definition. Without being explicitly mentioned, most research focuses on the set-up and preparation stage of an energy community, where challenges of starting an energy community and subsequently on-boarding members arise. A great part, however, does not explore motivational issues but is restricted to factual success factors, drivers and barriers of setting up and/or maintaining energy communities and collective energy actions. As mentioned in the ECHOES project, however, these "factual" drivers and barriers have a great influence on motivational issues; and only when these

barriers can be overcome psychological reservations can emerge as relevant barriers (ECHOES, 2017b).

For example, Walker & Devine-Wright (2008) and Beggio & Kusch (2015) deal with energy community organizations that collectively own and manage energy infrastructure. They identify a set of important success factors or drivers versus barriers based on experience with energy community set-ups. In the case of Beggio & Kusch (2015) this experience is derived from the community knowledge of the European federation of citizen energy cooperatives (REScoop). From the viewpoint of methodology, these works ground on a set of case studies and desk research. The identified incentives and drivers are the following:

- Economic factors, such as local income generation and the creation of local employment, but also the reliability of energy supply, which is spurred by the contribution of load management functionality for the power grid.
- Financial factors, such as return on investment or reduced cost of energy, i.e. overall economic viability of the energy community as a project. Access to viable finance schemes also belongs in this category.
- Administrative factors, such as rapid and non-bureaucratic access to planning permissions and other authorization processes.
- Social factors, such as local control (e.g. of siting, orientation of turbines on wind farms), also in the form of participation of citizens as shareholders as well as local approval and acceptance.
- Personal factors, such as the involvement of stakeholders and commitment of key players.
- Ethical factors, such as environmental commitment and social responsibility policies.
- Technical stability of the infrastructure in place.

Barriers identified by these works are:

- Administrative factors, such as market barriers, with respect to trade flexibility or the difficulty of obtaining access to green energy certificate, as well as billing and metering arrangements adversary to heat or electricity trading.

- Legal factors, such as the complexity or non-feasibility of legal rules and regulations or liability issues.

- Economic factors, e.g. when the economic viability depends on precarious funds, or badly designed economic frameworks without market incentives for heat production and trade, and high overall implementation cost.

- Social factors, such as a general NIMBY (not in my backyard) attitude and a lack of communication among energy communities.

- Technical factors.

- For Eastern European countries specifically (like Estonia), negative stereotypes regarding collective ownership, stemming from nationalization of property such as the forcible creation of kolkhozy (cooperative-run farms) and sovkhozy (state-run farms), can also hinder the process (Ruggiero, 2019)

As mentioned, this area of work deals with factual success factors or incentives and barriers that cannot be overcome without collaboration from the side of participants. There is another field of work that explores the reasons behind success or failure of energy communities in the absence of strong factual barriers. There is evidence that for instance the opportunity of local control through the set-up of energy communities impacts people's acceptance of renewable energy projects: in rural Devon (UK) the population voted against a huge biomass gasifier project; however, a survey revealed that a community-driven biomass gasifier project on a smaller scale would have had the support of 69% of the local survey participants (Rogers et

al., 2008). Thus, local control and acceptance are not only drivers for the success of energy communities, furthermore local energy communities can be viewed as drivers for the success of REN projects.

In a case study of a potential energy community project, Rogers et al. (2008) explored personal attitudes of potential energy community members by issuing a questionnaire and some in-depth interviews in a small settlement in the UK. The author found that factual barriers as administrative or regulative issues did not play a role. As a result, the theoretical idea of the foundation of an energy community was appreciated by nearly the whole population, whereas only around two-third wanted to actually become part of it. The drivers for participation were mostly of local nature, such as, e.g., saving money or strengthening the community, even though the overall topic of climate change or strengthening the market for renewables was of nearly equal importance. The barriers were mainly personal issues (almost 50%), such as "no time", "ill health", or scepticism about the community benefits of the project. However, the number of respondents was too low for drawing general conclusions.

Two other studies ask for the attitudes regarding the establishment of an energy community, both of them relying on quantitative surveys (Kalkbrenner & Roosen, 2016; Koirala et al., 2018). Participants in the Netherlands and in Germany were asked by means of questionnaires about their willingness and interest in energy communities, specifically, whether they would engage in energy communities.

For the Netherlands Koirala et al. (2018) carried out a factor analysis on the basis of 599 survey responses and found the following factors contributing to predicting the willingness to join an energy community: environmental concern, renewables acceptance, energy independence, community trust and community resistance. A multi-variate regression analysis revealed that

community trust was the most important factor, followed by community resistance, energy independence, and environmental concern.

For Germany Kalkbrenner and Roosena (2016) had a comparable set of objectives, in this case testing the hypotheses that community identity as well as trust, energy related social norms and environmental concern foster the willingness to participate in energy communities. 780 individuals responsible for energy and investment related decisions in households and further 174 people that own renewable energy generation equipment were asked to fill in a questionnaire. The willingness to participate was measured by the intention to voluntarily engage in an energy community and by the intention to invest. The share of people answering that they might be volunteering in an energy community was overall significantly higher (around 40%) than the share of people who would invest in an energy community (nearly 30%). The study found that overall, social norms have the highest influence on the willingness to join an energy community, followed by trust and environmental concern. This does not contradict Koirala et al. (2018), as in Kalkbrenner and Roosena (2016) community identity was found to be dependent on social norms and (general) trust, which is a construct comparable to the community trust analysed by Koirala et al. (2018).

In a nutshell, the most important factors for the potential willingness to join an energy community are:

- community trust
- community identity
- social norms

followed by:

- general trust of people
- energy independence

- environmental concern

However, the mentioned studies suffer from the well-known intention-behaviour gap, i.e. the difference between and sometimes even opposition of the statements people give in questionnaires and surveys and their measured behaviour.

This intention-behaviour gap does not play a major role when asking existing members of energy communities about their attitudes and reasons for joining the energy community. Yet, this scenario suffers from a selection bias. The following two studies therefore amend the studies cited above and thus help to complete the picture:

Based on 2,826 interviews in 84 energy communities in Germany Radtke (2014) found that 93% of the participants had joined the community mainly for ecological reasons, while 56% added that they also see this as a promising financial investment. The notion of community experience is highly valued (60%), and 85% of the respondents claimed that they identify themselves with the energy community. Regarding active participation in the energy community, 76% of the respondents indicate that they participate in meetings, and of these 89% raise their voice. Based on this survey a segmentation of the members regarding their motivation was carried out, which led to the following three member types: ecological attitude, structural conservatism attitude, and investor attitude, with a general dominance of the ecological attitude. Regarding the identification with and the acting in the context of energy communities, Radtke (2014) differentiates between independent-oriented mentality, participatory mentality, and association loyalty mentality. Ecological attitudes and both energy independence and striving for participation in energy issues are therefore dominant drivers for joining and actively participating in energy communities.

Bauwens et al. (2016) analysed the motivations behind joining and actively participating in an energy community, surveying 4,061 members of two energy communities in Belgium: BeauVent, a community of around 2500 members harvesting wind power, and Ecopower, a community of nearly 50.000 members that invests in renewable energy as well as acting as an energy supplier for its members. The results indicate that both self-regarding motives and norm-driven motives, such as environmental attitudes, personal trust and social identification, are the main drivers for joining and participating in an energy community. Regarding the importance of these factors, the study reveals that they are influenced by the following aspects:

- Institutional set-up: the more personal and less market based organized, the higher the influence of social norms
- Type of energy community (location-based vs interest based): the more geographically concentrated, the higher the influence of social norms
- Motivations and personal ideals, such as being an early adopter

In summary, all types of studies focus on the relevance of social identity and norms, ecological motivations and general trust as the intangible grounding and success factors of energy communities. As shown by Bauwens (2016) these factors should be taken into account when setting up new energy communities, also with regards to the institutional set-up and general characteristics of an energy community.

These findings are in line with the results of the EU project ECHOES, which ran from 2016 to 2019 and aimed at understanding the interconnection of the micro-, meso-, and macro level of decision making in the context of "energy collectives". The micro level is the level of individual decision making, the meso level considers cultural and life-style impacts on

decision-making processes, and the macro level deals with regulation and other frame-setting context.

The project reviewed and accompanied a huge set of existing energy collectives, carrying out literature studies, interviews and in-depth case studies [ECHOES D.4.1, 4.2, 5.3, 5.4]. Some of these were energy communities in line with the DECIDE definition; however, most were based on individual decisions to, e.g., behave in an energy conserving way or to invest into energy saving equipment. From these inputs a set of general statements were extracted, differentiated according to general drivers and success factors versus barriers of energy collectives that might be valid also in the context of energy communities; the most prominent are presented in Table 2: Driving Forces and Enablers of energy related environmentally friendly behaviour according to ECHOES.

Table 2: Driving Forces and Enablers of energy related environmentally friendly behaviour according to ECHOES

Macro	Meso	Micro
Driving Forces and Enablers		
Strong environmental motivation of the key stakeholders	Descriptive norms (i.e. observing the behaviour of others)	Environmental identity and nature affinity
Clear external financial incentives	Injunctive norms (i.e. what somebody thinks is expected by others)	Place identity
Social support system (for example in terms of sharing a common identity and ideas) accessibility of grants	To some degree: personal norms (in terms of what somebody expects from themselves)	To some degree: group focused identity
	Collective pride	

Barriers		
Lack of appropriate funding programs	Communication difficulties when too many members	Lack of interest of potential members
Complex and frequently changing legislation	Suspicions of potential members about true motivation behind the initiative	Unwillingness/inability to adopt new skills & behaviour
Bureaucracy	Lack of community spirit	

These results were used to enhance Dewey's 5-step decision process (1910) into a 4-step decision process [D6.2] that integrates the micro-, meso- and macro-level into one model as shown in Figure 5: ECHOES' 4-step decision-making process model, [D6.2, p.28].
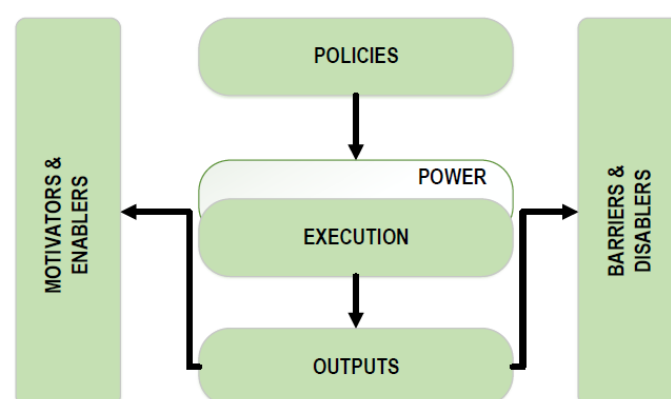
Figure 14 An Initial model of decision-making processes in collective units during transition to low carbon economy

Figure 5: ECHOES' 4-step decision-making process model, [D6.2, p.28]

In this model, "policies" are the analysis of the political and frame-setting context, through all levels of the political institutions. The elements "power" and "execution" focus on the actors and their organizational structures, both in change-setting institutions, such as municipalities, and executing institutions, such as companies, but also marketplaces. "Motivators and enablers" as well as "barriers and disablers" are determined by the main factors analysed in the previous case-studies, desk and literature research. Motivators are namely motivating agents, whereas enablers are factors that facilitate an according action.

The following motivators can be distinguished:

- Economic motivators, basically incentives and rewards that make a decision economically justifiable.
- Personal and social motivators, mainly demographic and psychological features of individuals that foster pro-environmental attitudes and behaviours.
- Informative motivators, which are the communication channels and stories that influence decision making.

Barriers and dis-enablers are:

- A low perceived value of energy, e.g., mediated via a small share of energy cost at an overall household budget.
- Personal and social barriers, mainly a lack of interest and involvement. This may be caused by unawareness, ignorance, resistance to change, a desire to maintain the status quo, by inertia and scepticism, by fear and anxiety as well as cultural values, social norms, and social status; the link between those features and the specific scenario of "energy collectives" was not illustrated.
- Administrative barriers, which mainly prevent the initiation of energy cooperatives and may also limit their expansion. They form the entrance condition: only in the absence of favourable policies, social and psychological factors gain relevance.

DISCUSSION AND FUTURE WORK

CONCLUSION

With this deliverable, we strengthened a common understanding of collective energy actions and other relevant indicators in this field, alongside a deduction to illustrate available evidence for promoting CEA. We provide a review of the literature in which energy actions (both individual and collective) are prominent, from both a psychological-behavioural and sociological-social perspective. In the section Motivators for collective energy actions (Introduction), we in particular list six previously identified strategies that can be employed to strengthen interventions targeting CEAs.

In the literature collective energy actions are often mentioned in the context of predefined groups with already existing identities. Segmentations of collective energy actions most commonly include the distinction between communities of place and communities of interest. We propose to segment CEA by the stage of development of communities and actions and defined according action phases to put this into practice. Other relevant factors of segmentation are the initial purpose of the group, as well as personal characteristics and socio-demographics, though a tailoring of interventions might not be as fruitful in this case, as these groups do not often share common motivators.

In terms of motivators and barriers, we found that most factors can be considered both, depending on their specifications: many studies find that collective energy actions succeed due to the economic and financial factors involved, but economic and financial factors can also be barriers to adoption. Similar arguments can be made for administrative factors, social factors, personal factors, and the technical infrastructure. Legal factors are often discussed as a major barrier in the literature.

In terms of predictors of collective (energy) actions, we found the most potent ones to be

- collective efficacy
- collective emotions (e.g., anger)
- social identification with the action

DECIDE NEXT STEPS

In the context of DECIDE, the next steps seem clear from the conducted analysis: As most evidence was conducted for participants which are already part of some energy action or community, as most evidence was anecdotal or "correlational" in nature, and as most evidence was collected in early stages of energy actions, DECIDE should make it a point of importance to elaborate strategies to reach people outside "the bubble", aim to upscale existing CEAs and to create sound experimental evidence for further decision making. More specific strategies to address these issues will be formed throughout the project and will be extensively discussed in future versions of this living document.

The next version of the here presented deliverable will therefore focus on pilot-specific recommendations. Trial-specific analyses are being conducted, based upon input from trial partners and stakeholders, and general intervention levers defined both in the introductory chapter of this document, as well as based on the gap map, will be specifically adapted to the DECIDE pilot sites. We will extend the presented gap maps, locating the DECIDE pilots in this gap map in order to get a better idea how to design the interventions and stakeholder interactions.

Recommendations for pilots will for example include the definition of clear individual and group identities, depending on the location, purpose and intervention of each pilot. Existing

social identities will be harnessed to develop such interventions befitting those identities. Interventions will be developed that target people's sense of efficacy, and that foster useful collective emotions. Across all pilots, we should aim to create narratives, and optimally co-create them with potential and already existing members of energy communities and participants of collective energy actions.

ETHICS

ETHICS DOCUMENTATION DECIDE					
Checklist for DELIVERABLES/MILESTONES on ethical issues					
Introduction	The basis of DECIDE's scientific approach is the conformity of its work with ethical principles. These include respect for human beings and human dignity, the fair distribution of the benefits and burden of research, the rights and interests of research participants, and the need to ensure the free and informed consent of participants (including vulnerable groups such as children). Whenever research approaches or interventions are pursued within DECIDE that involve people or have an impact on people and their environment (e.g. interviews, workshops, ...), they must be examined for their ethical implications. The aim of this checklist is to review DECIDE's scientific products (deliverables and milestones) from an ethical point of view, but above all to enable a quick ethical review during the planning and development of these outputs. Translated with www.DeepL.com/Translator (free version)					

Remark	In parallel to the ethics check, DECIDE data management guidelines are developed which will include: Guidelines/descriptions for procedures for data collection, storage, protection, retention, transfer, destruction or re-use. Description of the security measures that will be implemented to prevent unauthorised access to personal data or the equipment used for processing, methods of storage and exchange (LAN, cloud, etc.) Description of the anonymysation/ pseudonymisation techniques that will be implemented or explanation on why the research data will not be anonymised/ pseudonymised Detailed information on the informed consent procedures in regard to data processing					
SUBJECT	ISSUES	Tick the box			Remarks	Sources of verification
		Y	N	n/a	n/a – does not apply	
Research ethics general						
	Do you confirm having handled research subjects with respect and care, and in accordance with legal and ethical provisions (to your best knowledge)?	x			self-assessment	
	Do you confirm having taken account of research relevant differences in age, gender, culture, religion, ethnic origin and social class (if this applies)?			x	If Y, to be mentioned in Deliverable report	Deliverable report
	Do you confirm having considered potential research related harms and risks?			x	If any, to be mentioned in Deliverable Summary	Deliverable report
	Are there any unethical ways (e.g. to stigmatise, discriminate against, harass or intimidate people) in which the methods or knowledge produced could be used?		x		If Y, what did you do to prevent this?	deliverable report
Stakeholder rights,						

interests and dignity						
	Has the role of your local research partners/stakeholders clearly been defined and communicated ?			x		Deliverable report; (consent forms); information leaflet
	Do local stakeholder groups/partners involved in your research have their own ethical guidelines/boards? If so, did they approve your research?			x	If any, written approval	(written approval)
	Have you been evaluating/analyzing their programs and services? If so, will they be given a copy of your findings?			x		copy sent to partners/ stakeholders
	Are there any potentially negative, unintended consequences of the research cooperation with local partners for local people?			x	If any, to be mentioned in Deliverable report including ways to avoid this	Deliverable report
	Could the research have induced psychological stress or anxiety or cause negative consequences beyond the risks encountered in normal life?			x	If any, to be mentioned in Deliverable report including ways to avoid this	Deliverable report
	Has there been the possibility that the involvement of stakeholders created a situation where they felt real or perceived coercion to participate in your research? If yes, how did you manage/prevent this situation?			x	If any, to be mentioned in Deliverable report including ways to avoid this	Deliverable report
	Have the following European fundamental rights been observed: The rights of the child; Equality between women and men; Integration of persons with disabilities?			x		Conformity to European fundamental rights

Research design/Methodology						
	Has the research design been sensitive to the particular needs and perspectives of tageted stakeholder groups?			x		Methodology description in Deliverable Report
	Does the methodology clearly describe how data have been collected and analysed during the work?			x		Methodology and data management description in Deliverable Report
	Did research involve the sharing of data or confidential information beyond the initial consents given?			x		Consent forms; amendments to consent forms; Deliverable report
	Are people other than direct research participants likely to be directly impacted by the research?			x	if Y, discuss in Deliverable report	Deliverable report
	Did you make arrangements to preserve confidentiality for participants or those potentially affected?			x	Please explain the mechanisms in place to ensure the confidentiality of private information,	DECIDE Data management guidelines; (infomation sheets);
	Has the methodology addressed ways in which sensitive information, data or sources will be handled? (e.g. personal data, data protection, tracking of people)			x		Methodology and data management description in Deliverable Report
	Have participants been asked to give informed consent in writing and have they been provided with information about the research?			x		Information sheet and consent form

	Have the research approach/aims been discussed with stakeholders involved?			x		Deliverable report
	Has information (written and verbal) about the research been provided in an appropriate form and language for potential participants?			x		Information sheet
	Did you offer any incentives (other than reasonable expenses and compensation for time) to research participants?			x	If yes, what could be the potential ethical issues arising from this?	methodology description in Deliverable report
Data management/protection	Have personal data been processed in any way (e.g. collected, shared, stored,…)?		x			Copy of questionnaire/ online questionnaire url; Deliverable report methodology part; reference to DECIDE Data management guidelines; (Indication of own Data documentation systems of DECIDE partners if any)
	Have personal data been anonymized oder pseudonymized before processing?		x		Description of data processing (collection, management, storage) in deliverable . Describe how you anonymized/ps eudonymized	Deliverable report; reference to DECIDE Data management guidelines; (Indication of own Data documentation systems of

					the personal data.	DECIDE partners if any)
	Did you practise tracking or observation or profiling of participants ?		x		In the deliverable, provide explanation how the data subjects have been informed of the existence of the profiling, its possible consequences and how their fundamental rights have been safeguarded	Informed consent of participants; Deliverable report
	Did the research involve the collection of photographic or video materials?		x		Describe the purposes: if to be used in any outputs (publication, dissemination, etc.)Or to be made publicly available (e.g. in social media, magazine articles)?	Informed consent of participants with specific permission of photographic or video recording; Specific permission in case of further use (e.g. publications, social media); Deliverable report; In case

					of use in social media: social media statement etc must include the researcher/supervisor contact details and a statement that the study has received relevant ethical approvals
Has there been any audio collection?		x		Describe the purposes: only for transcribing/summarising purposes? to be used in any outputs (publication, dissemination, etc.)? To be made publicly available (e.g. in social media, magazine articles)?	Informed consent of participants. In case of any use beyond transcription, specific justification is needed; in case of use in social media: social media statement etc must include the researcher/supervisor contact details and a statement that the study has received relevant ethical approvals
Have you followed the Data management guidelines of DECIDE?			x		

	Have people providing personal data been informed on data processing including period of preservation?			x		Informed Consent Forms
	Did you define how access to the research findings of this deliverable/milestone including processed data will be regulated within DECIDE and externally?			x	Describe how you will collect, manage and store the personal data (taking into consideration the Data Protection Act and the 8 Data Protection Principles).	Intellectual property rights and Citation rules inside DECIDE
Publication and Dissemination of research results						
	Have research results in this deliverable been presented in an open, honest, transparent and accurate manner, respecting confidentiality of data or findings ?			x	self assessment	(Deliverable report)
	Have results in this deliverable reported in a way that is compatible with the standards of the discipline and can be verified?	x				Deliverable report
	Have all authors agreed on the sequence of authorship (acknowledging that authorship itself is based on a significant contribution to the design of the research, relevant data collection, or the analysis or interpretation of the results)?	x				Report history documentation (emails, sharepoint)
	Have authors of the deliverable ensured that their work is made available to colleagues in a timely, open, transparent, and accurate manner?	x				Report history documentation (emails, sharepoint)
	Have all authors of the deliverable acknowledged important work and intellectual contributions of others, including collaborators, assistants, and funders and cited related work correctly?	x			self assessment	
	Will the results of the study be offered to those participants or other parties involved who may wish to receive them?	x				Type of Deliverable; (consent forms)

Vulnerable individuals/groups incl. children					
	Did the research work involve participants who are particularly vulnerable or unable to give informed consent?		x		Provide details on type of vulnerability, details on recruitment, inclusion/exclusio criteria, informed consent procedure. Demonstrate efforts to ensure informed understanding of implications of participation; Describe procedures used to ensure that there was no coercion on participants.	Informed consent forms; Information sheets; Deliverable report

	Did the research work particularly involve children/minors?		x		Provide details on recruitment, inclusion/exclusio criteria, informed consent procedure (e.g. age ranges, children assent procedures and parental consent). Demonstrate efforts to ensure informed understanding of implications of participation; Describe procedures used to ensure that there was no coercion on participants and to ensure welfare of minors. Justify the involvement of minors	Informed consent forms; Information sheets; Deliverable report

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