New Clean Energy Communities in a Changing European Energy System (NEWCOMERS)

Deliverable D6.1

Benefits for community members in terms of increased access to clean, secure and affordable energy

Version: 3.0

WP6: Current and potential benefits for energy community members and society

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Summary of NEWCOMERS

In its most recent Energy Union package, the European Union (EU) puts citizens at the core of clean energy transitions. Beyond policy, disruptive innovations in energy sectors are challenging the traditional business model of large energy utilities. One such disruptive social innovation is the emergence of new clean energy communities ('newcomers'). The possible benefits of these 'newcomers' for their members and for society at large are still emerging, and their potential to support the goals of the Energy Union is unclear. Using a highly innovative holistic approach, drawing on cutting-edge theories and methods from a broad range of social sciences coupled with strong technical knowledge and industry insight, the NEWCOMERS consortium will analyse European energy communities from various angles. By taking an interdisciplinary approach and employing co-creation strategies in which research participants are actively involved in the design and implementation of the research, the NEWCOMERS project will deliver practical recommendations about how the European Union, as well as national and local governments, can support new clean energy communities to help them flourish and unfold their potential benefits for citizens and the Energy Union.

Find out more about NEWCOMERS at: https://www.newcomersh2020.eu/

Summary of NEWCOMERS's Objectives

As subsidiary objectives, the NEWCOMERS project aims to:

- Provide **a novel theoretical framework based on polycentric governance theory**, combined with elements from social practice theory, innovation theory, and value theory. The emergence and diffusion of new clean energy communities can be analysed, and opportunities for learning in different national and local polycentric settings can be explored.

- Develop a **typology of new clean energy community business models** that allows assessment of the different types of value creation of NEWCOMERS, as well as their economic viability and potential to be scaled up under various conditions.

- Identify the **types of clean energy communities that perform best along a variety of dimensions,** such as citizen engagement, value creation, and learning, and their potential to address energy poverty while being based on sustainable business models.

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- Investigate the **regulatory, institutional, and social conditions** at the national and local levels that are favourable for the emergence, operation, and further diffusion of new clean energy communities, and enable them to unfold their benefits in the best possible way.

- Explore **how new clean energy communities are co-designed with their members' needs**, in particular whether these communities have the potential to improve the affordability of energy, and their members' energy literacy and efficiency in energy use, as well as their members' and society's participation in clean energy transition in Europe.

- Deliver **practical recommendations informed by stakeholder dialogue on** how the EU, as well as national and local governments, can support new clean energy communities to assist them to flourish and unfold their benefits in the best possible way.

- Offer citizens and members of new clean energy communities a **new online platform, 'Our-energy.eu'**, on which new clean energy communities can connect and share best practices, and interested citizens can learn about the concept of energy communities and find opportunities to join one in their area.

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NEWCOMERS Consortium Partners

Logo	Organisation	Type	Country
	Institute for Environmental Studies (IVM), Vrije Universiteit Amsterdam (VUA)	University	The Netherlands
	International Institute for Industrial Environmental Economics (IIIEE) at Lund University (LU)	University	Sweden
	Environmental Change Institute (ECI), University of Oxford (UOXF)	University	United Kingdom
	Institute of Social Sciences, University of Ljubljana (UL)	University	Slovenia
	Institute for Advanced Energy Technologies "Nicola Giordano" (ITAE), National Research Council (CNR)	Research organisation	Italy
	Leibniz Institute for Economic Research (RWI)	Research organisation	Germany
	Consensus Communications (CONS)	Private for Profit (SME)	Slovenia
	GEN-I	Private for Profit (Large company)	Slovenia

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1 EXECUTIVE SUMMARY

The central mission of the NEWCOMERS project is to encourage empowerment processes for EU citizens to participate in and contribute to clean energy transitions. In this deliverable, our focus is on identifying the variety of possible benefits of new clean energy communities and types of value they have for their members (and could have for society at large), as well as identifying members' assessment of the potential of clean energy communities in supporting the clean energy transitions.

Thus, the **general research question** of D6.1 is: *How do clean energy communities meet consumers' needs for clean, secure, and affordable energy in their everyday life settings and circumstances, and how do they perceive the value of clean energy communities in comparison to previous energy service models?*

The conceptual foundation of our **qualitative study** was based on an individual-practice framework within which the **individual-value-practice (IVP) model** was developed as a guide to understand the empirical data. We collected data with **semi-structured interviews** that were carried out across 10 new clean energy communities.

Involvement in a new clean energy community is unavoidably related to evaluative judgements of such involvement and is affected by preferences related to other practices. To understand the potential that clean energy communities can have for diffusion on a larger scale in a particular society, it is necessary to explore such evaluations and identify factors that might affect them.

Our **results** show that clean energy communities could, in the immediate future, represent an important player in the energy sector and be a significant contributor to an inevitable sustainability switch. An important finding suggests that apart from the obvious renewable energy-related benefits of clean energy communities (e.g. production of clean renewable energy, reducing CO_2 emissions, reducing the environmental footprint, etc.), members also valued their involvement in these communities and clean energy in general for a variety of reasons related to themselves, the community, and wider society. Thus, the analysis revealed that **the benefits of clean energy communities** are wide-ranging and reach beyond environmental and financial aspects. The benefits should be understood from the perspective of members: how they see and **value** them. One of the important implications of our study therefore points to **the need to identify ways to divulge *why* (benefits, values) and *how* (achievability)** to engage with different models of clean energy communities. Identified barriers and inhibiting factors that prevent potential citizens from joining or creating new communities need to be properly addressed, and the 'clean energy knowledge bank' should be made widely accessible to the interested public.

Clean energy communities often represent a **'catalyst for innovation'** for energy-related and environmental activities in general. Therefore, one of the main identified opportunities for the

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NEWCOMERS project is the **diffusion of the accumulated knowledge** that was developed across the studied clean energy communities. The data suggest that **the spread of clean energy communities across society could be contributing not only to gradual transformation to clean energy systems, but also to the increase of environmental consciousness in general across Europe**.

2 INTRODUCTION

2.1 Background

As part of the NEWCOMERS project, research has been conducted in six European Union member states (Germany, Great Britain, Italy, Netherlands, Slovenia, Sweden). They have been selected for their differences in their share of renewable energies in total energy generation, their regulatory environment, the degree to which community energy models are embedded in society, and their economic and social structures. Within the participating member states, the NEWCOMERS project aims to explore and evaluate several forms of new clean energy communities[1] that have volunteered to be case studies of social innovations and perform along dimensions such as citizen engagement, value creation, and learning. The project is providing insight into how new clean energy communities meet their members' (i.e. citizens' and consumers') needs better than more traditional business models, and whether they have the potential to improve the affordability of energy, and their members' energy literacy and efficiency in energy use, while enabling participation in clean energy transitions across Europe.

Previous research suggests that the relationship between energy and consumer behaviour can be very complex and multi-faceted. Clean energy practices are not only consciously driven and based on informed decisions and economic drivers, they can also play an important role in an individual's identity formation and social status, and frame their lifestyle choices and daily activities (Burgess & Nye, 2008). With this in mind, WP6 explores how community members perceive new forms of clean energy

[1] Drawing from previous literature the NEWCOMERS project defines 'energy communities' as associations of actors engaged in energy system transformation through collective, participatory, and engaging processes, seeking collective outcomes. Clean energy communities are characterised by a diversity of participating actors, leading to novel types of partnerships and coalitions between citizens, industries and municipalities. They often involve the use of innovative and smart technologies and aim to create new value for their members and society that go beyond the joint production of renewable energy (Gui & MacGill, 2018; van der Schoor & Scholtens, 2015). Examples for such new clean energy communities are peer-to-peer trading systems, microgrids, and community-scale energy projects dedicated also to societal objectives like the alleviation of energy poverty or enhancement of citizens' energy literacy (Lennon et al., 2019).

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communities in terms of benefits and value and the attitudes and degrees of energy literacy among members, how they engage in learning processes, and how they perceive the incentives and barriers important for the diffusion of new energy communities (Tasks 6.1 and 6.2). Informed by these findings, the second part of WP6 expands the inquiries to the level of citizens to test their awareness, energy literacy, perceptions, and attitudes towards new clean energy communities to establish the potential for diffusion of such communities (Task 6.3).

2.2 Role of this deliverable in the project

Deliverable 6.1 (D6.1) is primarily related to Task 6.1 and partially to Task 6.2.

The **research objective** of the deliverable related to Task 6.1 is to: (1) identify the variety of possible benefits of new clean energy communities, and what kind of value they have for their members and could have for society at large; and (2) identify members' assessment of the potential of clean energy communities in supporting the clean energy transitions.

The leading research question of D6.1 is: *How do clean energy communities meet consumers' needs for clean, secure, and affordable energy in their everyday life settings and circumstances, and what is their perceived value of clean energy communities in comparison to previous energy service models?*

The conceptual foundation of our **qualitative study** was **based on an individual-practice framework** within which the **individual-value-practice model** was developed as a guide to understand the empirical data. We collected data from members of the studied clean energy communities with **semi-structured interviews** that were carried out across 10 new clean energy communities in the above-mentioned countries. The aim of the interviews was to capture and understand the elements of the individual-value-practice model, such as attitudes, social norms, technology, knowledge and skills, and incentives and barriers, and their effects on how community members value their involvement in the clean energy communities. All these elements were investigated to gain further knowledge on how clean energy communities may influence energy-related behaviour and practices. Our research was conducted by acknowledging the value of a community setting that can lead to success in terms of both behaviour and practices' change and diffusion of new clean energy practices outside of communities (Wemyss et al., 2018). We designed our research according to deductive (theory-driven) analysis and an inductive (data-driven) approach to data analysis.

In part, deliverable **D6.1 complements D4.3,** which investigated knowledge and skills in new clean energy communities as seen from the different actors involved, not only community members. Furthermore, **D6.1 provides a foundation** on which to further investigate the knowledge, attitudes, behaviours, and values of members related to clean energy on a broader scale, which is the aim of **D6.2**. The findings of D6.1 will uncover the variability of issues related to the value of those benefits for community members, furthering understanding of how clean energy community members think and discuss clean energy and what kind of value they perceive (for themselves, their household, their community and larger society) in their membership in the clean energy community. On the basis of

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this knowledge, we will design a **quantitative study (D6.2)** among clean energy community members, as illustrated in Figure 1.

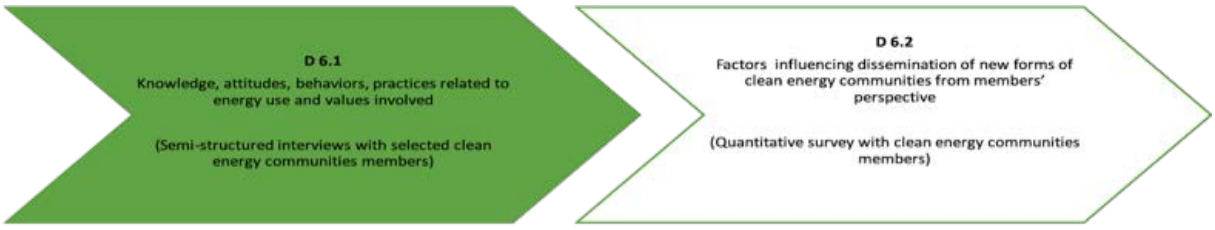

Figure 1: The sequence of qualitative and quantitative investigations of new clean energy communities from members' perspectives

2.3 Approach

This study combines multiple theoretical approaches to build an individual-practice framework for studying new clean energy communities. In particular, it leans on social practice theory (SPT) and value theory, and complements them with behavioural theoretical approaches. On this basis, we developed the individual-value practice (IVP) model to better understand the functioning of the new clean energy communities from their members' perspectives and the value and benefits associated with them.

The current literature mainly focuses on psychological and sociological determinants of (clean) energy-related perceptions and behaviour (e.g. Boudet, 2019). However, a brief review of the existing studies shows that not many of them are actually focusing on members of new clean energy communities using behavioural models or SPT approaches. Most studies that exist tackle various other energy-related issues, such as household energy use (Frederiks et al., 2015), individual perceptions of new energy technologies (Boudet, 2019), and household energy saving (Sweeney et al., 2013). In order to understand what drives individual behaviours in the context of the new clean energy communities, we need to widen the research perspective.

Thus, this deliverable focuses on insights into energy community members' practices and behaviours, and provides a more holistic understanding of clean energy communities by investigating the attitudes, perceptions, technology usage, constraints, incentives, and knowledge that affect members' perceived value of new these communities. We follow a pragmatic approach, arguing that there is an urgent need to use different streams of knowledge from social sciences and a range of different theoretical and methodological perspectives (e.g. Whitmarsh et al., 2011), to not only understand clean energy-related behaviours of individual actors within the communities, but also to inform future behaviour-change objectives, strategies, and interventions that could contribute to the upscaling of new clean energy

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communities. For this, it is necessary not only to understand the **features of new clean energy communities and the benefits** they can bring to their members and larger society, but also to uncover how members **value** those benefits, and how they perceive the worth of these communities and their own membership in them.

Based on the theoretical underpinnings presented in Chapter 3, a set of questions was developed for the semi-structured interviews with members of 10 energy communities across six countries. An interview guide, prepared by the University of Ljubljana team, was distributed to the local partner institutions with instructions on how to select and approach the interviewees. A comprehensive a priori code list was also prepared for each partner institution to perform a preliminary analysis, based on the native language transcripts (deductive approach to data analysis). The University of Ljubljana team gathered all anonymised transcripts and reports by early November 2020, and performed additional analyses (inductive approach to data analysis) of transcripts translated to English by the local research teams. The results are presented in Chapter 5 of this report. The research was conducted in compliance with ethical standards set out in D9.1 'ETHICS Framework for the NEWCOMERS project'.

2.4 Structure of the document

This deliverable is structured in four chapters. First, we present the theoretical framework and the conceptual model for the analysis. This is followed by the objectives of the research and a description of the empirical materials and method. The results of the study are presented within the sections that follow the logic of the conceptual model, and the document concludes with a discussion of our findings.

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3 INDIVIDUAL-PRACTICE FRAMEWORK FOR NEW CLEAN ENERGY COMMUNITIES

3.1 Psychological and social practice theory approaches to study new clean energy communities

Over the past few decades, the importance of understanding energy-related behaviour and practices has risen, and research has provided many new insights in this regard. Multiple studies have been conducted across several disciplines utilising various approaches, contributing not only to the richness of knowledge about energy-related issues, but also to the increasing complexity (Sweeney et al., 2013) and fragmented nature of the findings (Boudet, 2019). Most previous research endeavours were based on various behavioural approaches, investigating possible behaviour change by addressing psychological, social, and cultural factors (Hartmann & Apaolaza-Ibáñez, 2012). A vast amount of literature on these factors has accumulated over time, and while many approaches do not explicitly have a theoretical base, several theoretical frameworks and models have been proposed to study energy-related issues among individuals, such as the theory of reasoned action, theory of planned behaviour, value-belief-norm theory, the diffusion of innovations theory, social cognitive theory, social representations theory, and social practice theory (Boudet, 2019).

Most psychological and socio-psychological approaches can be classified as 'traditional behaviour change models' and are based on methodological individualism. This is not the case for social practice theory, however, which has recently been introduced as an alternative perspective on studying energy-related practices. It offers insights into what drives people's practices and highlights the reasons for certain behaviours (what and who is influencing the individual), thus putting the individual and their practices into a social context (Shove, 2010).

3.1.1 Socio-psychological perspectives

Traditional behaviour change approaches mostly rely on a combination of socio-demographic and psychological factors of consumer behaviour. A review of previous studies in the area of energy consumption and conservation indicated that there is no single approach and no single model that would provide an all-inclusive explanation or prediction of such behaviour (Frederiks et al., 2015). Rather, the literature has established that researching energy-related consumer behaviour is complex.

A comprehensive review identified a variety of such factors used by researchers trying to explain energy-related consumer behaviour (Frederiks et al., 2015; Figure 2). Furthermore, it revealed that recently, studies have adopted more integrative models with the ability to articulate various factors or forces that can potentially drive this behaviour. Despite this, the expanding literature does not offer compelling and conclusive empirical evidence of how these variables impact behaviour. The lack of

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consistency in terms of empirical findings represents a challenge for generalisation of conclusions and implications regarding behavioural change (Frederiks et al., 2015).

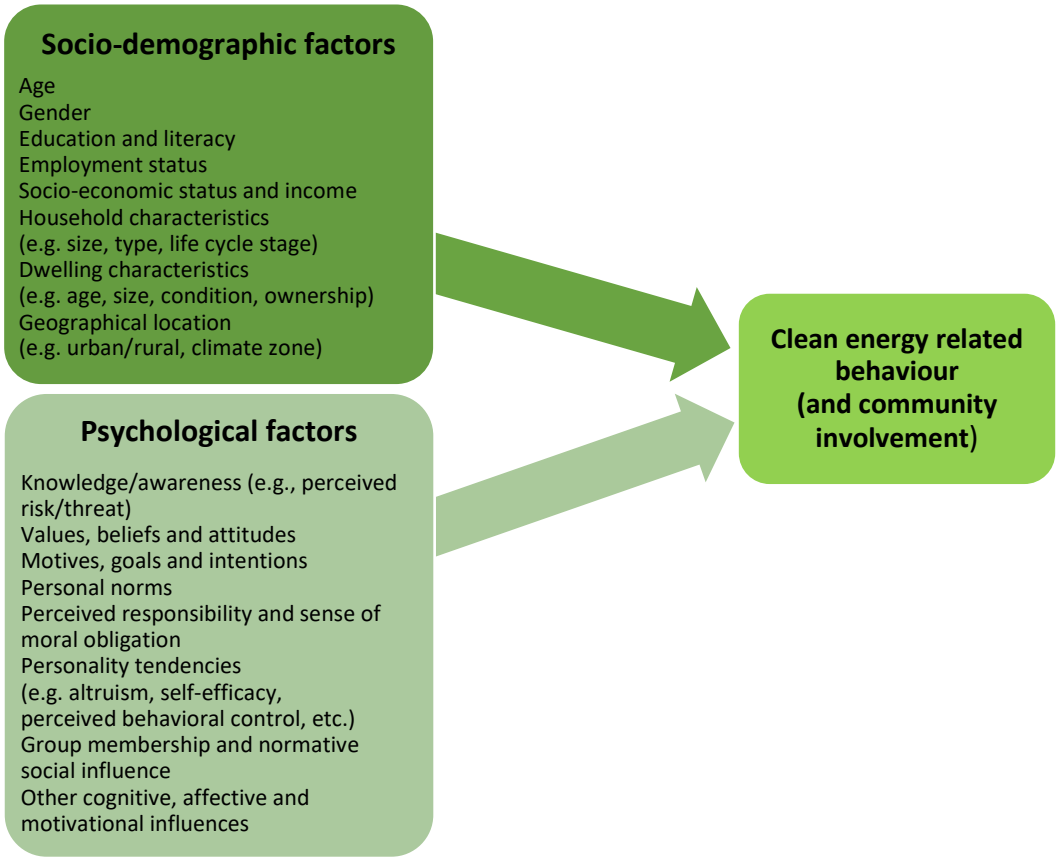

Figure 2: Individual socio-demographic and psychological factors that may influence clean energy-related behaviour (adapted from Frederiks et al., 2015)

Taking into account the differences in empirical findings, the common denominator of these views remains a rational energy consumer who has 'the agency to act in the common good by pursuing social or environmental goals' (Strengers et al., 2016, p. 763). Following this view, households have been segmented around attitudes and perceptions towards energy based on the implicit rationality of their views and behaviours, expected to increase their awareness and knowledge about energy consumption and act accordingly (Strengers, 2013; Sweeney et al., 2013). However, echoing the lack of consistency in empirical research, critics point to the evidence that such approaches lack sufficient explanatory power and fail to consider the broader social (and cultural) context that influences individuals' energy

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practices (Sweeney et al., 2013). Moreover, the aim related to energy consumption and behaviour is not only to change individual behaviours but also to change the complex system, which has many moving parts and cannot be tackled with simple solutions (Stephenson et al., 2010). It is therefore important to take into account the influences that go beyond the individual consumer.

3.1.2 Social practice theory

Due to the fragmented nature of insights offered by the research based on the traditional behaviour change approaches and their relative weakness in explaining behaviour change, social practice theory (SPT) presents itself as a promising alternative providing a more socio-cultural view on energy-related practices. Lately, SPT has been applied in various areas of consumer studies, which include a few on energy consumption (e.g. Gram-Hanssen, 2014; Jensen, 2017; Pullinger et al., 2014; Strengers, 2012; Strengers et al., 2016; Sweeney et al., 2013) and other sustainable consumption practices (for a review, see Corsini et al., 2019).

The two perspectives—individual and social practice—are often presented as contrapositions, also due to their different epistemological foundations (e.g. Shove, 2011). While for theories of behaviour the primary basis of action is individual choice, for theories of practice it is socially shared conventions (Hess et al., 2018). From the social practice perspective, individuals are not isolated, independent, or passive actors. Rather, they are active and reflexive, but at the same time not a central object in the social practice perspective, which is built of practices (Corsini et al., 2019). Energy-using practices are part of everyday life and embedded in contemporary social life, meaning that several factors (i.e. socio-technical structures) might inhibit a change of action (Hampton & Adams, 2018). Hence, SPT now offers an alternative view on how to study energy transitions at the micro-level (Shove, 2010).

Citing Reckwitz's (2002) definition, practice is 'a routinized type of behaviour which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, "things" and their use, background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge' (p. 249). Nevertheless, individuals are still thought to be the carriers and performers of practices, which implies that SPT maintains a degree of anthropocentrism (Strengers et al., 2016).

Following the above definition and a conceptualisation of practices provided by Shove et al. (2012), practices are composed of three interrelated elements (see Figure 3): meanings, knowledge/skills and materials. Materials are the objects, technology, and infrastructure needed to carry something out; competence encompasses any knowledge, skills, know-how related to practices, and meaning refers to shared understandings, beliefs, etc., related to the practices (Strengers et al., 2016). Shove et al. (2012) further explain that these elements are actively combined in various practices. They note that 'practices emerge, persist, shift and disappear when connections between elements of these three types are made, sustained or broken' (Shove et al., 2012, p. 14).

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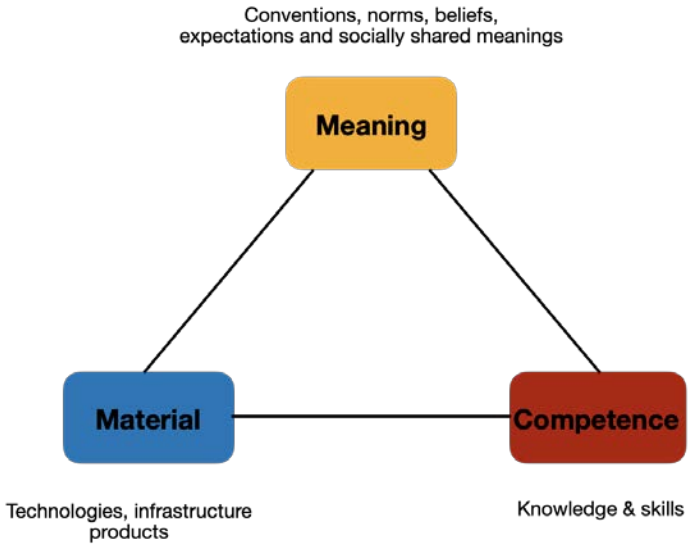

Figure 3: The elements of practice (adapted from Shove et al., 2012 and Piscicelli et al., 2016)

What does the SPT bring to the understanding of energy communities? By assuming the context in which the practices emerge, the theory provides us with a better understanding of how social norms, motivations, and perceptions are formed and transformed through their constant enactment (Corsini et al., 2019). To form a better understanding of energy communities, we need to consider the meaning of energy and its relation to practices from (at least) two standpoints. First, there are everyday individual practices in which energy consumption 'just happens' while individuals live their lives and it is not something they do, or are especially focused on (Verkade & Hoffken, 2017). The potential shifts in energy consumption and management can only emerge when everyday practices change. Second, while taking part in an energy community, individuals or households can also be engaged in various **energy practices**, where the individual must integrate elements of energy knowledge, skills, and meaning with the technology itself (Verkade & Hoffken, 2017).

3.1.3 Integrating perspectives

Both social practice and psychology researchers are interested in understanding (and potentially changing) energy-relevant actions, therefore, following several calls in the literature to combine these two main approaches (e.g. Wilson & Chatterton, 2011) would clearly benefit the investigation of practices and behaviour. Both approaches converge at important points of intersection (Whitmarsh et al., 2011). Psychologists concur that some types of behaviour (e.g. habitual) can be a product of contextual cues and social norms rather than conscious drivers. At the same time, the concept of social practices is largely based on norms and institutions that are reflected through action (Whitmarsh et al., 2011). It addresses the reasons for certain behaviours (what and who is influencing the individual) and thus puts the individual and their practice in a social context (Shove, 2010).

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The two approaches can therefore complement each other, as empirical research demonstrates (e.g. Hess et al., 2018; Sweeney et al., 2013). Although SPT focuses on practice as the object of investigation, the debates about the role of individuals and individual factors are still rather open for investigation (Hess et al., 2018). In SPT, the individual is often seen as a carrier of practice who is more often than not routinely reproducing what is 'normal' and part of 'everyday life' (Piscicelli et al., 2016, p. 39). Piscicelli et al. (2016) argue that SPT does not provide clear answers regarding the considerations around agency (the role of individuals) and their conceptions of 'normality'; they propose that the 'meaning' element of practices is in fact personally determined. Thus, personal preferences, attitudes, norms, and beliefs can either accelerate or hinder the acceptance, adoption, or diffusion of energy practices and behaviours (Piscicelli et al., 2016).

This implies that the individual perspective that dominates social-psychological approaches and the SPT perspective should be integrated to acknowledge 'the existing interaction between the carrier (i.e., the individual) and a specific configuration of "material", "competence" and "meaning" elements' (Piscicelli et al., 2016, p. 39). This integration represents a basic premise for our conceptual model, as explained in Section 3.4.

3.2 Community aspects and energy practices

Communities represent an important context in which energy practices are enacted. From a social perspective, practices can also be defined as actions that are shared among individuals, containing 'collectively shared experience of what is possible in a given context, and thus constitute a form of shared contextual rationality, which in turn motivates the individual actions of which practices consist' (Corsini et al., 2019, p. 3). Thus, SPT can be linked to the community aspects in the sense that people are connected and share certain internalised experiences related to a specific situation, and it is these experiences that shape practices (Corsini et al., 2019).

In terms of energy communities, a social practice view can be applied at both the community and member levels. The first is the level of a community where the collective energy practices through which energy is generated and managed are at the forefront (Verkade & Höffken, 2019). Here, the energy collectives perspective is emphasised by capturing the actions that explicitly bring energy into focus, either by highlighting or problematising it, or by making it a matter of concern for community members. Collective energy practices thus emerge when a group of people engages in energy projects and makes an effort to assemble the available community resources into actual practices that they individually could not or would not perform (Verkade & Höffken, 2019).

The second is the individual community member level. As noted by Verkade and Höffken (2019, p. 4), collective energy practices 'consist of the smaller practices that are performed by the community members, interrelated and united under the collective practice' (p. 4), such as operating a community of solar panel owners. Thus, a set of multiple individual but interrelated practices performed by various

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people at different times and places denotes energy practices in a specific clean energy community (Verkade & Höffken, 2019).

For our understanding of **how new clean energy communities function at the level of practices**, the toolkit of energy practices developed by Verkade and Höffken (2019) represents a useful starting point. The authors distinguish three different collective energy practices: (1) promoting individual practices, (2) developing collective energy generation, and (3) developing collective energy management. Not all three categories of energy practices are necessarily present in a specific energy community; rather, they can be seen as the stages along which a community evolves and develops (Verkade & Höffken, 2019). The stages are described in Table 1.

Table 1: Collective energy practices of energy communities (adapted from Verkade & Höffken, 2019, pp. 4-6)

Category (stage)	**Description**	**Typical practices**
Promoting home[2] energy practices	Practices that promote and support the growth of home energy practice that is organised at the community level.	- Applying community schemes for buying solar panels. - Promoting new knowledge and meanings regarding energy. - Promoting community's vision and knowledge within political and civil society. - Promoting individual energy practices of energy monitoring and energy saving within the community.

[2] Here, the category and activities could be extended from home energy practices to workplace practices as well. Communities may also include workplaces and people in the role of employees; workers tend to be forgotten when thinking about how to promote new knowledge and meanings regarding energy (see Moezzi & Janda, 2014).

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Developing collective energy generation	Developing projects of collective energy generation by employing diverse practices related to their contribution to collective practice.	- Studying technical information. - Applying for grants. - Seeking loans. - Raising money. - Thinking about insurance, permissions, marketing strategies.
Developing collective energy management	Practices that address how, when, and which energy is used within the community. They are not individually developed, but rather operated by and for a collective.	- Using energy monitoring platforms for the community. - Storing community energy. - Installing community virtual power plants. - Operating micro-grids.

3.3 Individuals, energy practices and the importance of value

Whenever people are engaged in certain practices or are in the possession of a certain object, it is common that they 'judge' the practice or object by conferring on them a relative worth, which is referred to as 'value' (Arvidsson, 2011). This term, in the singular form, should not be confused with the term 'values', used in plural, which means guiding principles that shape an individual's attitudes and behaviour (Arvidsson, 2011). **Value is a subjective idea** (Gordon et al., 2018), most often examined from the individual/consumer perspective, encompassing how individuals perceive and use objects or engage in practices (Türe, 2014), and how they perceive their utility, worth, and benefits (Chang & Dibb, 2012).

Involvement in a new clean energy community is unavoidably related to evaluative judgements, whereby people may judge clean energy systems and their involvement in them against various evaluative criteria such as standards, norms, goals, and ideals. To this end, what is determined through a process of evaluation (i.e. value) can be seen as 'an interactive, relativistic, preference experience' (Hillard, 1950, p. 42). The evaluation process of energy systems varies between people and places, in time, and in comparison to other alternatives and practices. The value is relativistic, personal, and situational. It also embodies a preference judgment (Holbrook, 1999, p. 8), which refers to both cognitive and affective factors like knowledge, attitudes, predispositions, and response tendency.

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While we can assess benefits of clean energy communities on the basis of studying their technological, organisational, environmental and social features, we can assess value types related to clean energy communities only through members' feedback. Value of a clean energy community is always in the eye of the beholder and it is about why a clean energy community and membership in it is important.

The literature suggests that **value is a multidimensional construct** (Chang & Dibb, 2012; Loane & Webster, 2014). A number of authors have studied consumer value using different consumer settings (for a review, see Loane & Webster, 2014) and established several dimensions. While there is no agreement upon the exact typology, the studies mostly concur on the general forms of value. Value can be of a more affective type (emotional, social) as well as utilitarian (functional, rational, conditional), and can be present concurrently in any given situation (Loane & Webster, 2014). Stewart, Loane, and Webster (2014) described these basic forms as presented in Figure 4.

Figure 4: Multidimensional value constructs (adapted from Loane & Webster, 2014).

The concept of value tends to be complex and multifaceted, and while scholars may not be in complete agreement on what forms of value exist, they agree that value is ultimately determined by the consumer/individual (Chang & Dibb, 2012). Furthermore, experiences usually involve more than one type of value simultaneously (Koller et al., 2011). This implies that perceptions of consumer value are by no means limited to these four types.

From the perspective of new clean energy communities, at least two other value types identified in the literature might be important. First, there is the 'ecological value' examined by Koller et al. (2011), defined as 'consumption-related issues regarding the natural environment and the impact made on it by humans' (p. 1157). Second, there is the 'network value', which is a value co-created through social networks or groups of consumers, who are, in our case, clean energy community members (Loane & Webster, 2014). As argued by Loane and Webster (2014), the latter type is different from the social

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aspect of value defined by Sheth et al. (1991), which is mostly linked to status- or esteem-based forms emerging from practices related to social group membership. Network value tends to encompass social value outcomes that are not necessarily related to status or other affective or functional outcomes of being part of a social group, but are instead linked to the consumers' membership in social networks (Loane & Webster, 2014). Hence, the network value denotes the benefit of social participation and integration that outweighs the costs associated with each (time to participate, equipment, learning, etc.), and the sole act of co-creating value in the group is providing value in itself (Loane & Webster, 2014, p. 455).

Another important aspect related to the question of value is how it is created. Gordon et al. (2018) propose four different **processes of value creation**: (1) value-in-exchange, where value is mostly an outcome of a cost/benefit evaluation of an economic exchange process; (2) value-in-use, where value is experiential and created in interaction, in partnership between the offeror and consumer, or when the consumer is using the resources; (3) value-in-context, which takes a systemic perspective and acknowledges that multiple contexts, practices, routines, processes etc. across multiple levels play a role in framing the exchange; and finally (4) value-in-behaviour, where value is also perceived in performing certain behaviours.

The latter is potentially highly relevant to understanding the process of value creation in new clean energy communities. It also resonates with the perspective of value-in-practice (Rihova et al., 2018), which argues that value can be created through practices: 'through the engagement with resources during a practice, as well as the (conscious) experience of a practice, customers are able to articulate what value they are experiencing by interpreting their experience within their own subjective situation and the wider social context' (p. 365).

Perceived value outcomes are key predictors of consumer choice (Zauner et al., 2015) and can have an important influence on individuals' behaviours (Gordon et al., 2018). Furthermore, perceived value can also be considered an antecedent of **empowerment** (Loane & Webster, 2014). In the instance where **value is co-created** by consumers together, as can be the case in clean energy communities, such co-creation is often based on **knowledge flows and processes of learning**. Members can use a combination of co-learning, collating information, and connecting to co-create value. A value outcome for the consumers in such a process is new knowledge creation, which forms a basis for empowerment—an outcome related to the functional value type (Loane & Webster, 2014).

Finally, also very important from the perspective of new clean energy communities, collaborative value creation can present a source of collective social value, thus contributing to the prosperity of the clean energy community (Rihova et al., 2018).

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3.4 Individual-value-practice model for understanding new clean energy community members' behaviours

In order to better understand how new clean energy community members think and behave in relation to clean energy, and to capture the interaction between individuals (and their behaviour) and elements of energy-related practices, we adopted an integrative model that combines individual and SPT approaches, as described in Section 3.1 in the IVP model. Although, they may seem rather conflicting (the first one focusing on the individual while the second shifting the attention from the individual to practices performed by the individual), we agree with the authors (e.g. Piscicelli et al., 2016; Sweeney et al., 2013; Batel et al., 2016; Ford et al., 2017) who argue that both approaches can in fact complement each other.

Adding the individual to the social practices' perspective may explain the variations in performance of social practices, which vary based on factors such as differences in attitudes, perceptions, and individual support for energy transition (e.g. Hess et al., 2018). Studying these is important, and Hess et al. (2018) argue that '**individual variations may be considered niches for changes in routines, and, on a larger scale, for social change**' (p. 184). This implies that our approach, while providing insights at the individual and community levels, might be important for a broader understanding of how changes in clean energy systems can occur by diffusing collective energy practices.

Thus, for the purpose of our empirical study of new clean energy communities, the **IVP model** (see Figure 5 below) is based on the ideas of Shove et al. (2012), Piscicelli et al. (2016) and Sweeney et al. (2013). **Our addition to the model is the concept of (consumer) value**. **Practices deliver different forms of value to consumers with the potential to further encourage collective action in new clean energy communities** (Loane & Webster, 2017).

As concluded by Piscicelli et al. (2016) and Sweeney et al. (2013), the IVP model places the **individual as a carrier of practice** in the middle of the interaction between the elements or structures of practice (Shove et al., 2012), rather than placing practice itself as a unit of focus. This allows us to explore the interactions between the individual and a configuration of practice elements (Piscicelli et al., 2016).

3.4.1 Linking the elements of the IVP model

In this section, we briefly explain how the elements affecting individual behaviour, perceived value (individual factors), and elements of practice (structural factors) can interact to potentially influence action and behaviour change. Our premise is that **while behaviour can partly be consciously driven, it is also dependent on contextual cues** such as norms and institutions, which are integrated in the concept of practices and are thus perpetuated through the actions of individuals (Whitmarsh et al., 2011).

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As suggested by authors who have already attempted to combine individual and structural elements to explain behaviour (e.g. Hess et al., 2018; Piscicelli et al.; 2016), the starting point of the IVP model is the framework of **elements of practice (meaning, competence, and materials)** described by Shove et al. (2012), which represents the structural elements. These elements are complemented by other factors (most of which are socio-psychological constructs) that relate to the structural elements or operationalise them. The elements of practice surround the individual (the 'carrier') and their perceived value, which drives their behavioural goals. All the components of the IVP model are presented below and illustrated in Figure 5.

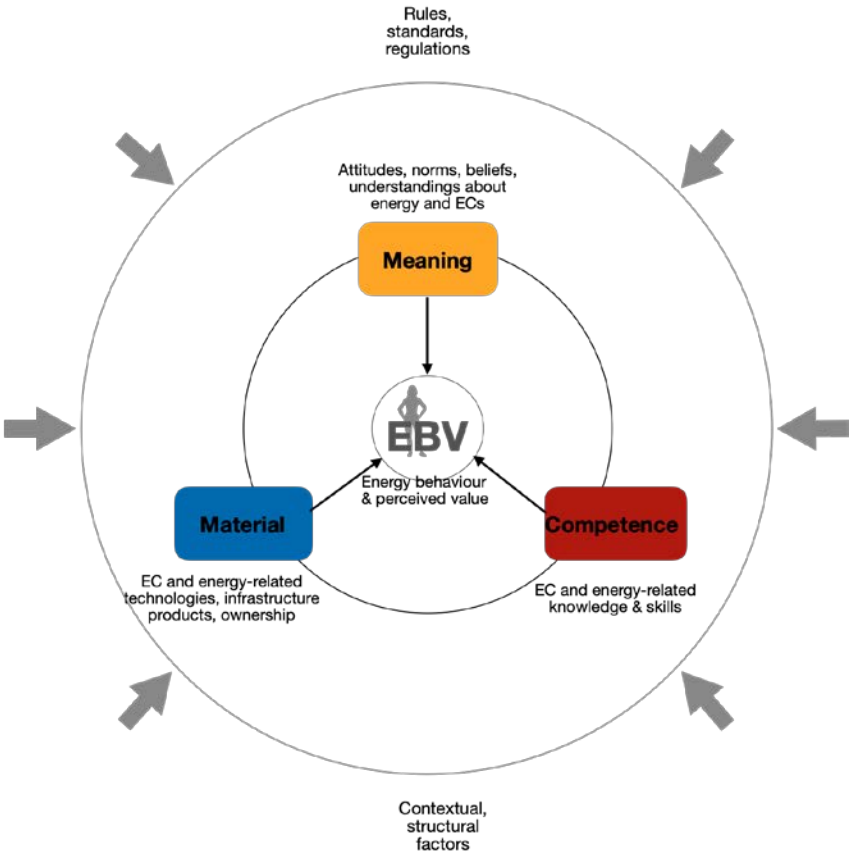

Figure 5: Individual-value-practice model for new clean energy communities (adapted from Shove et al., 2012; Piscicelli et al., 2015 and Sweeney et al., 2013).

(a) The meaning structure or the 'think' component

In SPT, the element of 'meaning' represents 'the social and symbolic significance of participation at any one moment' (Shove et al., 2012, p. 23) and can be perceived as the 'think' component (Sweeney et

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al., 2013). Based on previous attempts to combine social practices and social-psychological approaches, we include norms, attitudes, beliefs, and understanding with regard to the role of the clean energy community in addressing environmental issues, which may help us better understand individual performances of energy-related practices.

(b) The competence structure or the 'knowledge and skills' component

According to SPT, the element of 'competence' implies an implicit worldview (Shove et al., 2012). As argued by Hess et al. (2018), empirical evidence demonstrates that this structure is operationalised in the real world as acquired or needed skills and factual knowledge. Thus, to better understand this part of our model, competence may relate to social-psychological concepts of knowledge, skills, and learning that were added to our model. In terms of collective and individual energy practices, common rules and standards that guide actions and were particularly emphasised by Schatzki (2002) are also worth noting.

(c) The material structure or the 'have' component

SPT interprets the 'material' as objects, tools, infrastructure, and hardware (Shove et al., 2012). The material part of the IVP model can be labelled as the 'have' component that also represents technological development needed to achieve changes in practices (Sweeney et al., 2013). In the case of new clean energy communities, the material part can refer to any objects related to new clean energy technology, such as PVs, wind turbines, existing energy sources, smart metres, electricity storage, heat pumps, and also materialised knowledge that includes websites, handbooks, written minutes of meetings, newsletters, documentation, and written legislation/rules.

The main premise of the tripartite model is that the components interact and influence one another (Stephenson et al., 2010). For example, in the case of the IVP model, competence (knowledge and learning about clean energy and community functioning) can influence attitudes towards clean energy. Material culture (e.g. smart metres and PVs) can influence meanings or cognitive norms (e.g. attitudes about the affordability of clean energy and savings) and also accelerate knowledge (e.g. use of handbooks and written materials to learn about the new clean energy communities). Competence (knowledge) can in turn produce more materials and their more efficient use.

(d) Contextual factors

Energy-related behaviour does not happen in isolation but, rather, is conditioned by various technological, social, and cultural factors that form a sort of 'contextual soup' (Stephenson et al., 2010, p. 6123). These contexts are reflected in motivational elements or constraints that potentially affect the perceived value and behaviour. According to Sweeney et al. (2013), these can be categorised with respect to at least one or even all three components of the model (i.e. structural elements). Additionally, from the perspective of an individual, they can originate from the actual involvement of the individual in the new clean energy community.

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(e) Perceived value

The perceived value is attributed to the individual in the centre of the IVP model. It is thus related to each of the three structural elements separately, or emerges from the interaction of all three. As suggested by authors studying consumer value (e.g. Zauner et al., 2015), perceived value can be influenced by various antecedents, such as social norms, knowledge, and quality or price of the material component. It can also be determined in the process of participation within the community that sets the context of the IVP model (Loane & Webster, 2014). Moreover, the perceived value is closely linked to the explicit consideration of motivation. In the process of determining the 'relative worth' perceived by the individual, material, competence, and meaning-related factors are contrasted with and weighted against one another, thus influencing the perception of value. The consequence of the perceived value, as a result of the interplay of all elements of the IVP model, can further influence consumer choice and behaviours in regard to new clean energy communities and clean energy in general.

4 RESEARCH QUESTIONS, EMPIRICAL MATERIALS AND METHOD

This chapter first introduces the research objectives, followed by a short overview of the new clean energy communities that were selected for this research and methodological aspects of the qualitative study.

4.1 Research questions

Following the main aim and objectives set in the NEWCOMERS project, and based on the theoretical underpinnings presented in the previous chapter, the main research questions of this study are:

- What motivates consumers to be part of clean energy communities, and how do the communities meet their needs regarding affordable energy?
- What is the consumer value of clean energy communities from a functional or/and social perspective?
- What are members' attitudes, beliefs, and understandings of the clean energy communities in particular and clean energy in general?

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4.2 New clean energy communities in our study

Altogether, 10 communities were investigated, they were of different types and sizes (Figure 6 below, and Table 2 (section 4.3.1)). A more thorough comparison between the types of communities and their business models is done elsewhere (D4.2 and D4.6). In this document, we include only brief descriptions of studied communities to provide the basic context for interpretations of the data.

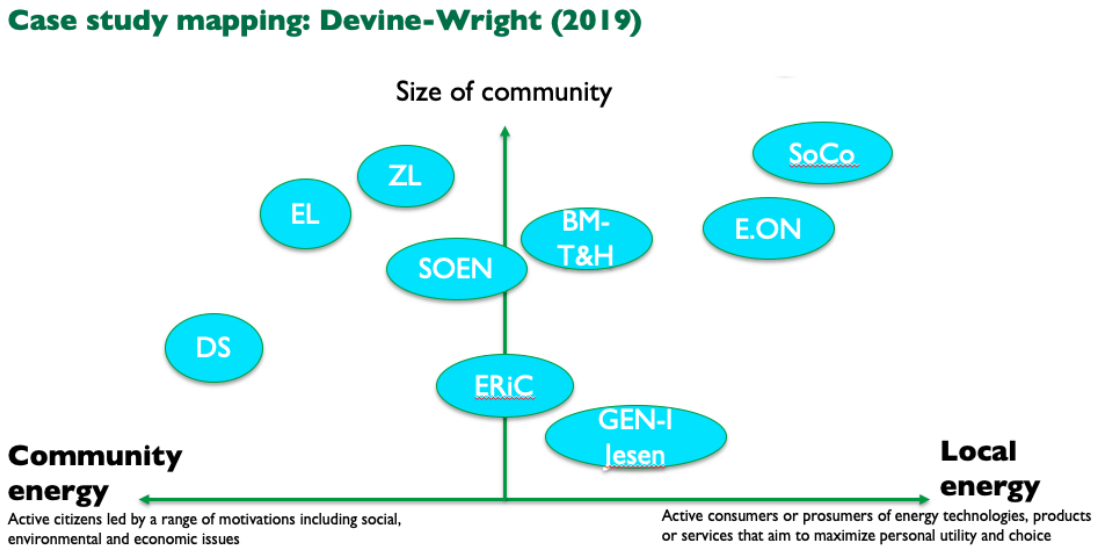

Figure 6: Case study mapping according to Devine-Wright's (2019) typology

4.3 Methodology

We studied benefits for community members in terms of increased access to clean, secure, and affordable energy with a qualitative approach. Semi-structured, face-to-face interviews were conducted, which allowed for a set of predefined topics but with open-ended questions. The interviews were conducted in person, but due to the COVID-19 pandemic, also via online platforms like Zoom and Skype. Participants were not offered any incentive. All interviews were audio recorded and transcribed verbatim. The interviews, lasting on average more than one hour, were conducted in September and October 2020. The personal characteristics of the participants were anonymised to guarantee confidentiality. At all stages of the research process, the Code of Ethics for Researchers of the University of Ljubljana (2014) and the ethical standards in D9.1 'ETHICS Framework for the NEWCOMERS project' were followed.

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Based on the theoretical framework presented in Chapter 3, we designed an interview guide (see Appendix 1) to be used in conducting interviews with selected community members across the studied clean energy communities in the six EU countries. The semi-structured interview guide consisted of a set of topics that provided a general guideline for the interviewer. The interviewer took the provided questions as prompts to open up a discussion with the interviewee rather than following a straightforward question-and-answer format. The interviewer could adapt the questions to the context of the particular energy community, the interviewee's role in the energy community, and the ability of the interviewee to answer the questions. The semi-structured interview guide covered (1) background on respondents and their involvement with the energy community; (2) knowledge and skills that needed to be learnt by members for joining the energy community and the process of learning; (3) barriers and incentives related to membership in the energy community; and (4) everyday life and (social) practices in the energy community.

The qualitative analysis of the results was made with MaxQDA2020 software (VERBI Software, 2019), and by hand, using both translated transcripts and the template reports filled in by the local research teams.

First, we read the transcripts and template reports several times and made a set of initial observations. Then, we looked for patterns in the data, working towards developing an understanding that could explain those patterns in the sample, and aiming to develop a more general set of propositions about the large-scale community membership. Led by the guidelines established by Braun and Clarke (2006), we identified and described core themes across the data. Each identified issue raised by participants was given a code name (in-vivo coding). We developed a definition for each code and established clear distinctions between them when we listed them in the codebook.

In the first step, open-coding iterative analysis, codes were ascribed to smaller meaning units (group of words, sentences, or statements that had some common meaning). In this process, the coding scheme was continuously refined. Then, we grouped codes with shared commonalities into the initial set of categories, followed by revision of the initial categories, searching for coherent patterns, and continuing with the process of defining and naming higher-level categories.

The coding process, framework, and results were discussed and elaborated among the authors, assuring the reliability of the findings.

Derived empirical material is presented in Chapter 5. It should be noted that this is not a comparative study that would expose particularities of the studied energy communities along the proposed research questions. On the contrary, this report will focus on mechanisms of clean energy communities, aiming to reveal their complexity and diversity in individual behaviours, perceived value, and elements of practices.

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4.3.1 Description of the sample

The sample consisted of 40 members of energy communities from six countries. The interviewees were members of new clean energy communities, selected purposely to provide demographic variability within the sample. Participants of the study were of different gender (men and women), age (the oldest participant was 88 years old, the youngest was 27 years old), they were also with different level of education, occupation and with different employment status. Table 2 provides the basic context of the interviewees according to the type of clean energy community.

Table 2: Sample of the clean energy communities and interviewees

Country	**Type of new clean energy community**	**Number of participants**
Germany	***Sonnen Community*** • Virtual community of Sonnen battery owners; trading platform • Surpluses generated are fed into "virtual pool" for other members to benefit from • SonnenFlat tariff as payment mechanism • Option for battery owners to make small share of their storage capacity available to public network to create a "virtual battery" • Optimising amounts of solar used, lowering costs, benefit of green electricity at household level; flexibility services at grid level	5 in Sonnen Community (all men)
Italy	***Solidarity & Energy (SO_EN)*** • Place-based; innovative contracting and community-based products • Addressing energy poverty; using technological innovation for social value creation • Strong focus on energy poverty and efforts to find replicable solutions in different contexts • Social housing	2 in SO EN SOCIAL HOUSING (1 man, 1 woman) 3 in SO EN CONDOMINIO (1 man, 2 women) 3 in ERiC (2 men, 1 woman)

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	ERiC • Place-based; local RE supply • Promoting and advancing environmental sustainability and economic development in the region by empowering citizens to make better choices regarding RE technologies • Facilitating RE generation technology (esp. solar PV) purchase, and using a circular economy approach to sourcing and disposing of solar PV panels • Community of interest offering education and support regarding purchase, installation, use and disposal of technologies (esp. solar PV) • Membership fee re-invested into other environmental projects • Spreading awareness of environmental issues and the benefits of renewable energy technologies	
The Netherlands	***Zuiderlicht*** • Place-based, innovative contracting + community-based products • Members can invest in solar (or other projects) through 250€ loans (max. 20 per member) • Investing means owning solar panel(s) on a roof nearby and benefitting from the Postcoderoos tax reduction; even if not investing members still get a 1% discount/ kWh on all Greenchoice rates • All investing members decide annually what interest rate they will receive on their loans • Interest rates are paid from the income generated by selling solar energy to the grid • The cooperative also gets 25€ / year / connection from Greenchoice which they re-invest in projects ***Buurtmolen Herbaijum*** • Place-based; innovative contracting and community-based products • Wind energy cooperative; owns wind turbine located on private land; Greenchoice manages cooperative; Qurrent/EWT invested in turbine, recovering costs through fee in members' electricity costs; members benefit from	6 in Zuderlicht (3 men, 3 women) 4 in Buurtmolen Herbaijum (3 men, 1 woman) 1 in Buurtmolen Tzum (1 man) 2 in Soesterwijkwiek (2 women)

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	Postcoderoos regulation, tax savings are greater than members' fee ***Buurtmolen Tzum*** • Place-based; innovative contracting and community-based products • Community/ cooperative TOER invests in wind turbine; TOER receives compensation from Greenchoice for electricity generated, pays MAST Foundation for land tenure (MAST owns land that wind turbine will be located on); coop members pay Greenchoice for electricity and get profits from TOER; MAST uses income to fund local sustainability projects • Cost of electricity for households is subsidised by Postcoderoos regulation ***Soesterwijkwiek*** • Place-based; innovative contracting and community-based products • Wind energy cooperative initiative (early stage) • Community / cooperative started a crowdfunding project in order to finance the implementation of two wind turbines • The community goal is to be electricity self sufficient	
Slovenia	***GEN-I Jesenice*** • Place-based; community energy aggregation • Collective self-consumption in an apartment building in Jesenice, 23 households • 129 PV panels; innovative heat pump system • Power common areas and heating system, then apartments • Cost savings for residents, increased energy efficiency and purchasing power • GEN-I Sonce + GEN-I ESCO + engaged and interested community of owners • First solar system for an apartment building in Slovenia	4 (3 men, 1woman)

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	• System co-financed by owners of the units	
Sweden	***Dalby Solby*** • Place-based community; local RE supply • Interested in sustainable living and sustainable energy; wanting to make the village as sustainable as possible, inspiring others, and being part of the movement/ transition • Sharing as guiding principle • PV panels to cover common areas consumption; solar thermal collectors to provide heat using in shared building and laundry room; energy efficient appliances such as LED lamps to increase energy efficiency; own shares in wind turbine • Cooperative technology ownership to increase sustainability (and decrease costs) of communally used buildings/ areas	5 (2 men, 4 women)
United Kingdom	***Energy Local*** • Place-based; innovative contracting • Local cooperatives ('Clubs'): households and local RE generation plants; contractual arrangements with Octopus Energy (licensed supplier) • linking generation with consumption over (public) low voltage distribution networks • Fixed time of use tariffs are used to encourage consumers to shift consumption to times of local generation and times of lower demand	7 (4 men, 3 women)

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5 RESULTS

In this chapter, the main findings from the 40 interviews with members of different clean energy communities are arranged along eight identified main themes: (1) reasons and motives for joining the clean energy community; (2) level of involvement in the community; (3) experienced values related to membership; (4) attitudes, beliefs, and understanding with regard to the role of the community in addressing environmental issues; (5) knowledge, skills, and learning processes in the clean energy community; (6) everyday practices and behaviour change in the clean energy community; (7) trust; and (8) factors influencing dissemination of the clean energy communities from members' perspectives. We summarise the main themes and identified sub-themes in Table 3. In the same table, we link the identified themes with the theoretical concepts of the IVP model (Figure 5).

Table 3: Themes, sub-themes and their connection to the IVP model

Theme	**Sub-themes**	**Components of IVP model**
Reasons and motives for joining the clean energy community	(1) Financial motives (2) Motives related to self-sufficiency (3) Environmental motives (4) Motives related to communal living	Meaning - norms and aspirations
Level of involvement in the clean energy community	(1) Passive involvement (2) Active involvement	Individual behaviour
Experienced value types related to membership in clean energy community	(1) Cognitive value (2) Financial value (3) Social value (4) Affective value	Value (individual judgments of worth of benefits)

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Attitudes, beliefs and understanding with regard to the role of clean energy community in addressing environmental issues	(1) Beliefs related to clean energy systems and climate change (2) Attitudes toward clean energy (3) Roles and responsibilities for clean energy transmission	Meaning
Knowledge, skills and learning processes in the clean energy community	(1) Learned skills (2) Learned knowledge (3) Learning process and diffusion of knowledge	Competence Material - knowledge artefacts
Everyday practices and behaviour change in the clean energy community	(1) Cognitive aspects (2) Affective aspects (3) Behavioural aspects	Meaning Competence Material
Trust	(1) Competence-based trust (2) Integrity-based trust (3) Community-based trust	Meaning Competence Material - organisational structures/rules
Factors Influencing dissemination of the clean energy communities from members' perspectives	(1) Structural factors (2) Personal factors	Meaning Material Contextual factors

5.1 Reasons and motives for joining a clean energy community

Case studies in the NEWCOMERS project include different types of clean energy communities, which is evident in the reasons and motives our interviewees gave for joining the community. In general, motives for joining clean energy communities are related to a mix of practical and environmental needs.

We can group the main identified motives into four categories: (1) financial motives (lowering the costs of energy consumption in the household and profiting from investing in a clean energy community), (2) motives related to self-sufficiency (achieving energy independence for their homes), (3) environmental

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motives (contributing to energy turnaround[3]; and contributing to reduction of CO_2 emissions), and (4) motives related to communal living. These motives often appear in combination, but one of the motives was usually prevalent in each interview. The importance of a particular motive might change over time, depending on factors such as the lifecycle of the interviewee's current membership in the energy community.

5.1.1 Financial motives

5.1.1.1 Reducing energy-related costs

One of the most common motives expressed by our participants was financial, i.e. related to saving money on energy consumption in the household. The importance of motive related to reduction of energy-related costs seems to depend on unit price of electricity within countries and economic strength of the household, being more important for those who were very price sensitive and/or came from countries with more expensive electricity. One participant from a price-sensitive group explained, 'We here are a community of blue collar workers; we are not engineers or something… we have limited knowledge about these things. So our decision about joining this project might be 10% related to this [environmental] awareness… but 80% is about finance.'

Reducing energy-related costs is often not related to reduction of energy consumption, but has more to do with improved affordability of the same or even increased use of energy in a household, as is evident from the following example: 'Four years ago, we built a detached house with a granny apartment and wanted to heat the house as cheaply as possible. That's how we got the PV system with the battery storage.'

Some also mentioned the importance of freedom in using electrical appliances like washing machines, or usage of water heaters or air conditioning according to convenience and not the price tariffs set by traditional energy providers.

5.1.1.2 Investment in clean energy

Some participants recognised investment opportunities in clean energy communities. With interests being rather low in banks, investment in clean energy could be seen as an opportunity for earning higher interest rates with invested money, which could in the long term prove to be a good alternative for saving money for either themselves or their offspring. This was explained by one participant: 'Every year you get some interest between two and five percent; you know on the bank account it's zero percent… and after 10 years you get it back. So I thought… this will be a good thing to give to my children. So I bought five solar panels for the oldest one and five solar panels for the youngest one.'

[3] Energy turnaround is related to processes of energy transition, in which dirty energy production systems (contributing to CO2 emissions) would be considerably replaced by clean renewable energy production systems.

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Another type of long-term investment is seen in profiting from new technology, after the amortisation of initial investment costs in electricity generation and storage technology. 'My calculation was that I say my investment has paid for itself after about 10 years, and after that I profit from it'.

5.1.2 Motives related to self-sufficiency and independence

Many participants were addressing the problem of relying on big energy providers and their (often opaque and profit oriented) pricing policy, which could affect the affordability of their lifestyle. Joining the energy community was seen as a step towards energy self-sufficiency, as one of the participants explained. 'Our goal was to make this house as self-sufficient as possible, so that we would be independent from the influences of politics and the energy companies… I like it warm in the living room and bright and I want to be able to afford it permanently.'

5.1.3 Environmental motives

Although environmental motives for joining the clean energy community were to some degree present with all participants, some were particularly concerned about the environment, climate change, and their own environmental footprint. Those discussed environmental motives as their primary motive for joining the clean energy community.

Among these, some stressed the importance of contributing to energy turnaround, and others contributing to a reduction of CO_2 emissions in general.

5.1.3.1 Contributing to energy transition

Some participants saw joining the clean energy community as a matter of intergenerational solidarity. Some even stressed the urgency for energy transition and felt individually responsible for contributing as global citizens. As one of the participants pointed out, 'We have to get there somehow, even if many people at my age have a problem with Greta.[4] You often hear in the discussions: "Why always us? Why should we start?" That's really intense at times. We have already slept through the last 15 to 20 years. But if we do not try it now… and everybody has to contribute to that.'

Many were looking for the potential of modern energy-related technology and surfaces that could be used for clean energy production and dissemination and upscaling

[4] referring to the Swedish environmental activist Greta Thunberg

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of clean energy production models. Some see the search for such potential, like connecting people with empty roofs with people desiring to install solar PV, as one of their crucial motives for joining the community. One participant said it explicitly: 'The main reason I'm in it, and probably the rest of us, is because we can see the potential to develop renewables in the areas that we're setting up the clubs'.

5.1.3.2 Contributing to reduction of CO2 emissions

It should be noted that most of our participants were not ready to reduce their energy consumption and give up the comfort and habits that required energy use in their households. However, they wanted to live up to their standards with as little environmental footprint as possible. The following example is very telling: 'I am certainly very ecologically oriented, but I don't have to sit around with Birkenstock sandals. For me, it is important that I can live bright, warm, and comfortable. That is my premise. That the whole thing is also ecological and runs on the smallest possible footprint is a positive side effect.'

Others made it very clear that care for the environment was their leading motive for joining the clean energy community, and that financial motives were not even slightly important in their decision to join: 'No matter how little energy a single person wastes at home, at least now I have the illusion that I no longer consume fossil fuels… the only thing I didn't think about is saving money… or earning money.'

5.1.4 Motives related to communal living

In some cases, joining the clean energy community was primarily related to choosing a place and communal way of living with members who shared the same worldview and were in particular dedicated to an eco-friendly way of life. In these cases, the issues related to energy production were just one of the elements addressed within the whole mix of elements contributing to sustainable living, and not the primary motive for joining the community. Some were searching for more opportunities for a pristine way of life, with better connections with people in the neighbourhood and chances to engage with 'the land'. As one participant said: 'I did not want to live in [city], I wanted more gardening opportunities. I wanted a social context, which you do not have in the quickly built apartments… there were seven floors with ten apartments on each floor, but I knew the name of my nearest neighbour, the others I had no idea about'.

5.1.5 Deciding factors for joining clean energy communities

Regardless of the motives for joining a clean energy community, there were usually different routes that people took to membership.

In general, we could divide them into (1) those who were actively and independently searching for alternative clean energy providers for their household on the market, (2) those who were approached by providers and were encouraged to join the community, and (3) those who were in the right place at the right time and went along to the clean energy transformation because they were already part of a social unit that was planning to undergo the transformation. These were not active in either starting the energy community or promoting its establishment, but they were also not blocking the

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transformation process and were generally supportive of the idea of the energy community and technological innovations in it.

In all three groups, factors like meeting and/or communicating with the right person (a representative of the clean energy provider or an acquaintance with experience in a clean energy community), reading about positive experiences from other energy communities, and different sources of encouragement (e.g. subsidies, special offers, and personal encouragement) played an important role in making the final step towards becoming a clean energy community member.

5.2 Level of involvement in clean energy communities

Involvement in clean energy communities varied considerably between members. We can think of their involvement on a scale between extremes of passive involvement and active involvement. Active involvement refers to considerate engagement in one or several processes related to running, maintaining, upscaling, and promoting the clean energy community. Higher involvement is very much reflected in collective energy practices within the specific community, whereby energy becomes a matter of concern for the people who are taking part.

The level of members' involvement seemed to be related to their role in the community. Those with the least involvement can be seen as followers. They were part of the community, but just followed the plan of the leaders. They participated only in necessary meetings, read correspondence related to operative issues of the community, and voted on investments in technological improvements. Those with the most active involvement were usually in roles such as clean energy community leader, member of a decision-making board, energy community ambassador, or similar. These members attended meetings, were involved in making plans for further development of the community, planned and decided on technological advancements of the community, searched for new possible members and investments, promoted the community's ideas, recruited new members, and participated in energy-related training.

It should be noted that one of the studied place-based communities was organised in such a way that it rotated the members in the decision-making board. In this way, every member became more involved in the matters of running and maintaining the community, at least for a period of time. In this case, active involvement could not be avoided.

In some cases, certain roles within the communities, like the role of an energy community ambassador, enabled members to get closer to information about technology advancements and community management, which they would otherwise not have access to. Besides this, some see such involvement as a chance to promote the clean energy alternative to new prospective members through sharing their own experiences with switching to clean energy production and thus promoting the energy turnaround.

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'I volunteered to be an ambassador for the company/energy community [name of the company], which means that I am generally enthusiastic about what they do, and on the other hand—because I'm so enthusiastic about it—I'd like to interest and inspire more people for such a technology. [So] if a prospective customer is interested in a battery, he contacts [name of the company], [name of the company] informs me and I contact this prospective customer and tell him about my experiences or the prospective customer comes to me, looks at the battery and decides of his own accord whether he wants to do it or not.'

5.3 Experienced values related to membership in clean energy communities

We identified several evaluative judgments (values) that our participants made about their involvement in the clean energy community. We present them in four groups: (1) cognitive value (perceived value related to new facts, advice, guidance, and information exchanges that enrich knowledge); (2) financial value (perceived value related to cost saving, cost-benefit trade-off of selecting clean energy community over alternative sources); (3) social value (perceived value related to creating ties with others in or through the energy community, with social support, praise, recognition, and social approval); and (4) affective value (perceived feelings arising from involvement in the clean energy community, such as the feel-good factor of acting environmentally consciously).

5.3.1 Cognitive value

Cognitive value refers to perceived value in gaining specific knowledge from diverse stakeholders and in cognitive contribution through learning processes within the community. More detailed information about identified learning processes is presented in Section 5.5. However, it should be noted that the possibility to learn new things related to energy, new technology, and community management, and being able to exchange relevant information with likeminded people (including external experts and community members), has been expressed as a highly regarded value by some participants. 'I think that being part of a group is useful to obtain advantages, to collaborate, even simply to exchange information or obtain opinions.' Seeing an added value in learning from the energy community and in sharing this knowledge further also encouraged some to take the role of energy community ambassador. 'Only as [name of the company/energy community] ambassador you have the possibility to get even more knowledge, also about the new batteries or something like that.'

5.3.2 Financial value

Our participants perceived the financial value of their clean energy community membership on two levels: personal (saving energy-related costs and/or return on investment) and communal (improving the quality of life of a community).

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5.3.2.1 Financial value on a personal level

The most commonly expressed financial value of community membership was related to savings or gains at the household level. With new, clean energy technology instalments (some, for example, installed PVs and batteries in their private homes, some joined the clean energy community that connects households with local wind or solar farms), our participants said they lowered the costs of their monthly energy consumption. Some lowered costs were visible immediately after the clean energy technology instalments, while other parts of the financial value were anticipated for the more distant future, as a return on their investments.

One of the participants was very explicit in mentioning the immediate financial value of joining the energy community and the anticipated financial value related to advancing the investment with the battery. 'From the very first moment we realised that we had a 30% saving on the bill, even if the reimbursement by [name of the company/energy community] is not immediate… with the storage we would be able to be completely autonomous and we will get the total savings'.

In cases where our participants entered the clean energy community with a motive of earning money, perceived financial value was manifested through the interest rates that they had been earning from money invested in the community. These members explained that the interest rates for money invested in the community were much better than for money saved in banks.

5.3.2.2 Financial value on a communal level

The financial value of an energy community was not perceived only at the household level, but in some cases also on the level of a place-based community, since surplus of produced energy in the community could be sold. The income would then be used for improving the infrastructure in the village, and consequently life in the community. As one of the participants explained:

'I think that it is also a very nice movement that, as a village community, you generate electricity in that area and when you have more, that you can then also let money flow back, because that is just an issue in [name of the village] and I think in many rural areas. How can you own your own energy supply and thereby also do something about the quality of life'.

5.3.3 Social value

The perceived social value of being a community member is one of the value types that was not much anticipated in advance; thus, it was not articulated as a motive for joining. However, on the subject of greater involvement in matters related to the community, it was revealed as a highly regarded value, both for place-based and virtual clean energy communities. In one of the studied place-based communities, which highly values community life, social exchange, and shared views on environmental issues, participants even mentioned social value as the most important among all perceived value types.

Across all studied energy communities, social value was perceived on various levels, and it seemed to be dependent on the type of community and the role of the participant within the community. The most commonly perceived social value was related to connecting with like-minded people and/or being

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part of a community, which is also related to affective values, like belonging and safety. As one respondent stressed: 'I think we all need to belong… with the people who are purely and honestly involved I feel at home, that gives me safety.'

In place-based energy communities, members created stronger personal ties with each other, learned to work together, and actually felt the power of a collective in achieving common goals, which is one of the indicators of collective empowerment. Some participants were very explicit in pointing out that people need to come together in order to achieve visible changes in energy transition. If everyone joins in, the energy revolution is achievable: 'There are also people who try to do everything by themselves. But I think a community, where you can exchange ideas and opinions, is a great contribution.'

An important dimension of perceived social value is related also to complementarity of knowledge and skills (and material objects) that different community members possess, so that there is no need for individuals to know and do everything by themselves. Everyone can do what they are best at or the most interested in by enrolling in one or more interest/working groups that are responsible for particular dimensions of community life. As one of the participants said, 'I think this is the home of the future. I think what you do, you do for everyone. I think it's good because you do not have to know everything yourself, you do not have to own everything yourself. It is based on joint ownership, as well as having common equipment for lawn mowers, wheelbarrows, all that we own together so you do not have to have it yourself.'

In taking on a more visible role within the energy community, some received social recognition and approval, especially when they had a more visible role in the dissemination of knowledge, which we will discuss in more detail in Section 5.5.3. of this report.

5.3.4 Affective value

Affective value intersects with other values, but we are discussing it in a separate section, because it indicates how people feel about their involvement in clean energy communities, about others, and about themselves. Participants across all studied energy communities were quite explicit and unified about at least one form of affective value, namely the 'feel good' factor; feeling good about themselves for being 'agents' and part of the future from the technological and environmental point of view. They felt they were being environmentally responsible for reducing their CO2 footprint and consequently showing intergenerational solidarity. Also, by joining the energy community, they felt that they were not only following the technological developments (and thus reducing the feeling of being left behind), but were actively part of technological innovations, which gave them the feeling of being on top of new developments. Thus, affective value can be strongly related to several dimensions of individual (psychological) empowerment, but also to collective empowerment.

We could easily claim that our participants gained a greater sense of agency after joining the energy community and felt they were trendsetters in addressing pressing matters related to climate change. This is evident in the following example: 'I'm proud that I can be a part and that it works and I have confidence that it will continue to work. They—individuals or communities such as (name of a

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company) or even governments—all play their parts… communities like [name of an energy community] are already a driving force.'

5.4 Attitudes, beliefs and understanding with regard to the role of clean energy community in addressing environmental issues

Participants' beliefs regarding clean energy systems revealed their perception about renewable energy and their wide-ranging points of view about how to address climate change (Section 5.4.1). Identified participants' attitudes towards clean energy (Section 5.4.2). Were both positive and negative. The analysis made it obvious that clean energy systems represented just one piece of the 'sustainability mosaic' for several participants. They declared that energy issues were important but represented just one part of their everyday effort (sustainable lifestyle—Section 5.4.2.3) to contribute to a more sustainable environment.

In the analysis, we aimed to determine participants' views about the 'responsibility roles' for transition to a more sustainable society (Section 5.4.3): namely, their opinions about who should make a change for society to become more environmentally sustainable. Participants' views varied a lot, which made it difficult to establish a clear, prevalent answer. However, the most salient argument was that a real step towards a comprehensive clean energy change demands a strong collaboration between various actors on the macro, mezzo, and micro levels. Governments, businesses, NGOs, and individuals (as consumers and citizens) should work together in a synergetic and collaborative way to be successful in addressing the complex problem of climate change.

5.4.1 Beliefs related to clean energy systems and climate change / environmental issues

In general, the participants were well informed about climate change topics and well aware that it is essential to abandon fossil fuels because of global pollution. Most participants believed that we had to reduce our environmental footprint, which is currently unsustainable and has a great negative impact on life on our planet. However, according to some participants, the awareness of the seriousness of climate change and its immediate and future effects are still not widespread enough among people in current society.

The participants were generally sensitive towards clean energy issues. For several participants, the energy transition was seen as indispensable for environmental reasons ('It's the Earth's heating up'), especially correlated to the harmfulness of fossil fuels ('To should get rid of fossil fuels through a number of alternatives: hydrogen, hydropower, sun, wind, nuclear'). Some participants believed that clean energy systems could also be seen as an investment opportunity.

From the interviews, it was possible to denote that participants believed that clean energy systems should be one of the main focuses in dealing with climate change. One member said that opting for clean energy was not a matter of preference or a transitional arrangement, but an unavoidable choice that we had to make sooner rather than later.

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5.4.2 Attitudes toward clean energy

As expected, a great majority of participants had a **positive attitude** towards renewable energy systems and clean energy transition in general. Some participants pointed out that clean energy communities represented the future of energy, and it was not possible to imagine a sustainable environment without them, as seen in the statement 'I think in the long run we cannot avoid working and living with clean energy'. Some participants were very explicit in pointing to the need for upscaling and expanding communities to achieve a higher level of self-sufficiency.

Although the majority of participants perceived clean energy transformation as a positive and necessary process, some members still had a few **concerns**. These concerns could be grouped into three categories:

(1) The complexity of recycling of renewable installation materials ('the solar panels and wind turbines cannot be recycled and will become the next problematic waste product'; 'materials will become the new asbestos');

(2) Geothermal controversy and potential earthquakes ('I am sceptical about geothermal technologies and the required drilling due to bad experiences with earthquakes.');

(3) Non-optimal return on investment for renewables ('I think everyone should have solar panels but personally think a 10-year return on investment is too long'; 'the costs are exorbitant and not worth it').

Members of one studied place-based clean energy community were very environmentally sensible and concerned for the environment in general, and clean energy issues represented just one focal point of their active sustainable lifestyles. In this community, the members' eco-conscious lifestyles were expressed and manifested in various ways; for example, by eco-gardening, using electric/hybrid cars or not possessing any car, being active in the local sharing economy within the community, shopping and acting locally, vegetarianism and having a resource-saving lifestyle, having a positive attitude towards life, nature, and animals, and embracing an active environmental protection attitude.

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5.4.3 Roles and responsibilities for clean energy transition

The participants' views on which stakeholders should be carrying the main responsibilities for the clean energy transition were divided. Some participants declared that the responsibility was on individuals; some members believed that the 'sustainable energy revolution' should be led by the government; and others thought that individuals and state institutions (government, municipalities, regional authorities) should synergically work together to achieve the sustainability transformation.

(1) Individuals. Some participants thought that every individual had their own responsibility and must pay attention to their 'environmental footprint'. Individuals should rethink their own lifestyles according to where they can save the most energy. They believed that decisions should not come top-down, and energy initiatives could grow organically like grass-root movements. They pointed out that everyone was equally responsible for acting within their capabilities.

(2) Government. According to several participants, the government carried (all) the decision power and capabilities and should therefore be in charge of the renewable energy transition. They suggested that, in general, 'the state and municipalities should be more supportive of clean energy projects'.

(3) Shared responsibility. A considerable share of participants believed that it was possible to achieve the clean energy transition (only) with the joint effort of government and individuals. 'So I think most importantly we have to act together with the government'; 'a combination is needed'; 'It is everyone's responsibility and the governments need to listen to the individuals'. The 'shared responsibility'—the 'jointness' of all the stakeholders—was really important. One participant pointed out that it was necessary to exercise pressure from 'below' to create change and then the government needed to listen: 'What is therefore needed is a commitment from below and responsive politicians.'

5.5 Knowledge, skills and learning processes in clean energy communities

Our analysis revealed several elements related to skills and knowledge that our participants either brought to or developed within their clean energy community. The information flow within the clean energy community was identified as one of the crucial empowerment processes for community members, and it influenced their smooth functioning. Besides identifying the information flow within the community, it was also important to know how information flowed outside, to the interested members of the public. An adequate dissemination of information about the energy community benefits is necessary in order to 'scale-up' clean energy communities and utilise decentralised clean energy systems.

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We will present the main findings in this section in three groups:

(1) Learned skills (participants' skills and educational background before joining the energy community; specific technical and non-technical skills that have been developed within the clean energy community; and interlacement between previous energy and non-energy related skills with the newly acquired skills);

(2) Learned knowledge (newly developed technical and technological knowledge about renewable energy systems; development of other specific knowledge typologies: business knowledge, legal knowledge and knowledge about human behaviour);

(3) Learning processes and diffusion of knowledge (how the clean energy community members access information and how they gain and share their knowledge; 'diffusion of knowledge' from the clean energy communities to general society and prospective new members).

5.5.1 Learned skills

5.5.1.1 Previous skills

Our participants had very different educational backgrounds and employment histories, including a journalist, programmer, statistician, factory worker, environmental science specialist, PhD student, retiree, graphic designer, energy cooperatives consultant, nurse, technical writer, therapeutic community worker, housewife, cultural worker, support teacher, technical assistant, electronic engineer, accountant, mathematician, and biologist. Some were convinced that one could join a clean energy community without knowing anything about energy-related issues. However, as discussed in the section about reasons and motives for joining, many (but not all) of our participants had at least some knowledge about energy issues prior to joining the community. Specific cases were, of course, those members who were also the initiators and/or leaders of clean energy communities that were very knowledgeable and skilled with regard to clean energy technologies before joining or setting up the community. We discuss those in Deliverable 4.3.

The community members were heterogeneous in their previous knowledge and skills. This heterogeneity was in some cases perceived as an added value for the energy community, because members' varied expertise meant they could creatively contribute to addressing different issues. Thus, several participants' skills, even if not directly connected to energy, were recognised as important for the fluid daily functioning of the community. One example mentioned by an participant was 'A graphic designer contributed to the visual communications needed for the community.'

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Even if participants' core skills were not directly connected to the energy sector, several participants had a very positive inclination towards sustainability and renewable energy issues. One of the participants explicitly mentioned, 'I am actually an accountant by profession, but I have always had a soft spot for renewable energies and sustainable building.'

In each studied energy community, there was at least one community member who, before joining, had 'advanced energy related skills'. Such members (presented in Deliverable 4.3.) were usually specialists in renewable energy and/or sustainability issues, and sometimes acted as community representatives. In each studied community, the 'energy expert(s)' were often also 'the person in charge' (and/or a local networking agent) and had a considerable impact on all aspects of the community, especially regarding skills and knowledge learning processes. previous knowledge and skills.

5.5.1.2 Acquiring specific technical and non-technical skills

The participants within energy communities acquired numerous and varied skills. First, they developed several purely technical skills, such as managing solar panels, controlling the functioning and effectiveness of renewable energy installation, managing internet portals and specific energy-related apps, controlling and managing energy consumption, and using batteries. After joining the energy community, the participants assessed themselves as being more capable of identifying technical problems and using and maintaining specific technological appliances.

Second, participants also learned several non-technical skills. One such skill was the ability to comfortably communicate about energy issues and even explain specific technological knowledge to existing or prospective community members. This skill was seen as enforcing community cooperation. Another identified non-technical skill was related to networking ability, which was important in contributing to 'promoting local-scale/grassroots action towards a sustainable future'.

5.5.2 Learned knowledge

5.5.2.1 The specifics of previous knowledge

Before joining the clean energy community, the participants differed greatly in knowledge about energy communities or energy issues in general. This was possible because communities had been generally established in such a way that they were accessible to different people, with very different initial levels of knowledge.

Several of our participants had at least some basic knowledge about renewable energy. Some of them had experience with renovating a house in an environmentally friendly way, a few had already had some experience with photovoltaic systems and energy efficiency adaptations, and others had always been eco-conscious. One participant said: 'I knew a lot about the energy transition and wider environmental problems'. Some participants were already very active in energy areas before the establishment of their communities, or had advanced knowledge about the construction of photovoltaic panels, as one participant pointed out: 'In 1979 I already organised the first solar energy exhibition'.

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5.5.2.2 Learned knowledge within the clean energy communities

Most of the participants confirmed that within clean energy communities they gained specific technical and technological knowledge about energy systems and renewable energy installations such as photovoltaic systems, heat pumps, and new batteries. One participant explained, 'I learned to exploit the energy produced by photovoltaic panels, and to take care of the maintenance and management of the photovoltaic system'.

Apart from technical knowledge, which was the most highlighted form of learned knowledge, the participants had also acquired specific 'business and legal knowledge'. They learned how to make a business case, estimate the costs, make agreements, get controlling permits from the municipalities, etc. Certain participants also explained that they learned more about public subsidies ('learned how to manage a subsidies scheme'), energy tax regulation systems (e.g. tax break schemes) and the regulations to establish an energy community ('learned how to set up and run a community energy initiative').

In addition, it was possible to denote that participants had gained specific knowledge about human behaviour, especially related to the local territory and geographical and cultural specifics. One participant declared that after joining the energy community, it was possible to better understand how the local municipality's decision making functioned on a daily basis. A few members also learned about how to enhance clean energy at the local scale. Related to this, one participant declared that they internalised the notion of collective empowerment, stating that 'collective action does lead to results'. Hence, a community empowering process was explicitly recognised in the ways that energy community members learned to connect and unify among themselves to achieve a common goal, like creating a solar PV installation.

5.5.3 Learning process and diffusion of knowledge

5.5.3.1 Learning process

The energy community may impersonate real 'knowledge banks', and it is interesting to explore the processes and methods of how the information is shared within the community and diffused to the 'outside'. Most participants claimed that they had learned specific knowledge through everyday practice (learning by doing). Other methods were set in place that accelerated the learning process. We identified seven methods of sharing knowledge between community members (Figure 7).

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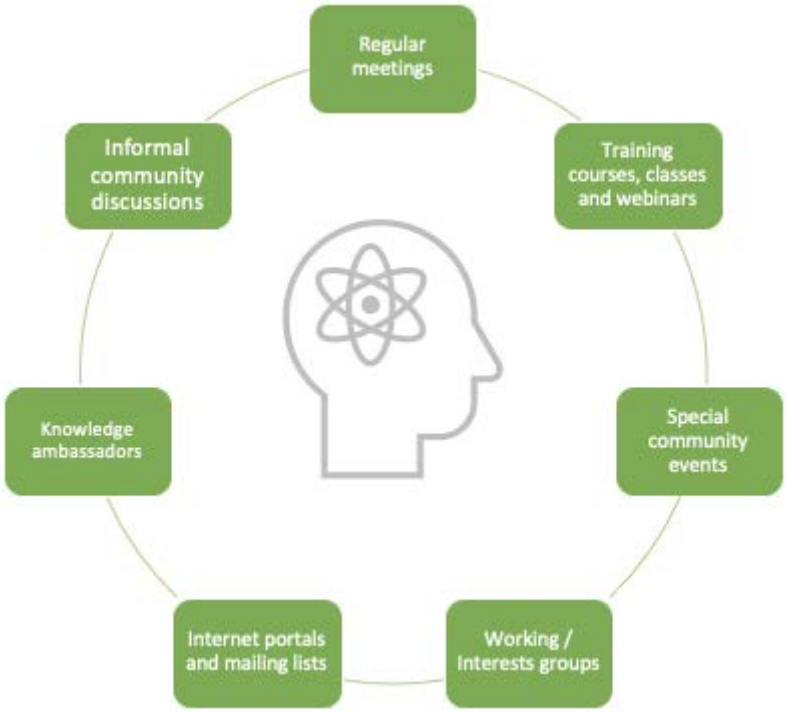

Figure 7: The knowledge bank of new clean energy communities

(1) Regular meetings

Several participants thought that meetings were indispensable because they facilitated access to information and were a way to gain knowledge about the project, costs, technical features, and future developments, as one participant pointed out: 'At the meeting it is also possible to present ideas about future investments or new projects'. Some were very specific about the importance of attending 'face-to-face' community meetings. 'We've found that has just not been possible with kind of newsletters and stuff. They're supportive, they can pique an interest, but you have got to explain it face to face.'

(2) Training courses, classes and webinars

Some participants found training courses very useful. In some cases, these courses were performed in special official or improvised 'energy centres'. Some energy communities also introduced online webinars, where community members could learn about specific energy solutions.

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(3) Special events

Some energy communities organised special, non-regular events, usually to discuss extraordinary topics like new investments, or teach special technical aspects such as maintenance of photovoltaic (PV) systems. These special events were conducted in different forms, like breakfast events, community events, annual events, occasional demonstrations, and advice sessions.

(4) Working/interest groups

In some energy communities, important learning and knowledge sharing activities were manifested through interest and/or working groups. These groups took responsibility for managing different areas of energy community operations, and the residents could choose which of these groups they wished to participate in.

(5) Internet portals and mailing lists

In some energy communities, the official community webpage served as an advisory portal with energy saving hints and tips. The mailing list usually represented the basic tool to inform community members about new practices, technical novelties, and meeting schedules.

(6) Knowledge ambassador / supervisor / main interlocutor / community leader / promoter

In all the communities, there was at least one member who excelled in their knowledge about energy issues and represented a real point of reference for all aspects of the community (sometimes also legal, organisational, managemental, etc.). Several participants pointed out that the community leader, or in some cases the energy community ambassadors, were their main source of information.

(7) Informal community discussions

In local-based clean energy communities, the community members live in the vicinity and are able to meet in person casually, on various (unarranged) occasions. Several participants from such communities expressed that through everyday informal community discussions, it is possible to spontaneously learn from each other and to rethink various energy issues from another perspective.

5.5.3.2 Diffusion of knowledge

Making knowledge that was created and accumulated within clean energy communities accessible to the outside world, including interested public and prospective new members, was very important for the energy turnaround. We identified several ways in which this information was shared in the larger community. Several participants already shared the information, stories, experiences, and best practices with other individuals and groups outside their energy communities. Some are doing this informally, others more formally as ambassadors.

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The most common way for them to share their experience and knowledge was within their close social circles. 'I pass on information or my opinion, what I see as a big advantage.' Several participants declared that they promoted the cause and the community in informal settings such as parties, and to friends and family. Some participants shared their knowledge and promoted the clean energy community to neighbours and within the local area where they lived. For example, one participant worked in the local community centre and had the opportunity to promote the work of the energy community there.

In a few communities, a formal role of 'promoter' had been established. These promoters officially publicised and presented the benefits of clean energy communities. Another method of knowledge diffusion was through social media and the internet, such as creating videos about energy communities and sharing them on YouTube.

Our analysis shows that dissemination of knowledge and information about the benefits of membership in the clean energy community had clear potential for improvement and was worth exploring further. Until now, the information flow about clean energy community issues had been rather limited to relatively closed members' social circles.

5.6 Everyday practices and attitude change in clean energy communities

How participants behaved with regard to energy production and/or consumption seemed to be closely linked to how they felt about that behaviour (affective level) and how they thought about it (cognitive level); namely, how they nested their behaviours in their pre-existing knowledge about energy and climate change, how concordant they were with their worldviews, and those views corresponded with their way of life. While presenting everyday energy-related practices on three separate levels, we should always consider behaviours and cognitive and affective responses to them as constantly interacting, adapting, and changing between participants and also within the narrative of one single participant.

5.6.1 Cognitive aspects

Apart from acquired skills and knowledge (discussed in 5.5.1 and 5.5.2), which are crucial cognitive components of behavioural change, there are other more subtle and perhaps less eloquent aspects that should be mentioned.

In general, participants noted that they were more aware of energy issues compared to the period before joining the community. Most participants had a positive attitude about new renewable features that had been discovered within their community, such as using solar thermal collectors or solar cells, or owning shares in a wind power plant. In addition, they also recognised the need to have the smallest environmental footprint possible ('to be more eco-conscious'). Some participants comprehended that the 'renewable energy switch' could also bring tangible cost savings and profits.

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Several participants had internalised the power of collective cooperation in achieving energy turnaround and felt they had improved in group dynamics, which could result in improved quality of daily life. Often, renewable energy-related technologies and community dynamism were expressed and perceived jointly with each other.

Some of our participants perceived the energy community both as an opportunity and a challenge, because they had to deal with new technologies and thus were constantly learning new things, and also because they needed to learn to work and negotiate with other members of the community on matters of the shared project (sharing energy, spaces, activities, negotiating further investment, etc.).

5.6.2 Affective aspects

In general, our participants had positive attitudes towards their clean energy community and related processes. (e.g. 'nice feeling that I'm helping something also'). Some participants mentioned feeling good when contributing to environmental causes through membership in the community. Some felt relief that they were able to contribute to reducing carbon fossil emissions while keeping the same habits with regard to their energy consumption.

"Nice feeling that I'm helping something also; "it's very nice.

I think that is fantastic, and it inspires me."

"so positive, it is that you are part of a social community"

"being able to meet like-minded people",

"we are well connected, whatever happens")

The pleasant community feeling represents one of the most important affective components of practices related to membership in the clean energy community. The strong sense of community is mentioned as an important factor for the well-being of members (e.g. 'So positive it is that you are part of a social community').

"You don't need to own everything yourself, you can s hare it among the residents."

Several participants reported experiencing good feelings after joining the community, stimulated by the sense of community and social exchange between members. This affective response was especially accentuated within the local place-based communities. An important aspect of the community feeling was also highlighted with regard to 'sharing culture', which was also more common in place-based energy communities. One participant pointed out: 'You don't need to own everything yourself; you can share it among the residents'.

The experience of community feeling seemed to be conditioned by the type of clean energy community. Not every participant experienced the 'community feeling' after joining. Especially for those from the virtual energy communities, the community was perceived more as a rational alliance between like-minded people for achieving social change, which was also economically stimulating for all involved parties. This is evident from the

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following example: 'Well, I can't imagine that such a community works together like a family or a circle of friends. This is a rational alliance, and I think you can't expect more.'

5.6.3 Behavioural aspects

5.6.3.1 Changes in practices and everyday behaviour

Most of the participants said that after joining the energy community, they noticed themselves gradually changing practices in their daily lives. Some changes were explicitly related to membership in the community and collective energy practices, like the use of new technologies, while others indicated habits and activities related to transport, travelling, waste disposal, and consumption in general. Usage of specific energy-related technical appliances changed substantially for most participants, because they had not engaged with those technologies before joining.

After joining the community, many reported changing practices in other areas and increased their pro-environmental orientation in general. For example, some recycled more and reduced their driving ('we now take a walk or a bike to go to work'). Some participants noted major changes in their daily household practices in order to save energy and monitor energy use, such as installing triple glass windows and LED lighting. One participant was explicit about the importance of acting pro-environmentally on various levels: 'It is not only the focus on solar power installations or owning wind power shares but acting individually too. I installed a heat pump, and I think that it is important to shop locally or be self-sufficient with gardening.'

Practices were also influenced by affective aspects of community identity. Being a community member encouraged our participants (mostly from place-based energy communities) to 'act as a community' and be there for each other. Participants reported supporting each other in various everyday activities, and also in more specific technical tasks and challenging legal matters. For example, one participant reported having full support of their clean energy community when they initiated a legal battle with the housing corporation in order to disconnect from the natural gas system.

Some participants declared that they had changed their practices to maximise energy efficiency and/or cost savings, which influenced their everyday lifestyle. Before installing solar panels, some participants had used household appliances in the evenings, but moved to daytime consumption to take advantage of solar power. They made use of the ability to programme devices, as shown in this example: 'We have changed the timetables, for example, to do laundry, we used to do it in the evening because it was more convenient'.

Controversially, some participants declared that after joining the community, they became more relaxed in their energy use and stopped adopting cost reduction-driven practices. 'You can more easily lead a normal daily life, do things naturally. Daily management has completely changed. I feel free to actually use the things we need most… I have the dishwasher on and I put it on several times… I'm

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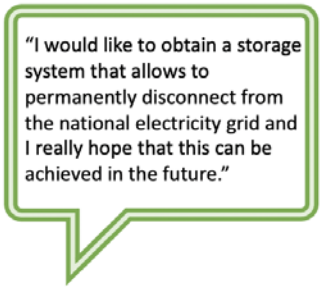
using a lot because working from home with the computer always on, I also take full advantage of the system and the costs have not increased.'

For several participants, it was important that joining the energy community has actually allowed them to maintain their daily routines intact and to live their lives according to their established standards and habits: 'My behaviour hasn't changed much since I joined the community'; 'My everyday routine has not changed.'

5.6.3.2 Future plan for changes due to clean energy community membership

Being a member of a clean energy community may in some ways affect how people think and plan for the future. Most participants mentioned that they had an intention to buy an electric car, as stated in this example: 'So e-car yes, that's relatively evident, because it's simply the most energy-efficient way to move around'. One participant also mentioned that they were willing to initiate and organise an e-car pool or car sharing group.

Several participants had been stimulated by the clean energy community atmosphere, a modus-operandi, and they developed very clear and concrete future plans to improve their households in a sustainable way (instalments of storage batteries, PV solar panels, heat pumps, etc.) 'I would like to obtain a storage system that allows permanently disconnecting from the national electricity grid, and I really hope that this can be achieved in the future.'.



5.7 Trust

Trust among community members and with respect to direct stakeholders such as energy providers and network operators largely affects community cooperation and can affect the functioning of clean energy systems in general. We structured identified issues with regard to perceived trust related to clean energy communities along three dimensions: (1) competence-based trust (how community members perceived trust regarding the knowledge and expertise of community leaders and main energy providers / network operators) (2) Integrity-based trust (if and how community members perceived 'honesty and openness' within the clean energy community); and (3) community-based trust (issues related to fair distribution of participation and involvement among the community members).

5.7.1 Competence-based trust

5.7.1.1 Trust in community leaders' knowledge and competencies

A great majority of the participants had trust in their clean energy community leaders, who in many cases were also the founders of the communities concerned. Members often highlighted that they were confident in the expertise of the leaders. Several participants mentioned that community leaders were capable of running the community and pushing it forward. Reasons cited included competence, skills, and ethical behaviour.

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5.7.1.2 Trust in energy providers' / network operators' knowledge and competencies

In general, participants were quite satisfied and trusted energy providers' knowledge and expertise. One participant expressed significant levels of trust in the energy provider's competencies, and in particular, in the capabilities of its core practitioners, who were able to develop the community model and work through technical complications.

In some locally based clean energy communities, participants knew the energy providers before the installations were set up and had already trusted the expertise and experience of these practitioners, who had long-standing reputations. In some cases, the participants had not known the energy providers beforehand, but after the renewable energy installations, they established a trusting relationship and reinforced it over the years. This trust with the energy provider also contributed to the process of building community trust between members because of the everyday mutual cooperation, sharing of information, and collaborative engagement between all stakeholders involved (complemented linking processes between community members and energy providers). Interestingly, in one particular clean energy community, the energy provider gained the members' trust by promising a sort of satisfaction guarantee when switching energy operators, offering to underwrite any financial loss the consumers might experience by switching providers.

5.7.2 Integrity-based trust

We noted a high level of integrity-based trust within the clean energy community. Members perceived honesty and openness as essential components of the community. One participant highlighted that honesty represented one of the main common values integrated within the community. 'First of all, honesty and respect. By being honest, we move forward.'

5.7.3 Community-based trust

Participants talked about reliability and trust between community members. Members were content with how things were organised and working out in practice. There were no complaints about other members for not fulfiling their tasks. For some participants, the clean energy community represented a big family.

Some participants mentioned that participation and involvement were equally distributed within the community. For example, one participant observed that a fair division of roles (e.g. regarding the maintenance and monitoring of the photovoltaic system) was established between members.

However, it was noted that the perception of 'community-based trust' was more frequent in place-based energy communities. Members of virtual clean energy communities had not considered the established energy community as a 'true community'; therefore, subjects of fairness and good behaviour of members did not represent an issue for them.

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5.8 Factors influencing dissemination of clean energy communities from members' perspectives

We identified several factors that our participants talked about when they were thinking about their own process of joining the clean energy community and possibilities for upscaling the community models in current society. They could be grouped into two major categories, with regard to the level on which they appear (macro, mezzo, micro) and with regard to how much influence participants feel like they have on those factors. (1) structural factors, such as obstacles and encouraging factors in relation to the system, like legislation, politics, and culture; and (2) personal factors, such as obstacles and encouragements people find in relation to themselves or other people, like financial burdens for household, high/lower costs and financial stimulus for instalment, time required for cognitive/physical work, knowledge or lack thereof, and support or lack thereof from household members. In this section, we highlight the main issues that, when properly addressed, can stimulate the dissemination of clean energy communities.

5.8.1 Structural factors

5.8.1.1 Digital gap

A few clean energy communities ran their business online only. One participant explained that transferring clean energy community businesses online can be very convenient for some, but not all households could join such community models. '[name of the company] are an entirely online energy supplier, so all the billing is online. And there is a contact phone number, but … it was a barrier for a couple of customers, because basically, they want their printed bills… and they were unable to go online, because they didn't have internet at home. They were unable to go online to even look at [name of the company] or to sign up to switch, or indeed to join the [name of the energy community].'

5.8.1.2 Media coverage of clean energy communities

Several participants mentioned the role of the media in popularising the idea of clean energy communities. The media could have an encouraging role for those already involved in communities, and some mentioned the importance of being presented in the media as a good example and trendsetters in caring for the environment. Positive publicity for clean energy communities seemed to influence participants' perceived social and affective value of their community membership. Some also mentioned that the media could help to build an agenda by publicising the importance of energy turnaround for addressing climate change. This would not only put the clean energy issue on the public agenda, but also put pressure on governments to become more committed to transforming energy systems in a sustainable direction. However, the role of the media was not only seen as an inhibiting factor for spreading and accepting new clean energy technologies. Media coverage can become a problem, especially when they spread misinformation, as one of the participants stated. 'There just

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seems to have been such a concerted attempt in the media to turn people away from having a smart metre… We've had a huge amount of queries about smart metres, just because of what people have read in the press. And we seem to be constantly fighting misinformation about them.'

5.8.1.3 Prevalent type of housing in a country

Some interviewees were sceptical with regard to upscaling the concept of clean energy communities around Europe because of the structure of property (housing) ownership. Some countries had more renters than homeowners. The housing market was not arranged in a way that would encourage investments in clean energy for renters and landlords. Several participants from different communities (but not all) referred to this issue. One example addressing this concern is very telling: 'If I now take up the topic of renters' fluctuation, for example, that doesn't go with the community model, it doesn't go with the implementation of individual rental buildings, it is complicated and someone who has read in once, will say "No, I stay away from that. That is ecologically sensible, but in the end I get caught in the nettles, I don't have the time and the return I get for that is far too low."' Another participant explained, 'When it comes to renting, you can say yes, I rent an apartment or a house where I have an energy certificate with an A or A+. However, if I go to the urban centres now, there is of course not only the question of the energy standard of the house, but whether I find affordable living space. As long as a landlord can still get such apartments on energy levels D, E, F, and G well rented out without investing, then he will do that because he has no need to, because the tenant pays the additional costs. On the other hand, I can't say, dear landlord, that you have to invest tens of thousands of Euros if it doesn't work out well in terms of form or if it simply doesn't pay off from a tax point of view.'

5.8.1.4 Political support

It was obvious from all studied energy communities that many interviewees wanted more straightforward political support of clean energy communities from their (local) governments. In some cases, the lack of political support had been observed in vague political determination regarding preference for alternative energy systems in the country. Some pointed to divergent treatment of different renewable energy solutions by the government, especially when it came to deciding between solar energy, wind power, or biogas.

This is illustrated in the following example: 'For communities like [name of the company], the tax hurdles are very high in the beginning… because suddenly you are a commercial enterprise. The farmers here who run biogas have relatively few obstacles… Biogas is biogas on paper, but there are a lot of corn farmers in our area who produce the corn, not for eating, but so that it can be thrown as waste into the biogas plant to produce even more electricity. And there are a lot of tractors driving and producing CO2… and that has nothing to do with organic. But that is supported by the politicians. More powerful than PV modules or wind power.'

Some were also critical about the government's apparent unwillingness to fully commit to renewable energy due to previous financial investments in big 'dirty' energy systems. It would cost too much to abandon a source of energy in which the governments across Europe have invested for years, a source

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that often sustains local administrations. As one of the participants pointed out: 'When I look at the open-cast mine between [names of places], what kind of forests and villages were flattened to make electricity with a lot of dirt and CO2… It's been known for decades, but if the government has enough shares in the energy suppliers and then always gets big dividends to keep the municipal budget running, then the motivation to hurt them is relatively low.'

Another observed lack of political support was detected in relation to various administrative and legal hurdles for clean energy communities that were not easy to overcome. In some cases, the legislation about housing, energy systems, and energy providers was outdated and unfit for new circumstances, which also made it difficult for authorities, who tended to avoid taking responsibility for the commissioning of any type of permit. This often resulted in 'finger pointing exercises'.

5.8.1.5 Culture

Several participants were rather critical about the consumption-oriented culture of society, which encourages short-sighted mindsets that are driven by personal needs and desires without considering the impact on a wider society and the environment in general. For the majority, reliance on fossil fuels was seen as more convenient, as one example shows: 'If I enter any internet forum—no matter which one—when it comes to renewable energies, people fight to death, because some people say that battery storage is not worth it, it's the same with cars, then you have to charge it every 100km in winter and stand there for an hour at the charging station.'

Some saw that well-known individuals could lead by the example, and consequently improve the potential reach of the clean energy community appeal.

5.8.2 Personal factors

Personal factors that were perceived as obstacles to involvement in clean energy communities differed greatly between our participants. It seemed to be closely related to their role within the community, their level of financial investment in the new technology, and their level of involvement in the community.

5.8.2.1 Time and effort

Those participants who had been more involved in setting up or promoting the energy community reported different obstacles than those who were less involved. Time and effort that needed to be invested in becoming a member was one of the frequently mentioned obstacles for greater involvement.

5.8.2.2 Financial costs

Most participants agreed that the financial burdens, especially the initial costs in the new technology, could be an important barrier for households to join a clean energy community, since not all can afford

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it without sufficient subventions. It is an investment that in most cases shows return only in the long run.

5.8.2.3 Lack of knowledge

Some participants pointed to a lack of knowledge or information with regard to the organisation of energy communities, specific technologies, legal systems, financial support (subventions, taxes) and related issues in the general population. Lacking knowledge and information was perceived as an important obstacle for people even to start thinking about alternative models of energy production and energy supply. In one of the previous sections, we discussed in more detail the knowledge, skills, and learning processes that presented barriers or encouragement for upscaling clean energy systems.

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6 DISCUSSION

In relation to energy community-related behaviour, our analysis showed that members engaged in a plethora of energy-related practices that were in part conditioned by their energy community membership. The practices varied from everyday chores related to energy consumption—which also included the cognitive aspects and possible changes to routines—to practices that were strongly related to being part of an energy collective. Here, practices were also manifested through the levels of members' community involvement, such as being part of the discussions about energy, attending meetings, reaching decisions about investments, etc. Practices related to the energy collective seemed to be particularly important for **increasing the visibility of clean energy in general and clean energy communities in particular.** It was through these practices that clean energy was problematised, discussed, and evaluated, which in turn could influence the shape of everyday household routines and practices (e.g. Verkade & Hoffken, 2017).

Our analysis allowed us to extract the **'knowledge bank'** that presents a core around which the knowledge inside studied communities was being built. We were also able to identify several methods for the spillovers or diffusion of knowledge outside of the communities. Among the ways that appeared promising were establishing community promoters and using social media. Room for improvement was noted in this area, namely paying greater attention to the learning processes inside the communities and between them.

The clean energy communities often represented a **'catalyst for innovation'** for energy-related and environmental activities in general. Our analysis revealed that involvement in clean energy communities activated and stimulated the **'meaning' and 'competence' elements of the social practice triad.** Community members became more aware of environmental issues and more knowledgeable and skilful in rethinking, re-evaluating, and changing their everyday practices with regard to their energy consumption and environmental footprint. The data suggest that the **spread of clean energy communities across society could be contributing not only to gradual transformation to clean energy systems but also to the increase of environmental consciousness in general across Europe.**

Clean energy communities could in the immediate future represent an important player in the energy sector and contribute to an inevitable sustainability switch. Our analysis revealed that apart from the obvious renewable energy-related benefits of clean energy communities (e.g. production of clean renewable energy, reducing CO2 emissions, and reducing the environmental footprint), members valued their involvement in these communities and clean energy in general for various other reasons, for themselves, for the community and wider society, and for present and future generations.

The **benefits of clean energy communities** are wide-ranging and reach beyond environmental and financial considerations. The benefits should be understood from the perspectives of members: how they see and **value** them. This is because involvement in a new clean energy community is unavoidably related to **evaluative judgements of such involvement** and is affected by preferences related to

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other practices. Our analysis made it clear that while the most common motives for joining the clean energy communities were related to environmental concern and saving money, one of the most important aspects of **perceived value of membership in the clean energy community** was related to social benefits, such as the communal way of living, social recognition and social approval, connecting and acting with like-minded people, being part of a community, and building up the community identity. Also highly valued were political aspects, such as achieving self-sufficiency and independence, and participation in decision-making processes at personal and community levels, and aspects of personal development, such as acquiring specific skills and knowledge, and pro-environmental behaviour. All these specific elements represented **high value for current members and could be communicated to prospective members** who cherish the less tangible types of value related to community membership. We should point out that some types of social value also seemed closely related to the network perspective, whereby the value is manifested through the **co-creation** of collective energy practices. These practices bring about the emergence of collective knowledge about clean energy and also represent a sort of platform for enactment of members' friendships with the potential to bring community members even more closely together and enhance the well-being of communities.

We should stress that our inductive analysis led us to identify several issues related to empowerment processes and outcomes with regard to energy systems. It seemed that the studied energy communities were designed in such a way that enabled empowerment processes that could lead to greater feelings of personal empowerment for members. Several of our participants underwent a sort of personal transformation, from rather passive energy consumers to active agents that could, through collective engagement, influence the shape of energy systems, not only in their households, but also in their region.

One of the main identified opportunities for the NEWCOMERS project represents the **diffusion of the accumulated knowledge** that was developed across the studied clean energy communities. Knowledge and skills, a crucial dimension within the energy practices, seemed to be at the forefront as one of the important sources for empowerment processes of community members, as well as the basis for the smooth operation of new clean energy communities. From the policy and behavioural change perspective, it is relevant to note that many average households do not necessarily possess ready-made energy-related knowledge or skills, nor elements of the 'meaning' structure of the social practices triad (Verkade & Höffken, 2017). Nevertheless, our results show that to a certain degree, some of our participants were quite knowledgeable or at least had some basic knowledge of clean energy, and were also interested in energy-related issues. Above all, many of them confirmed that since joining the community, they had acquired specific technical and technological knowledge, as well as knowledge about human behaviour and relational skills. Furthermore, as noted by Higginson et al. (2013), the effect that practice and behaviour had via sharing skills and knowledge can be powerful—it normalises the positive changes that develop in a community and puts forward the actions and practices that need to be modified to achieve change towards energy transition.

The lack of knowledge and information about clean energy communities (**poor energy literacy**) among the public was perceived by our participants as one of the most significant **barriers in**

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upscaling clean energy communities as a more popular alternative energy system in society. This lack of information is an **opportunity that could be addressed with better knowledge dissemination and the mediatisation of successful practices**. Our data showed that the lack of knowledge about the benefits of a clean energy community system for individual households and communities was not only a problem for the general population, but more specifically, represented a challenge for policy makers.

Thus, one of the important implications of our study is **the need to identify ways in which to divulge why (benefits, values) and how (achievability)** it is possible to transform society towards greater sustainability through engaging with different models of clean energy communities. Identified barriers and inhibiting factors that prevent potential citizens from joining or creating communities need to be properly addressed, and the clean energy knowledge bank should be made widely accessible to interested public.

A summary and integration of our findings in relation to the **IVP model** is presented in Figure 8. For any given member (or household), there is an interplay of all three elements of practice present, which is (to various degrees) shaped by contextual external factors. Furthermore, the interplay of practice elements shapes individual and collective energy practices and perceived value. Perceived value in turn affects behaviours, involvement in new clean energy communities, and empowerment.

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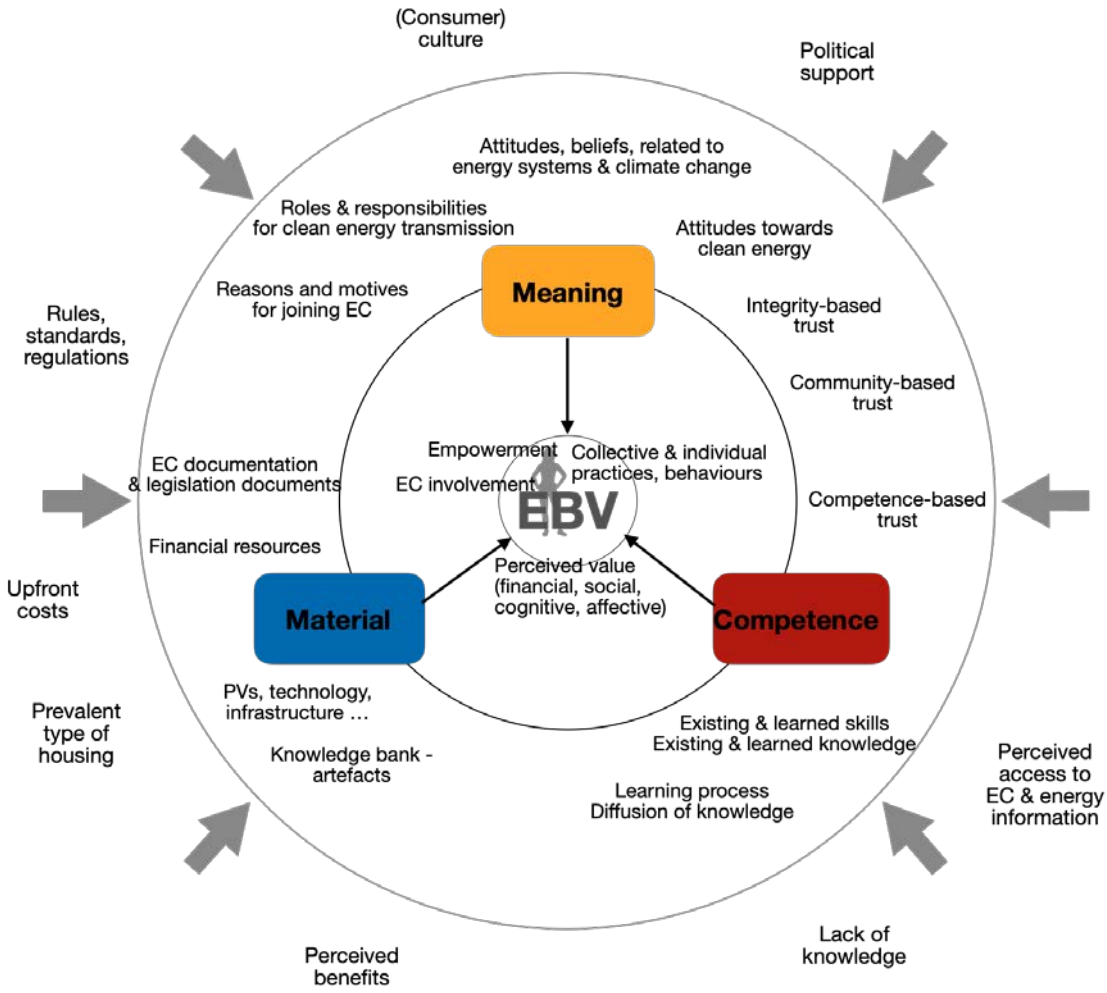

Figure 8: IVP model components and relationships in the new clean energy communities

In our final remarks, we cannot avoid discussing the **COVID-19** crisis. Our data showed that the pandemic had already affected the functioning of the clean energy communities and was especially disturbing activities related to setting up new initiatives, which were, for most of the studied communities, dependent on face-to-face meetings and mobilisation activities. In addition, since COVID-19 was increasingly becoming an economic crisis, this could severely affect citizens' abilities to invest in clean energy communities.

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7 CONCLUSION

Based on what was known from previous research addressing energy-related consumer practices and behaviours, our aim within tasks 6.1 (and partly 6.2) of the NEWCOMERS project was to develop a more holistic way of understanding energy-related consumer behaviours in the context of new clean energy communities, with emphasis on defining the benefits of membership. These benefits (for people and society in general) could be assessed on the basis of studying the technological, organisational, environmental and social features of these communities.

Involvement in a new clean energy community is unavoidably related to evaluative judgements of such involvement and is affected by preferences related to other practices. To understand the potential these communities have for diffusion on a larger scale in society, it is necessary to uncover such evaluations and the factors that affect them. The perceived value of a clean energy community is relativistic, personal, and situational, related to various factors. Thus, our study (conceptually backed by individual approaches, SPT, and value theory) aimed to assess the perceived value of clean energy communities for their members through members' feedback.

On this basis, we compiled the IVP model, which served as a framework for our empirical investigation of new clean energy communities. The model allowed us to take an overall view of how community members behaved with regard to energy-related activities in their households and communities, while recognising the interactions between the model components (meaning-competence-material-value) and between different factors that affected members' behaviour and the experienced value of such behaviours.

Taking a holistic perspective, we were able to explore and take into account social relations within and outside the communities, the knowledge flows, material infrastructures, and contexts, and observe how they were connected with individual factors and reflected in perceived values and practices. In the next research stages, we are going to use this insights to design a quantitative survey among community members (WP6.2) and quantitative citizen survey (WP6.3), aiming to test our IVP model and to better understand possibilities for diffusion of innovative clean energy communities in a wider society.

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9 APPENDICES

Appendix 1: THE INTERVIEW GUIDE

*The catalogue of interview questions contains 6 general questions, numbered **Q1-Q6** and shown in **bold**. Directly after each question, a list of prompts and follow-up questions, is provided.*

1. Background on respondent and their involvement with Clean energy community (EC)

Q1. Please introduce yourself and tell me about your views on EC, your role in it and how you came to be involved.

Prompts:

- How long have you lived in the area and in your current apartment/house?
- To begin with could you tell me a bit about your involvement with EC? For how long have you been part of this EC?
- If you think about energy community, what makes it a 'community'?
    - Would you say that your EC works as a 'real' community? Why do you think yes or no?
    - How do you address people from your and other EC (do you use specific phrases)?
    - What does your EC mean to you personally?
    - Is there a clear leader of your EC? How would you describe it?
- Can you describe how the EC idea came about? How did you hear about this possibility?/How did you get involved?
- What were the main reasons to get involved in the EC? *(MOTIVATION / VALUE)*
    - Environment / Costs - savings on energy bills / encouragements from the community and/or other people/ successful stories of other people, the media ...)
- Was anyone you knew already involved in the EC?
- Do you know many other people who are involved in this EC or similar ones? *(SOCIAL NORMS + SOCIAL VALUE)*
    - Is the framing as a community important to you?
    - How important is it that other people you know are involved?
    - Did you talk about it with anyone else you know?

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- Could you describe in what ways have you been involved in the EC (or EC project)?
    - Would you like to get even more involved? In what ways?
- Had you heard about ECs before you got involved? / Heard about this particular EC before you decided to join?
    - (if yes) What was the deciding factor in becoming involved?
    - (if no) What made you get involved?
- What is your occupation? What have you studied?

2. About EC and respondent's learning process (knowledge & skills)

Q2. I want to understand a little bit about the purpose of EC from your point of view and also about the learning process in EC as setting up EC was surely something quite new to everyone at the time.

Prompts:

- What is the aim of your EC?
    - Have you set yourself any goals related to EC? (e.g. energy/money saving of a certain %, anything else?)
    - According to your opinion, how successful is your EC in achieving those goals?
        - To what extent have they been reached?
- What holds the members of this EC/project together (similar values, economic benefits, interest in technology)?
    - In your opinion, in what ways does this EC/project differ from the others?
- What do you think you are gaining by being involved in the EC, personally, as a household/institution and community? (VALUE)
- What did you know about ECs and clean energy alternatives before you got involved in the EC?
    - How and where did you get the information about energy communities/renewables/energy savings?
    - How was the information presented to you?
    - Who have been your main informants when your EC (or EC project) was set up (or when you considered to join the EC (or EC project)?
- What have you been doing as part of your involvement?

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- Attending meetings / anything participatory (financial investment, organisational, educational …) / did not need to do anything but agree to be part of the EC (or EC project) project?

- Did you have any previous expertise/knowledge on energy issues in general and clean energy in particular?
    - What about knowledge on any aspect of setting up the EC project? (Are there any particular skills that you would like to expose and were useful in your involvement in the EC)?
    - Were/are you aware of any local/state incentives for new energy technologies? Where and how did you hear about them?
- What have you learnt from others in the EC? Can you also say other learnt something from you?
- Have you been sharing your experiences with the EC with other people?
    - What did you try to achieve by that?
- What were the most important things you have learned by working together with others in EC?
    - Can you give us an example (when and how it happened)?
- Have you formalised the knowledge (shared/developed/gained) in the EC so far and in what way (i.e. produced some learning materials, notes, shared documents, handbooks, seminars, conferences, lectures, tutorials …)?
    - Where is this knowledge stored, to whom and how is it accessible?
- How often do you find yourself in a role of promoter/ambassador for your EC specifically or the idea of EC in general?

3. Barriers and incentives regarding involvement in EC

Q3. Please tell us about the barriers and incentives/support in regard to EC.

Prompts:

- What difficulties did you face in joining /setting up/running the EC (or EC project)? *(BARRIERS)*
    - What did you find helpful in addressing above mentioned difficulties?
- How would you assess the financial burden for joining the EC?
    - What about other non-financial costs, such as your time?

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- How important were subsidies for your joining/ setting up/ maintaining EC? Were they easy/difficult to obtain? *(INCENTIVES)*
    - Any other incentives beside financial) that encouraged you to join the EC?
- In your opinion what are the main obstacles in setting up clean EC? (for example: structural: energy system, bureaucracy, housing law; personal: capitals (cultural, social, economic); technological) (*This question is suitable for the founding members only*)
    - Where you involved in addressing any of these and what was your role?
    - If not, who from your community was/is?
- In your opinion what are the main drivers (incentives) for setting up clean EC?

4. General interest/attitudes about environmental issues

Q4. Could you please share your views on environmental and clean energy issues.

Prompts:

- What does clean energy transition mean to you? Do you feel part of a clean energy transition?
- What do you consider to be the principal drivers of clean energy transitions?
    - Who has the responsibility to act – individual/communities/governments?
    - Do you think that clean energy transition is more about implementing new technologies or changing behaviour related to energy consumption of individuals?
- Do you think that all members of your EC are driven by the same motives/reasons for joining the transition to clean energy models?
    - You already mentioned your reasons for joining the EC (above); what are in your opinion the reasons of other members for joining the EC?
    - Do you feel that the members need to share similar views? Could you share your opinion on that?
- Were/are you interested in environmental issues before you became a part of the EC? In what way?
    - Has that changed as a result of EC? (i.e. Awareness/attitude towards clean energy issues / climate change / change in behaviours and daily practices?)
    - How important is energy conservation to you personally?
        - Has this been affected through being part of the EC?

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- When comparing your views before you joined EC and now, in what ways has being part of the EC changed your perspectives regarding energy consumption/about energy technology? What about your interest in these issues? *(ATTITUDES, BELIEFS, UNDERSTANDINGS)*

5. Everyday life in EC

Q5. Could you tell me a bit how your involvement in EC has affected your everyday life?

Prompts:

- Did you have any technological issues/problems/difficulties with using new technology when you joined the EC? *(BARRIERS)*
- Any other energy-related difficulties in your household? *(BARRIERS)*
    - For example, related to other household members, the building itself, the appliances you own?
    - If there are things that makes it difficult, what actions have you taken to overcome the difficulties?
    - Thinking about any difficulties, what would support your efforts for clean energy? Is there anything specific that you found or would find helpful (e.g. other household or community members assisting you, certain information from TV, internet, radio, friends, magazines, etc.)? *(SUPPORT)*
- Are you planning on having a home energy efficiency makeover as a result of EC involvement (new efficient appliances, smart meters …)?
- What sorts of changes have you made as a result of your involvement? *(PRACTICE or BEHAVIOUR change)*
    - Any changes to the way you live in your house/apartment?
    - Any changes to the way you view energy production and consumption?
    - In what way has this affected your energy (electricity) consumption in your household/ building/ institution?
        - Things you do, what helps you monitor your energy consumption?
- In what way has your involvement in the EC affected your community life?
    - Do you exchange ideas with other members regarding energy saving and how to make living more sustainable?
    - New relationships formed?
    - Taking up voluntary work for the benefit of EC?
    - Do you feel more a part of a community as a result of your involvement?
- Overall, how would you rate the experience of being involved in the programme?

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    - What are the positives/negatives?
- Apart from energy saving, has being part of the EC led you to act more sustainable in other parts of your life? (For example: waste reduction, use more public transportation, ...)
- Based on your experience, can your kind of EC (project) involve a larger number of people? How would you attract more people to EC/project like yours?

6. Close

Q6. Finally, any more questions?

Prompts:

- Is there anything you would like to add? Is there something else you think we should know about?

Thank the interviewee for taking part.

Explain the next steps in the research. Ask permission to come back to them and clarify our understanding of their activity once we have had a chance to review materials and conduct further interviews.

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