



Original research article

Creating valuable outcomes: An exploration of value creation pathways in the business models of energy communities

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ABSTRACT

Energy communities (ECs) have emerged as new, collective market actors within European energy systems. Their innovative business models are thought to result in a multiple types of value creation that transcend mere economic considerations. Yet, despite widespread acknowledgement of this, how multiple types of value are created in ECs remains inadequately explored and understood. We engage with this challenge by (1) situating ECs within the longer history and body of knowledge on community participation in energy systems before (2) mobilising insights on value creation from the literature on business models, and (3) distinguishing between value creation as a business model process and types of value outcomes derived from business activities. We apply this approach to three paradigmatic European cases and through comparative analysis identify two distinct value creation pathways. The first pathway links business activities and how they are assembled to functional value outcomes such as cost savings or CO₂ reduction, which are quantifiable. The second pathway links how ECs are governed to normative value outcomes such as increased agency or social cohesion, which is a matter of individuals' perception. These results, we argue, call for greater attention and support to questions of organisation and process to ensure the transformational potential of ECs is realised.

1. Introduction

Energy Communities (ECs) are increasingly being promoted as a means of fostering citizen-centred, democratic energy futures [1–4]. Since the foundational work of Walker and Devine-Wright [5], such community participation in energy systems has been distinguished from commercial energy activity for the use of open and participatory approaches and for leading to local and collective outcomes (see also 6). In the 15 years since then, a large body of work has emerged around community participation in energy systems. Scholars have explored how projects are developed [7–10], the potential roles for communities within systems transformation [11–15], and the benefits or outcomes such approaches deliver [16–18], all whilst continuing debate on the meanings of 'community' [19,20]. This accumulated knowledge positions community participation in energy as an expanding field of practice, the result of diverse motivations [6,19], organisational forms [21] and development processes [22], all leading to a variety of benefits

[17,23]. Yet, despite such interest in community energy projects, knowledge of how a wide range of benefits are created through community participation and within ECs specifically, remains limited [2,24].

Reflecting on a decade of work following Walker and Devine-Wrights' seminal article [5], Creamer et al. [24] call for more attention to the interaction between questions of process (who is involved in community projects and how) and the types of outcomes produced. Like others before and after them, they note how outcomes are dependent not only on what energy activities are undertaken but also on how they are undertaken [25]. In this paper, we take up this call and examine the interaction between the process and outcomes of community energy projects to further understanding of how different types of benefits are created.

We engage with this challenge by mobilising insights on business models [26–28] and their application to ECs [25,29–33]. The application of business model approaches to the study of ECs has grown rapidly

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since 2019. The reason is straightforward. In many European countries, ECs have grown out of community renewable energy projects [34,35] and are now increasingly interacting with national energy markets through the development of business models [36]. Accordingly, ECs have emerged as (collective) market actors, set out in statute within the European Commission's Clean Energy for All Europeans Package [3,37]. Thus, the application of business model approaches to the study of ECs has been undertaken for good reason. Whilst ECs have been developing increasingly sophisticated business activities, business model approaches offer new ways to understand their activities, often resulting in new classification schemes [38,39]. Our ambition here is different. We mobilise insights on business models because with a central focus on how value is created and captured the business model literature offers a variety of frameworks [40] and insights through which to examine the interaction between process and outcomes of ECs as conceptualised in the work on community participation.

In the following paper, we situate our understanding of business models, value creation and community benefits in the literature, drawing on work from the study of business models and community participation in energy systems. Then, in a comparative analysis of three European case studies, chosen as representative of three dominant archetypes of ECs (community renewable energy generation, collective self-consumption, and local energy supply), we examine on the one hand, how ECs create value, and, on the other hand, what types of value are created. Through an iterative comparison of these cases against insights from the existing literature, we subsequently identify two distinct *value creation pathways* that link two value creation processes to two foundational types of value outcomes. We conclude by reflecting on our findings and the often instrumental promotion of ECs by policymakers to decarbonise and democratise energy systems [11,31,41]. This leads us to reflect on two emerging dilemmas facing efforts to scale up and roll out ECs across Europe, each with implications for the state of energy democracy achieved.

This paper makes two contributions. First, we advance the seminal work of Walker and Devine-Wright [5] to explain how and why differing forms of EC governance – open and participatory versus closed and institutional – result in different value outcomes. In doing so, we advance understanding of how the benefits associated with community participation in energy systems interrelate with questions of process (who is involved and how) and demonstrate how the value of ECs comes not only from their outcomes or what are termed ‘value proposition’ within the literature on business models, but also from the way they are set up and run.

Second, by drawing on the distinction between process and outcome as introduced by Walker and Devine-Wright, we make a conceptual contribution to work on sustainable business models [42–44]. Within the business model literature, value creation and capture normally refers to “the share of total (monetary and ‘objective’) value that any one party receives” (Gummerus, 2013, 33). Value in this sense is understood as quantifiable. In contrast, studies on community participation and ECs often emphasise the multiple perceived benefits that emerge from local, participatory approaches [5,17]. In this work, value is synonymous with benefits, which can comprise quantified or qualitative value judgments, frequently judged by the normative criteria. By separating the processes of value creation from the types of value outcomes, we navigate between the often competing understandings of value creation and capture used in work on business models, and the multiple, subjective value outcomes that are often foregrounded as core benefits of community-based approaches, but are increasingly seen as critical to a wider range of energy system actors [46]. Separating process from outcomes subsequently clarifies how multiple types of value can result from business activities that at first glance appear very similar. In practice, this allows us to open a ‘black box’ between work identifying archetypal business models of ECs [30,32,47] and studies investigating types of value created by ECs [16,48–50].

2. Business models, value creation and community benefits

To explore how ECs result in multiple benefits we introduce work on business models. We give particular attention to value creation processes and how related insights can complement our understanding of the multiple benefits derived from community participation as recognised in studies on community participation in energy systems.

Business models are often described as conceptual tools that specify what an organisation does and how it creates value [28,51]. Over the last two decades, different approaches have been developed, variously focusing on key elements and archetypes, or activities [40]. A focus on key elements has resulted in efforts to understand and map the range of business models being developed by ECs (see for instance 24,36). This has facilitated understanding how the sector is developing [52] and provided a useful foundation for our research, informing our case selection (set out below in Section 3.1). Nonetheless, research dedicated to identifying archetypes exhibits several weaknesses. It clouds understanding of the range of actors involved [36] and obscures the identification of which actors create what types of value and for whom. Some archetypes position the community as the principal business model proprietor whilst others see it merely as the recipient of a product or service. A focus on key elements thus struggles to represent the multiple ways in which actors, including community members, may be involved in creating value [43,53].

Recognising this limitation, our approach builds on the activity system perspective first advanced by Zott and Amit (2010) [54] in which business models are conceived as ‘systems of interdependent activities that transcend the focal firm and span its boundaries’. The approach focuses attention on the content, structure, and governance of business activities. *Content* refers to the activities performed to design and deliver business models; *structure* to how and in what order activities are linked together to create and capture value; and *governance* to who performs each of the activities [54]. Emphasis is subsequently placed on connections and interdependencies between different activities (e.g., renewable energy generation, metering, or billing), with innovation interpreted as the addition of new activities, the linking of activities in new ways, or involvement of new actors. The capacity of this approach to describe and explain changes in activities, their ordering and governance, has proved particularly apt when exploring the evolution of business models in energy markets [55–57] and has increasingly been applied to the activities of ECs [25,36].

Building on this activity system perspective, we understand business models as shaping and being shaped by the regulations, policy, culture, technological innovation, and social practices that together characterise energy systems [58,59]. Accordingly, actors do not have a free hand in value creation or business model innovation, as opportunities to create value depend in large part on national energy policies [60–62]. Achieving the goals of the Paris Agreement requires, for instance, deploying renewable-based energy generation technologies and a concomitant shift in most energy markets from demand-led systems via flexible supply towards supply-led systems with flexible demand. That opportunities for value creation emerge from decisions related to energy system transformation is an important insight that is often overlooked. Another is the extent to which value creation is often a collaborative process, which can result in value creation and capture for the range of stakeholders involved, other than customers [46,63]. Contemporary work on ECs further supports this, suggesting that the creation of new business models routinely requires ECs to form diverse and evolving partnerships with commercial and/or public actors, in order to link supply and demand [36,64,65]. This evolutionary perspective suggests business models are not immutable but should be viewed as ‘temporary fixes’ [57]. It also allows for a more critical, situated understanding of different types of value being created because it recognises that value creation is a situated process.

Common across all approaches to business models is a focus on value creation. Whilst unifying, the relentless focus on value also causes some

confusion, particularly when considering non-market benefits of market-based business models [66,67] that characterise EC engagement with energy systems. Traditionally, value has primarily been understood in monetary terms [57,68,69]: a firm would offer a product or service to its customers and capture economic value for its shareholders in the form of revenue. In this sense, value is typically monetary and quantifiable. More recently, scholars have examined wider value outcomes associated with business models. Work on sustainable business models for instance, (e.g. 33,54) considers wider sets of important stakeholders, including society and the environment, whereas Hall and Roelich, (2016) [70] have introduced the idea of ‘complex value’ to recognise how business models need to provide value to different stakeholders in an energy system.

Current evidence suggests that ECs must generate multiple types of value to multiple stakeholders to survive [71–73]. Despite this recognition and where business model approaches have been foregrounded, value is often narrowly conceived as the outcome of the product or service an EC offers [32]. Business activities are used to explain value outcomes. This contrasts with the literature on community participation in energy systems that foregrounds how projects are set up in explanations of resultant benefits [2,25]. Who captures value generated is an important related question, not least to practitioners developing EC projects, but also for academics - it raises questions about power dynamics between collaborators and has implications for the extent to which energy democracy can be increased – but largely falls beyond the scope of this paper. In the context of ECs, value is routinely clustered into economic, social, and environmental categories [16,43,47]. As employed here, value outcomes are subjective, derived from stakeholder sense-making. They are synonymous with benefit and can be viewed “as a cognitive judgment of utility” [45]. Thus, a traditional focus on monetary value becomes one of many possible types of value outcome, some of which share similar characteristics to economic value: the capacity to be objectively identified and measured. In other instances, value outcomes relating to participation and purpose, or energy autonomy for example, are subjective and can only be perceived by stakeholders themselves.

To investigate how ECs create multiple types of value including those going beyond economic value, we mobilise the work of Gummerus (2013) [45]. Noting the competing conceptions of value used within and across multiple disciplines including business models, management, and marketing theory, Gummerus proposed two distinct conceptions of value. One conception focussed on *value creation processes*, understood as involving activities, resources and interactions between stakeholders. The other conception focussed on *value outcomes*. Crucially for us, Gummerus goes beyond traditional business model conceptions of value creation as being primarily concerned with the absolute share of financial value a firm captures to include a range of non-monetary, subjective types of value.

In this paper, we mobilise this approach and distinguish between value creation processes and types of value outcomes (Table 1). We understand value creation processes as rooted in business model framings of value creation and capture and as involving individual and/or

connected, interdependent sets of activities under differing structures and governance arrangements. By contrast, we understand types of value outcome as being perceived by stakeholders involved. In doing so, we follow Mihailova et al. (2022) [43] in advancing a dynamic view of business models, where the types of value being created depend on the stakeholder and their position within the business. Understanding value creation processes thus requires knowledge of the overall activity system (what activities are involved) and their structure (how they are linked together) whilst understanding value outcomes requires the capacity to focus on particular stakeholders involved, of which community members are often given primacy but are rarely the only ones. The resulting framework and analysis is distinctly socio-technical [74] focusing on configurations of ECs, the processes involved and the types of outcomes created.

Overall, our approach thus de-centres actors (who normally take centre-stage in much work on ECs) and foregrounds business activities, questions of business model governance and types of value outcomes. It facilitates the examination of value creation through an understanding of business models as interdependent networks of activities undertaken by potentially diverse actors. So, whilst ‘the community’ is of particular interest in our analysis, we do not assume it to be the focal actor in any business model. Instead, we approach community as a crucial stakeholder comprised of multiple members, working alongside others to create multiple types of value outcome.

3. Research design and methods

Given our interest in understanding value creation, our unit of analysis is the business models of ECs, which we investigate through comparative analysis of case studies. Case study methodologies are particularly apt at answering ‘how’ questions [75] and for undertaking explanatory research, which in this instance involves inquiry into the ‘symbiotic’ [24] relationship between value creation and types of value outcome. Comparative case analysis using purposive theoretical sampling allows us to clarify emergent findings and develop more robust theory grounded in varied empirical evidence [76].

3.1. Case selection

To examine value creation, a critical case selection procedure was used [77] in which we purposely sought a diversity of cases to test and refine emerging knowledge. Cases were selected as exemplars of archetypal business models employed by ECs across Europe:

- **Community renewable energy generation**, recognised as the most common type of EC across Europe, in which citizens come together to finance, own, and manage renewable generation assets [78,79].
- **Collective self-consumption**, where a group of end users generate, store or trade energy within a tightly prescribed area such as a building [16,33].
- **Local energy supply**, where groups of users connected to the same medium- or low-voltage substation generate, store or trade energy. Also referred to as ‘community self-consumption’ [33], or local energy markets [32].

Table 2 summarises the business model elements of these archetypes and details case studies used in the analysis. Table 3 lists interviews conducted.

3.2. Data collection and analysis

Data was collected and analysed through multiple methods. Workshops with core practitioners were undertaken between April and May 2020 as part of the ‘New clean energy communities in a changing European energy system’ (NEWCOMERS) project. Workshops were designed by the authors and delivered by local research teams in each

Table 1

Conceptual difference between value creation and capture processes and type of value outcome (adapted from [45]).

	Value creation process	Types of value outcome
<i>Analytical purpose</i>	How value comes to be	What is valued, how it is perceived
<i>Conceptual basis</i>	Connected interdependent sets of activities, structures and/or governance arrangements of business models	Quantified versus qualitative value judgments
<i>Explanatory power</i>	Identification of how activities, structures and/or governance create value	Identification of types of value outcomes and their importance to different stakeholders

Table 2

Comparison of business elements across three dominant archetypes and exemplar case studies.

	Case 1. Community renewable generation	Case 2. Collective self-consumption	Case 3. Local energy supply
Value proposition	Ownership of renewable generation assets	Ownership and use of onsite renewable energy	Access to local renewable generation
Central activities	Generation of renewable energy and sale to third parties	Generation and use of onsite renewable energy generation	Connecting local generation to consumption over public distribution networks
Exemplar case study	Zuiderlicht energy cooperative, The Netherlands	GEN-I Jesenice, Slovenia	Energy Local clubs, the United Kingdom
Characteristics	18 RE projects across Amsterdam with 900 members	2 PV installations on one apartment block serving 18 apartments	7 operational clubs, with 350 members
Number of interviews	8	7	16
Interviewed parties	Founders and members	Residents and utility project managers	Founders, club advisors, local club representatives, members

Table 3

Interviews conducted.

Case study	Role	Codes
Zuiderlicht energy cooperative	Founders	ZL1-ZL2
	Members	ZL3-ZL9
	Lead resident	GJ1
	GEN-I manager	GJ2-GJ3
GEN-I Jesenice	Members	GJ4-GJ8
	Founders	EL1-EL2
	Local club advisors	EL3, EL6-EL8
	Energy Local Managers	EL4-EL5
	Local club representatives	EL9-EL12
Energy Local	Members	EL13-EL16

country. Their aim was to facilitate understanding of the key elements and activities of ECs; their distinctive features; actors involved and their primary motivations. Short workshop reports recorded insights and guided next steps. Semi-structured interviews with practitioners, managers and representatives of industry partners followed between May and August 2020. Further semi-structured interviews with members of ECs and held between August and October 2020, explored member roles and perceived types of value associated with membership.

The analysis involved three steps:

- (1) To investigate the business models of each case, actor-technology maps were assembled reviewed by central practitioners in each community and then refined, before being converted into high level figures of business activities for each case, presented below. This process facilitated examination of the *content* and *structure* [54] of case study business model.
- (2) To identify types of value outcomes reported within each case, interviews with practitioners, managers and EC members were coded using NVivo 1 qualitative analysis software by the lead author. The analysis built on previous work within the wider project [49] that examined the perceived types of value of participating in ECs by their members. Here we expand on this work by examining types of value outcome as perceived from a wider range of stakeholders including project partners and practitioners and for a specific purpose, to investigate how value

is created. A recent review, by Adams et al., [16] of the social and economic value emerging from decentralised energy business models was used as a starting point (Annex 1) of the analysis. Interviews were coded and analysed at the lowest level of aggregation proposed by Adams et al. [16]. The new types of value outcomes were identified by thematic analysis and inductive coding [80], informed by our wider reading of community participation literature. Whilst our purpose was not to identify new types of value outcomes associated with ECs but further understanding of how they are derived, 11 new types of value were identified within the case studies, not previously recognised by [16].

- (3) To examine interactions between value creation processes and types of value outcomes we pursued an iterative form of cross case analysis. First, we examined evidence for, or indications of, how and why individual types of perceived value outcomes (such as network benefits) were created within each case. This involved further examination of the coded interview materials and interrogation of the content and structure of business activities systems created in step 1. A comparative analysis of results across cases was then undertaken to search for patterns within the data. The identification of two foundational types of value outcomes were derived from within Adams' et al.'s definition of social and economic types of value outcomes resulting in a new clustering of types of value outcomes related to how they were created. Prior work suggesting a symbiotic relationship between value outcomes and value creation processes provided an important steer for the analysis.

4. Results

The following section presents the results of our case analysis. First, we introduce each case. Next, we provide an analytical summary of their activity systems, before summarising the results of our analysis into the types of value created and captured by each case. In the next section we present the results of our iterative comparative analysis on how the business models of ECs create value.

4.1. Community renewable generation: Zuiderlicht energy cooperative

Zuiderlicht energy cooperative (henceforth Zuiderlicht) is one of the larger actors to emerge in a second wave of cooperative energy organisations in The Netherlands during the early 2010s. Motivated by a lack of progress on the energy transition, a group of citizens came together in 2012 behind the idea of installing solar panels on the roof of ASV Arsenal, a local football club. The club house, adjacent to their houseboat community, was newly built and had a flat roof. To install panels the group had to secure agreement from the owners (the municipality); develop contracts; set themselves up as a legal entity (a cooperative); navigate national subsidy regimes and finance the project (through a share offer). This took several years, the support of the municipality and the local distribution network operator, but the project went live on 10 August 2015. “*One thing led to another*” (ZL2) and Zuiderlicht expanded rapidly with further PV installations completed on local schools and apartments.

Zuiderlicht had a twofold purpose: “*one [was] having as much clean energy as possible...the other one [was] getting people involved. (ZL1)*”. Their development ethos was simple: to start with their own projects and then “*enlarge the movement*” (ZL2). Participation was encouraged through becoming a voting and/or shareholding member of the cooperative, whilst workshops trained participants in project development.

4.1.1. Business model activity system

From an activity system perspective, the business activities of Zuiderlicht are limited. Power is generated and used onsite by the building owners, with excess power sold to a licensed supplier. There are few

ongoing activities (Fig. 1). These primarily concern collection of generation and consumption data, and the allocation of consumption from onsite generation from the local network. The cooperative must also maintain its books and repay investors.

Taking a more holistic perspective, a variety of additional activities are important to Zuiderlicht, as an organisation and as an archetype of community renewable generation. Commissioning new projects involves locating new sites, negotiating with rooftop owners, securing community finances and loans, and obtaining installers. Educational programmes for students of partnering schools have been developed. Zuiderlicht also undertakes regular talks and workshops that serve multiple purposes. Talks engage users of community buildings hosting PV panels; they recruit new people to the cooperative; and they attract new community investors. Workshops train people in project development, wherein developing relationships and securing the agreement of host sites were viewed as the most time-consuming and challenging elements.

“Technically [developing projects is] maybe not so hard and financially it’s not so hard but in order to get to talk to the person who can make a decision about a particular roof of a building, that’s what takes the most time.”

(ZL9)

4.1.2. Perceived community value

In this case two types of value sit centre stage: increasing renewable generation and enabling participation. Moreover, Zuiderlicht was said to be “*doing the right thing*” (ZL6) by seeking empty local roofs rather than agricultural land on which to site PV, “*why put panels on the fields? ...the roofs are really a good place, especially in Holland. We are a small country*” (ZL3). Zuiderlicht’s use of open and inclusive processes was also valued for enabling participation, through multiple routes, creating a sense of individual and collective agency.

“I have no power to do something big, like six, seven, eight hundred panels on the building on my own but together with the entire critical mass of Zuiderlicht, yes, we get things done.”

(ZL4)

In part, Zuiderlicht’s capacity to encourage empowerment processes in the community can be linked to its simple, replicable model. At no point was value ascribed to Zuiderlicht as being an innovator. Having established an effective model, Zuiderlicht appears to have refined its approach, concentrating on ‘getting people involved’ and expanding ‘the movement’.

Whilst important, economic value appears to take a back seat to the increased agency members report. Those who invest receive a competitive financial return. Yet, with members frequently reporting purchasing shares for younger generations, financial returns do not feature prominently in Zuiderlicht’s narrative. Reduced import costs are likely to play a role for sites hosting PV installations but they too do not feature as an expressed value by those interviewed. Working towards a more sustainable future is more significant:

“It’s a very sweet conversation: how people can get three percent interest on 200 euro and be part of helping to save the planet.”

(ZL4)

“We have invested in Zuiderlicht projects for our four grandchildren. With an eye to their future.”

(ZL8)

Infrequently expressed types of value included energy independence linked to increased autonomy, ideas of local and/or regional benefits, and enhanced social relationships.

4.2. Collective self-consumption: Gen-I Jesenice

In February 2019, two solar PV installations with a combined output of 36.7 kW were commissioned on the roof of an apartment block in Jesenice, Slovenia. A ‘first of its kind’, the project was realised after an amendment to national regulations on the self-supply of renewable energy sources in 2018. It involves a national utility (GEN—I) working with apartment residents to facilitate collective self-consumption of power. Generated electricity is used to supply power to the building’s common areas and a heat pump, as well as 23 individual apartments. The project is expected to produce 37,000 kW hours and to save 18 tons of carbon dioxide emissions and approximately €4500 annually.

The project was initiated and led by a single resident, with prior experience as an electrical engineer. In 2013, he organised the installation of a heat pump to provide hot water to all apartments, saving the block €7000 annually. The process built trust, which was then harnessed to install PV panels. For the lead resident, the project fed into a larger narrative and pursuit of increased self-sufficiency: “*It’s become more and more important to be self-sufficient, ecologically aware, and to reduce costs*” (GJ1). For GEN—I, the project represented a trial under new regulations. So, when GEN-I was approached, they quickly agreed because of the good rapport between apartment residents and the lead resident. GEN-I subsequently took on responsibility for conceptual design including technical design, energy forecasting, security, and financial planning; and for implementation including control and safe operation of the system. To avoid residents having to pay upfront, grants, crowdfunding and debt-financing were used.

4.2.1. Business model activity system

Several business activities underpin collective self-consumption in the apartment block, including generation of power via co-located solar PV panels, the residents’ electricity consumption, and billing arrangements that utilise annual net metering and the allocation of benefits and costs for residents based on agreed distribution algorithms (Fig. 2). These are the primary, ongoing activities of the model. To install two PV systems also required extensive negotiation with and between residents, with the project’s viability being seen as dependent on all residents agreeing.

“It is difficult to get a consensus. Much harder in a block to get consent from people.”

(GJ4)

“We are of different ages, different interests, it is hard to bring everyone together and convince them that it is good. ...everyone has their own thinking. ...The majority agrees, but if one disagrees, it is difficult.”

(GJ5)

4.2.2. Perceived community value

In this case economic value is central. Environmental benefits, whilst recognised, trail behind, followed by energy independence. Few if any local benefits were articulated, although some interviewees expressed appreciation for the innovative nature of what they had achieved.

Interviewees perceived economic value from self-consumption of renewable energy within the apartment block. Yet because of how the PV systems are paid for – via grants, crowdfunding, and loans, which must be repaid – residents expected to receive economic value in the medium to long term, as the upfront capital costs of the PV systems are repaid. After seven years, members expect to save money through self-consuming power generated onsite.

Although interviewees considered environmental action important, value creation associated with environmental protection manifested most frequently in the idea of doing something for future generations: “*you also have to think about the future. Two, three generations ahead...*” (GJ6). It was also regularly positioned beneath financial gain, as the

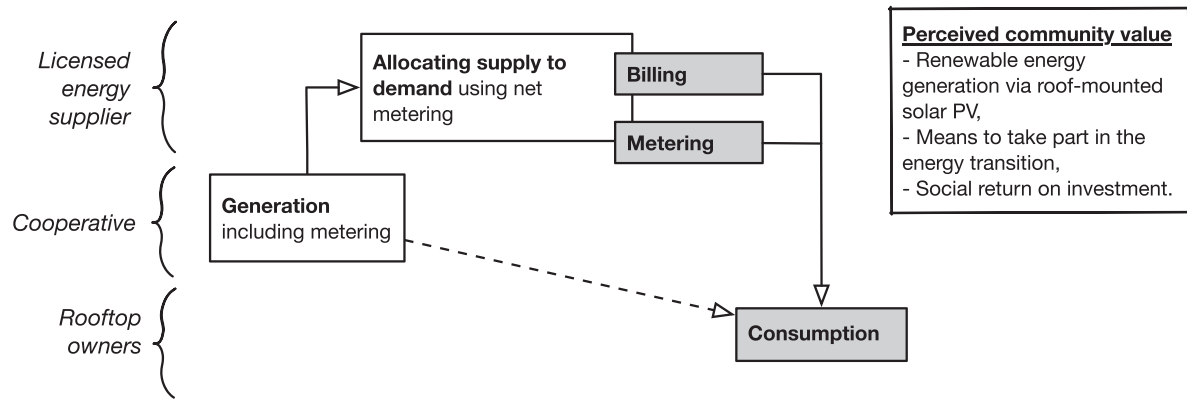


Fig. 1. Core business activities underpinning Zuiderlicht's business model and primary types of value created. (Grey boxes indicate pre-existing activities, white boxes new activities, lines equal linkages, dotted lines new linkages).

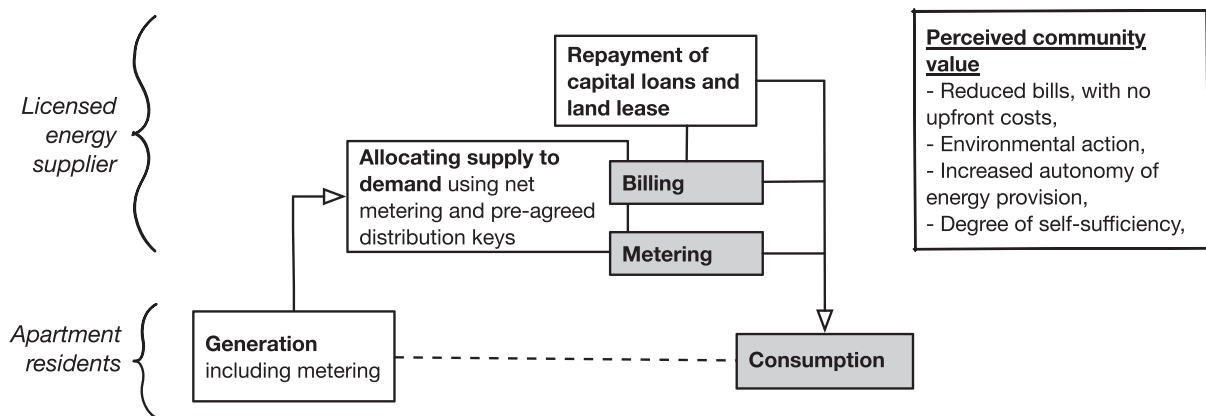


Fig. 2. Core business activities underpinning Jesenice's business model and primary types of value created. (Grey boxes indicate pre-existing activities, white boxes new activities, lines equal linkages, dotted lines new linkages)

following resident makes clear:

"About the protection of nature, or pollution, we're not that aware. But in the end, we're aware about that too. But the first motive is definitely finance...This was that shared point for all of us."

(GJ5)

Meanwhile, energy independence, expressed as increasing self-sufficiency, appeared of growing value to members. Suggested as the catalyst or "the basic starting point" by the energy manager at GEN-I, achieving greater levels of self-sufficiency has become a dominant thread in Jesenice's narrative. According to the lead resident, what started with "the opportunity of [achieving] 50% self-sufficiency" has resulted in asking "what we have to do so that we will be 100% self-sufficient" (GJ1). One resident even suggested that the aim of 100 % self-sufficiency could motivate further action.

"it's his [the lead resident's] wish that we would come to this phase where we would become self-sufficient...we would cover the rest of the roof, what is unused, that we would install these panels, that we would gather more of this energy. And I think we're at the point that the majority would probably say yes."

(GJ5)

4.3. Local energy supply: Energy Local

Energy Local (EL) offers a well-known yet little-understood approach to local energy trading in the UK. Having won a prestigious Ashden Award in 2018,¹ EL has been heralded as a 'game-changing solution' to managing generation and use at a community scale. In practice, Energy Local Clubs (ELC) are established to create new connections between local renewable energy generators and local consumers, through which locally generated power can be traded between generators and consumers. Each ELC is set up as a cooperative, consisting of local generators and consumers (principally households) operating under a regulatory exemption – known as complex site arrangement – which is managed by the licensed supplier. ELCs define who can trade and consume power. Power is shared equally between members according to demand in 30 min intervals and paid for on a 'match tariff' agreed by all club members (both generators and consumers) annually. Match tariffs are set such that generators receive higher export prices than they would selling to a licensed supplier and consumers pay lower import power prices than they would under standard supply arrangements. This results in a higher income for generators and lower bills for households.

4.3.1. Business model activity system

EL's model is a negotiated settlement between local generators and domestic consumers (who group together in ELCs) and a licensed supplier, who manages the 'complex site' whilst delivering the back-office

¹ <https://ashden.org/awards/winners/energy-local/>.

services required for trading energy. Operation of each ELC involves a variety of interdependent activities. These include renewable electricity generation from small and medium-sized plants, belonging to individuals or organisations such as renewable energy cooperatives and charities. Smart meters record half-hourly generation and demand data. Demand from within the club is allocated to local generation via a 'fair share' algorithm, performed half-hourly by the supplier. Generation and demand are subsequently netted across each club, with aggregated totals taken to settlement under two virtual meter readings (consumption and generation). Any additional electricity is supplied to members on a fixed time-of-use tariff, by the licensed supplier. Information on current and forecast local generation is provided to members via consumer access devices (CADs) and used to incentivise use of locally generated electricity. Members agree the match tariff annually (Fig. 3).

4.3.2. Perceived community value

In this case a range of value outcomes can be identified.

Interviewees expressed several types of economic value, including reduced import costs for demand-only members and improved export prices for generation-only members, as being important. Where generation assets are also owned by a community organisation, ELCs were also thought to increase investment returns for the members who owned the generation asset.

Community members placed equal importance on environmental value creation. Members perceived value in accessing and using local renewable energy. ELCs were also valued for supporting new renewable generation projects:

"the whole point of this ...is to subsidize and encourage new renewable energy to be installed"

(EL12)

"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."

(EL8)

Additional value was perceived in making local and national energy systems more efficient through local balancing, reducing system stress and line losses. Smart meters were seen as vital components for creating environmental value, enabling people to flex energy use and foster renewably powered energy systems. More broadly, ELCs were valued as

facilitating more sustainable lifestyles, built around local energy supply and facilitated by information about the timing of local generation.

ELCs also resulted in a range of perceived local and regional benefits. One member simply stated: "It's local and I believe that localism is a great way of taking control of your own lives" (EL16). Another referred to shopping locally: "you buy your sausages from the farmer, the eggs from the farmer; why not buy your energy from the farmer as well?" (EL7). Thus, value was also attached to the use of local renewable energy. ELCs were also frequently cited as having the potential to reduce energy poverty locally through their potential to reduce energy import costs, and because each club was open to all residents on equal terms.

"that was one of the big motivators behind Energy Local is that you would all get to have an equal share"

(EL2)

This points to perceived value in the social relationships, sense of community and equitable approach developed in ELCs. There was a strong sense of EL being "a great little community project" (EL13). Whilst one founder reflected, "there's a lot of passion around it being a community response rather than maximizing individual benefit" (EL2) and a member saw the creation of clubs, as "the thing that makes it feel you're part of a local initiative" (EL14).

Where the topic of energy independence surfaced, autarky was viewed as an undesirable outcome. Pointedly, emphasis was placed on what can be done to support system functioning through local generation and use of power (an aspect of perceived environmental value). Instead, energy independence was expressed in terms of increased autonomy and was linked to the value of participation: "participation in local decision-making is really important... the coop gives you some sort of control... there is this feeling that you have got some autonomy [within the energy system]" (EL15).

Ownership of the cooperative was also viewed as important. As one member explained "the chance to take part in something that was publicly owned again and energy generating was a big motivator" (EL16). Finally, members perceived value in the innovative, ground-breaking nature of the initiative, expressing pride in "an incredibly innovative project" (EL14), and, as a result, were more forgiving of the challenges faced, recognising that "changing systems takes a long time" (EL15).

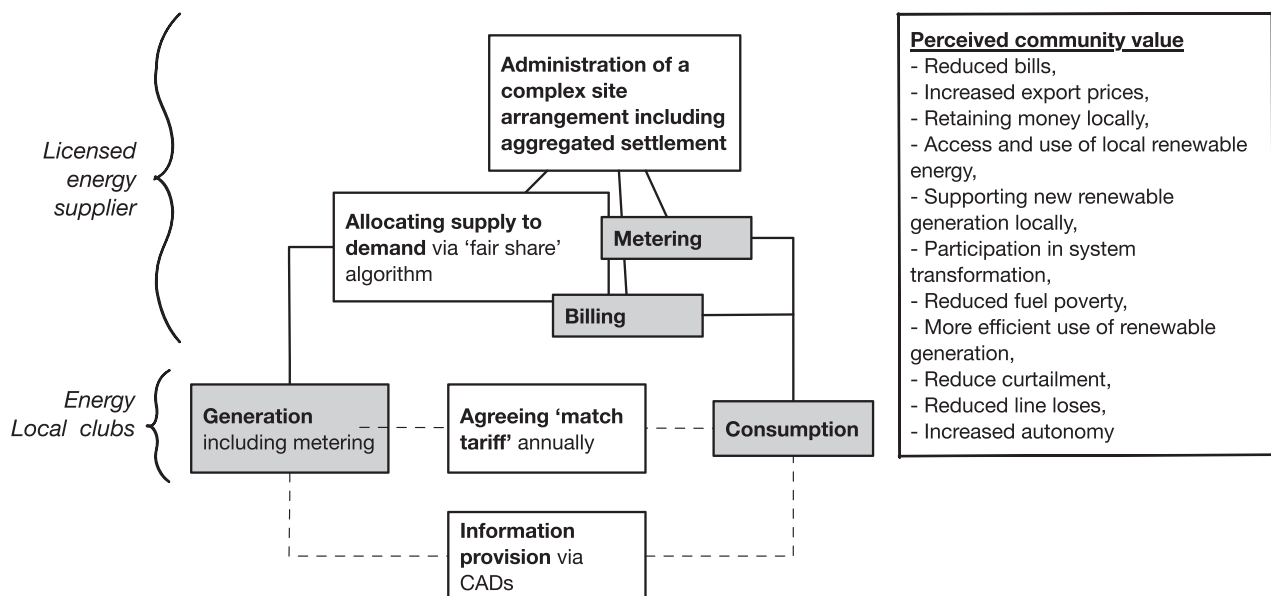


Fig. 3. Core business activities underpinning EL clubs and primary types of value created. (Grey boxes indicate pre-existing activities, white boxes new activities, lines equal linkages, dotted lines new linkages)

5. Comparative analysis: linking value creation processes to types of value outcomes

In the following section we identify two value creation pathways to advance understanding of the symbiotic relationship between value creation processes and types of value outcomes. These pathways build on three observations.

First, despite many similarities between the business activities undertaken across the cases – each involved the generation and sale of renewable electricity for instance – a wide variety of perceived outcomes are observed (Table 4).

Second, perceived value outcomes can be grouped in two foundational types, differentiated by whether they entail practical, often quantifiable outcomes of a business model or whether they can only be perceived by individuals through sense-making. Following the existing literature [42,70,81], we label the first type a functional value outcome, and suggest it describes the practical outcomes of the business model or solution: the physical performance of the EC. In our cases, functional value outcomes included all types of economic value identified (including reduced electricity import costs, increased export prices, investment returns, local economic benefits, and the removal or reduction of upfront costs for assets), as well as some social (including autarky as a form of energy independence), and environmental (including provenance of energy supply, deployment of renewables) types of value outcomes. In contrast, what distinguishes the second type of value outcomes from functional value is the extent these types of value can only be perceived through individual sense-making. This includes such value outcomes as increased autonomy, sustainable lifestyles, and fairness. Following the existing literature [82,83] we refer to these second type of value outcomes normative value outcomes because they each involve subjective judgments of progress towards an ideal.

Third, we note two conceptualisations, each linked to one of our primary literatures, concerning how value is created. On the one hand, and building on the business model literature, value creation is explained through the activities of businesses and how they are joined together [54]. Here, attention is directed to the activities undertaken, particularly those that are thought to be ‘value-adding’ [84,85]. On the other hand, and strongly embedded within the literature on community participation, questions of process are normally used to direct attention to who is involved and how, rather than what activities are undertaken. Research on community participation thus directs attention to the governance of business models and ECs more broadly, highlighting how different forms of governance, whether open and participatory or closed and institutional, result in different types of value outcomes. As originally conceived by [52], ‘business model governance’ largely ignores who is involved and how, and as a result also ignores any implications

this may have for the types of value created. Differentiating between these two conceptualisations of value creation thus offers a means to identify two value creation pathways.

Building on these observations, within our results and the literature, we identify two value creation pathways, and one means to enhance functional value capture (Fig. 4).

5.1. Governing ECs for normative value outcomes

First, we observe a direct interdependent relationship between how ECs are governed, and the range of normative value outcomes generated. Who is involved in the governance of an EC during development and operation, has a direct impact on normative value outcomes realised. Business model governance also has an indirect impact on functional value creation, via influencing of the business activities involved and their organisation.

Based on our analysis, two elements of governance are worth emphasising. **Collective ownership of organisations** appears to facilitate a range of normative value outcomes, such as agency in system transformation and a sense of increased energy independence. Ownership of a cooperative, as in the case of EL, indicates who is involved and therefore has access to benefits, such as reduced import prices (a functional value). Ownership also provides a means for participation via involvement in decision-making (a normative value). In this way, ownership appears to preserve value outcomes associated with sharing and social relationships as well as participation and purpose. This relationship was also observed in the case of Zuiderlicht, where participation and ownership of the cooperative underlined many types of value outcomes perceived by members, particularly increased autonomy and empowerment (normative value outcomes), as well as delivering local renewable projects (a functional value outcome). Related, **collective ownership of assets** (for generation, storage or flexible demand) is important within the cases analysed because it provides a tangible means of participating in energy system transformation: it can give members “that feeling that you actually brought something to the community, and you built something together” (ZL7). As in the case of Zuiderlicht, assets may also provide members with an opportunity to recoup financial benefits (a functional value outcome). Whilst ownership is not the only means by which such value outcomes may be created, our analysis suggests that it provides a foundation on which sustained value creation can occur over time.

How ECs are governed and by whom directly influences the range of normative value outcomes. It also indirectly influences what functional value is created and who captures it, through decisions of about which activities are included and how they are linked together. For example, who benefits financially from the ECs is an outcome of governance decisions about who finances renewable energy generation assets or the rate at which locally produced renewable power is sold to member consumers.

5.2. Configuring activities for functional value outcomes

Second, we observe a strong interdependent relationship between the organisation of business activities of ECs with functional value outcomes generated. Functional value outcomes, we suggest, result from the organisation or ‘structure’ [54] of activities in a business model.

In this sense, generating a functional value is a question of selecting activities and assembling them in activity systems. Many activities undertaken in ECs are, after all, identical to those of other emerging business models in the energy system (see e.g., 69) but may not produce the same functional value outcomes. For instance, value associated with reduced electricity import costs in the case of EL and Jesenice derives not just from the generation of renewable energy but also from how local supply is connected to member demand via metering and billing. Different means of allocating supply and demand, through different business activities, result in different value outcomes for members.

Table 4
Perceived value outcomes per case.

Zuiderlicht energy cooperative	Gen-I Jesenice	Energy Local
- Renewable energy generation via roof-mounted solar PV	- Reduced bills, with no upfront costs	- Reduced bills
- Means to take part in the energy transition	- Environmental action	- Increased export prices
- Social return on investment	- Increased autonomy of energy provision	- Retaining money locally
	- Degree of self-sufficiency	- Access and use of local renewable energy
		- Supporting new renewable generation locally
		- Participation in system transformation
		- Reduced fuel poverty
		- More efficient use of renewable generation
		- Reduce curtailment
		- Reduced line losses
		- Increased autonomy

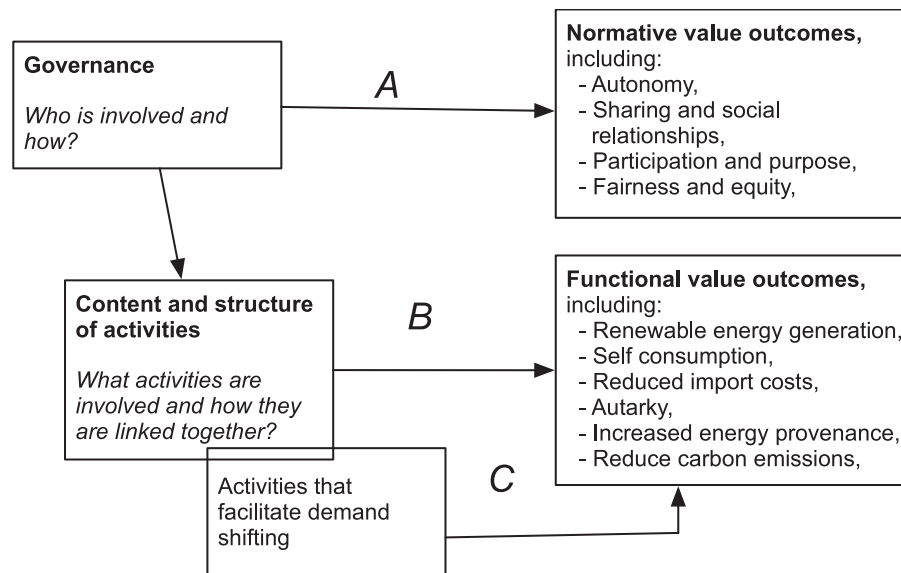


Fig. 4. Two value creation pathways (A and B) and one means to enhance functional value capture (C).
NB: listed value outcomes are exemplary rather than exhaustive.

Equally, increased autarky – achieving greater independence from conventional energy suppliers – in the case of Jesenice, derives from the interconnections of multiple activities including onsite generation and consumption. This suggests creating functional value is interdependent on what activities are undertaken and how they are linked together.

Third, we observe how the creation of functional value can be enhanced by the inclusion of activities designed to facilitate the shifting of demand by community members. Only one of our case studies was designed to facilitate members shifting their demand to make better use of available supply (ELCs). A comparison of this case with the others revealed that it was the only case where the amount of functional value created and captured could be increased. This was made possible through the addition of activities that collectively helped consumer members shift their energy demand to better match local supply. By shifting their demand, consumer members could use more local renewable energy power and therefore meet more of their energy needs via the ELC at a lower price than regular supply contracts. The fact that certain groups of business activities related to metering and billing allow ECs to capture more functional value further supports our conceptualisation of the interrelationship between activity systems and functional value outcomes.

What emerges from this comparative analysis is a picture of two distinct value creation pathways that link the process of value creation and capture in the business models of ECs with two foundational types of value outcomes, with a simple relationship between the two (Fig. 4). Functional value describes the practical outcomes of the business model or solution. Conversely, normative types of value are subjective and can only be perceived by individuals. Functional value outcomes can be linked back to decisions on how activities are assembled, themselves a matter of business model governance, whilst normative value outcomes derive from the governance directly.

6. Discussion and conclusion

In this paper, we have been interested in advancing conceptual understanding of how ECs create multiple types of value through their activities. Using a distinction between value creation processes and types of value outcomes, first proposed by [45], we have argued for two value creation pathways, each consisting of an interdependent relationship between a particular form of value creation processes and foundational type of value outcomes. The first pathway links business

activities and their organisation to functional value creation. The second pathway links questions of business model governance - who is involved and how? – to normative value creation, whilst also being ultimately responsible for decisions over how activities are linked, thus influencing the creation of functional value.

These results are based on theoretical and empirical examination of three diverse cases, selected for being examples of predominant business models of ECs across Europe. Such diversity in archetypes was a deliberate research choice, taken to stretch and test emergent findings, in a way that examination of similar cases would not. Our findings have, in this sense, increased robustness because they explain the interaction between value creation and type of value outcomes in a wide diversity of cases. Further work, to test these findings in a larger number of cases, across diverse contexts and potentially beyond ECs, as particular form of collective market actor, would further strengthen the results.

The work is important for both analytical and practical reasons. Analytically, it gives us a better understanding of how multiple types of value outcomes can be created through community participation in energy systems. It points towards normative value outcomes as transcending the creation of functional value [81]. It also raises a variety of questions which could be addressed in future work. One area concerns further inquiry into how normative value outcomes like increased sense of participation, are achieved in practice. Related, further research could explore possible relationships between functional and normative value outcomes, namely how the distribution of functional value can influence whether certain types of normative value are realised, particularly those concerned with equity and fairness. Analytically, this work answers Creamer et al.'s [24] call for research advancing understanding of the link between process and outcomes in work on community participation in energy systems.

Our research also advances understanding of business models for sustainability and for ECs, in particular. To the latter it opens a black box between research on business model archetypes of ECs and the multiple types of value outcomes they create. To the former, it advances understanding of the multiple types of value outcomes business models can generate and points towards a new stream of work, potentially exploring the importance of creating functional and normative value outcomes for consumers.

Practically, our analysis helps to explain the growing interest from commercial companies in the development of ECs. If functional value outcomes can be created and captured through the selection and

configuration of particular activities, then they can also be fostered by private enterprises and provided as packaged service offerings to customers. Depending on the reasons for joining an EC, the option to join one set up and owned by a commercial enterprise may be appealing.

Practically, our work also points towards two emerging dilemmas within contemporary efforts to increase citizen participation in energy system transitions via the growth of EC business models.

One dilemma concerns efforts to standardise EC business models as a means to facilitate their diffusion and impact [34,50,65,86]. Our work here suggests that standardisation of business models, whilst promising, may also come at a cost. In our view, there is a risk that efforts to standardise and then replicate existing business models may result in a narrow focus on how functional types of value are created and distributed because questions of process – particularly who owns and manages the business model – are already ‘settled’. It is tempting to utilise existing governance structures, whether open and participatory or closed and institutional, to speed up the process, whilst concentrating on establishing new activities (e.g. renewable generation) whilst re-configuring others (e.g. metering) all of which must be done in the creation of each EC. In short, efforts may end up being directed to the organisation of business activities, such as generation, metering, billing, and use, as the primary elements of new business models that need to be actively configured each time, over and above exploring questions of business model governance (who is involved and how). Efforts to replicate ECs may therefore lead to a focus on creating functional types of value, resulting in shallower forms of energy democracy, in which citizens play increasingly active roles but have little say on the rules that shape participation [87,88]. Having identified this as a potential dilemma, we suggest that any support towards replicating ‘what works’ should be directed towards helping practitioners realise normative value outcomes that increased participation in the governance and ownership of ECs brings.

We see a second dilemma arising between the desire to maintain independence and enhance the functional value captured in their activities. Our work, alongside that of others [89,90], shows that one way to enhance functional value creation is to undertake a variety of additional activities that allow members to shift their energy demand. Our work also demonstrates that in practice this means working with others: it is unlikely that EC members have the specialist expertise and skills to work with the necessary Information and Communication Technologies (ICTs) required to facilitate and monitor demand shifting. To enhance functional value outcomes captured thus requires ceding some control of EC business models to others.

In practice, navigating these dilemmas is not a clear cut. Commercial enterprises are already heavily involved in the development and

management of ECs [36]. Nevertheless, articulating these dilemmas helps explain the growing interest and involvement of commercial enterprises in ECs, the reasons why the boundaries between community and non-community actors are increasingly blurred, whilst at the same time bringing debates on community participation and energy system transition into sharper focus through critical examination of how questions of process influence the types of value outcomes realised. How these dilemmas are navigated will, we argue, have significant repercussions for the scale, pace, and nature of energy transitions; whether this will be a process of incremental change in citizen roles and responsibilities or a deeper transformation in terms of democratic involvement and social justice.

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CRediT authorship contribution statement

Jake Barnes: Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Validation, Writing – original draft, Writing – review & editing. **Paula Hansen:** Conceptualization, Investigation, Methodology, Writing – original draft. **Tanja Kamin:** Funding acquisition, Investigation, Project administration, Writing – review & editing. **Urša Golob:** Funding acquisition, Investigation, Project administration, Writing – review & editing. **Sarah Darby:** Funding acquisition, Project administration, Writing – review & editing. **Nicolien M. van der Grijp:** Funding acquisition, Investigation, Project administration, Writing – review & editing. **Daniel Petrovics:** Investigation.

Declaration of competing interest

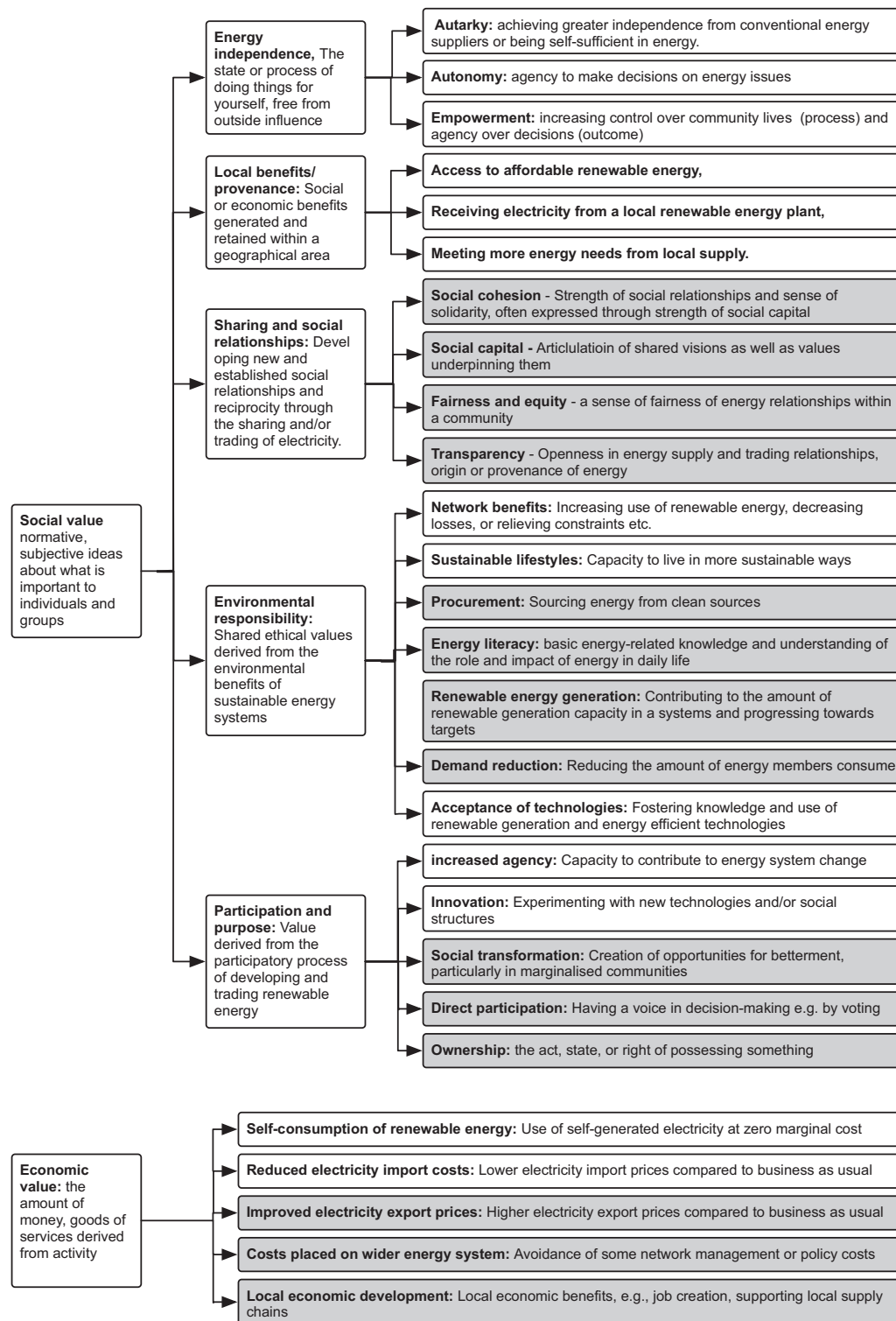
The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Annex 1

Code hierarchy used to investigate types of value outcomes within case studies, expanded from Adams et al. (2021). Concepts in bold, code descriptions in plain text. Additional value codes identified within the research indicated by grey boxes.



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