Promoting Just Transition or Enhancing Inequalities? Reflection on Different Energy Community Business Models in Terms of Energy Justice

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1. Introduction

The energy sector has traditionally relied upon large-scale centralized facilities, owned and operated by big investors, municipalities, or state-owned businesses. The local energy community concept emerged to challenge the dominant operating logic of the industry[1]. These new types of collective energy-related initiatives are increasingly starting to own and operate energy systems for self-consumption, as well as to supply energy to the grid. Energy communities have a crucial role in fostering the energy transition from the bottom up, as they can increase the share of renewable energy production, foster energy efficiency, and decrease transmission losses. This role is increasingly highlighted in the European Union, with the Clean energy for all Europeans package and revised Renewable Energy Directive, which introduced energy communities into European legislation and acknowledged their instrumental role in the energy transition (European Commission, 2022).

The promise of citizen-organized collective action has garnered attention among citizens, researchers, policymakers, and businesses. Countries across the globe are looking to adopt measures to facilitate development and increase the share of energy generated from these communities (Brummer, 2018). There are currently around 7700 energy community projects in Europe alone, which involve more than two million citizens (European Commission, 2021b). Energy community projects are highly heterogeneous and can take many different forms. Differences emerge, for instance, in the choice of energy technology, location, demography, actors involved, and project motivations and goals. There is also a notable distinction between community-led and externally-led energy community projects, which relates closely to power and the distribution of benefits.

As citizens and communities voluntarily take greater responsibility for energy generation, the social and economic implications of energy communities are becoming more visible. Energy communities are often assumed to be without criticism and associated with positive impacts, such as increased community cohesion and wellbeing (Lacey-Barnacle, 2020). However, the extent to which they can contribute to strengthening energy justice is becoming an important consideration (Hoffman et al., 2021). The inability to incorporate ethical and societal implications into the new energy paradigm may reinforce old injustices[2], disproportionally affect vulnerable and energy-poor households (Hanke et al., 2021), and fuel new societal inequalities (Jenkins et al., 2017). Thus, it is vital to adopt from the outset an inclusive and fair approach to energy community projects, to ensure and foster a just energy transition. Energy justice is fundamental also to increasing the acceptability of new renewable energy technologies (Sovacool et al., 2017), and delivering the energy transition in the first place.

[1] Despite the recent uptake of community energy, it must be noted that collaborative efforts to produce, distribute and consume energy locally are not a new phenomenon. For example, rural cooperatives for electricity production were explored in the German Reich and the United States in the first half of the 20th century, and community-owned renewable energy projects, namely wind farms, started to emerge in Denmark and the Netherlands in the 1980s (Coenen & Hoppe, 2021).

[2] Approximately one billion people lack access to electricity, while over one-third of the global population suffers access deficit for clean fuels and technologies (IEA et al., 2020). The issue is not limited to the developing countries alone, as an EU-wide survey showed that 37.5 million people, or 8% of the EU population, are not able to keep their home adequately warm (Bouzarovski et al., 2020).

It is time for researchers to fully acknowledge that energy communities do not automatically equate to local prosperity and contribute to just energy transition. Projects categorized as energy communities differ substantially in their operational models, and their impacts on local communities and the energy system overall. Energy communities inherently interface with the established energy regime and its infrastructures, actors, and business logic. Recent research has underscored how companies and their business models are vital forces behind sustainability transitions, and can either support or restrain the diffusion of more sustainable ways of organizing production and consumption (Bidmon & Knab, 2018; Sarasini & Linder, 2018). This chapter discusses how key principles of the energy justice literature are exhibited in different energy community business models, looking to spark more research attention on just energy communities.

2. Towards just energy transition from the bottom up: the core concepts

In this section, we introduce the central concepts of the research: energy communities, energy justice, and energy community business models. The purpose is to elaborate on previous research, provide an overview of prominent frameworks, and discuss the nexus and discrepancies of the three concepts.

2.1. Energy communities

The increased interest in forming energy communities has sparked research on what the concept of energy community entails, how these initiatives are enacted under different socio-economic, societal, cultural, technological, and regulatory conditions, and on the outcomes and factors influencing the development and operationalization of energy communities. The review of the burgeoning literature reveals that the concept of energy communities has remained multifaceted, with varied conceptualizations, applications and definitions (Bauwens et al., 2022; Gui & MacGill, 2018). Predominantly in the literature today, an energy project is regarded as an energy community project when any form or level of joint voluntary citizen participation is attached. It does not necessarily matter whether the community initiates the project, members have decision-making power, revenues are returned to the community, or energy is produced locally (Forman, 2017).

Energy community initiatives may vary in terms of their activities, operational modes and overall outcomes. The seminal work by Walker and Devine-Wright (2008) introduced 'process' and 'outcome' viewpoints as the key dimensions of conceptualizing energy community projects[3]. The process dimension concerns who is involved in setting up the projects, while the outcome viewpoint emphasizes the spatial and social distribution of the project outcomes. Research on energy communities can also be divided into outcome- and process-focused approaches.

Outcome-focused studies and definitions underscore energy generation at the local level and self-consumption of the local energy production (Hoz et al., 2020). Community

[3] There is also a third viewpoint in Walker and Devine-Wright's work, which emphasizes that energy community projects should lead to something productive and valuable.

initiatives can help achieve energy autonomy by strengthening energy security and minimizing environmental footprints (Gjorgievski et al., 2021). Process-focused studies see energy communities as organizations where different actors and stakeholders involved in the process share common interests and problems, and are subject to the formal and informal rules that govern the system (Fouladvand et al., 2020). This approach also emphasizes the social benefits of energy communities, and how the communities can act as change agents (Mahzouni, 2019). The social benefits highlighted in the process-focused studies may include educational aspects (Boon and Dieperink, 2014), upscaling of sustainability practices (Smith et al., 2016), improvement of social coherence (van der Schoor & Scholtens, 2015), raising the level of awareness of renewables (Rogers et al., 2008), enhancing acceptance (Busch et al., 2021), and fostering technological diffusion (Nolden, 2013). At the societal level, energy communities can impact job creation, economic development, and strengthen local institutions (Busch et al., 2021). As seen above, energy communities can produce different benefits and have various socio-economic impacts.

According to Hicks and Ison, Walker & Devine-Wright's conceptualization of energy communities lacks the specificity to conclude what process or outcome is legitimate for community energy projects (Hicks & Ison, 2018). To bridge this gap, they proposed a set of conceptual tools, including five spectrums of community energy[4], which can support the understanding of community renewable energy through the motivations and choices embedded in the policies and practices of the projects. These spectrums capture the enormous latitude in several aspects of community energy projects, from the range of actors involved to the level of engagement within the project.

The review of the energy community project reveals that initial projects were predominantly local; however, it is currently recognized that communities can take highly dispersed forms. For example, new digital energy communities act as an intermediary, and can provide financial resources (Bonzanini et al., 2016; Lam & Law, 2016; Nigam et al., 2018; Vasileiadou et al., 2015), and help in knowledge production and sharing (Hyysalo, 2021; Hyysalo et al., 2018).

As this short overview demonstrates, energy communities are multifaceted in various aspects and characteristics. However, there seems to be a consensus that energy communities are groups united by particular interests in renewable energy generation or energy consumption, formed as voluntary initiatives of individuals and stakeholders, in locale-based or dispersed forms, and governed by participatory decision-making (community engagement), to yield various benefits to the community members and society as a whole.

[4] The five spectrums are: range of actors (ranging from only local individuals to only non-local organizations, business, and government), distribution of voting rights and balance of decision-making power (ranging from one vote per actor to one actor has all votes), distribution of financial benefits (ranging from full community benefit to full non-local investors), decisions around the scale of technology (ranging from scaled in relation to local energy demand and agreement, to scaled to maximize economic efficiencies), and level of engagement (ranging from early timing and a wide set of methods to late timing and a limited set of methods)(Hicks & Ison, 2018).

2.2 Just transition and energy justice

Just transition is a societal goal that co-exists with the low-carbon transition paradigm. McCauley & Heffron (2018) define just transition as "a fair and equitable process of moving towards a post-carbon society" that must seek fairness and equity concerning major global justice concerns, including, for example, ethnicity, income, and gender. The just transition concept is employed in three different strands of literature, all with their own forms of justice: climate, environmental, and energy justice.

This chapter looks at energy justice, namely a fair distribution of costs and benefits in the global energy system (Sovacool et al., 2013). Jenkins et al. (2016) assert that the notion of energy justice involves, a) evaluating where injustices emerge, b) identifying the segments of the society being treated unjustly, and c) what processes exist for remediation to reveal and mitigate such injustices. Energy justice research strives to apply the principles of justice to energy policy, energy production systems, energy consumption, energy activism, energy security, and climate change (Jenkins et al., 2016). Scholars of energy justice have traditionally approached just transition through the production or consumption lenses, for example, availability of renewable energy sources or implications of energy-saving techniques for wellbeing and community cohesion. Contestations and disputes over energy resources is one of the core themes in the field. In addition to distributional and procedural justice, the energy justice literature has focused on recognition justice concerns, examining who is affected or ignored (Jenkins et al., 2016). The most comprehensive conceptualization of the different issues within the energy justice paradigm was initially executed by Sovacool & Dworkin (2015), who presented a conceptual framework comprising eight energy justice principles. The framework was revisited the following year by Sovacool et al. (2016), and in 2017 extended with two new principles, resistance and intersectionality (Sovacool et al., 2017).

Table 1. Overview of energy justice principles. Adapted from Sovacool & Dworkin (2015), and Sovacool et al. (2016, 2017).

Energy justice principles	Description
1. Availability	The economy, market or system should guarantee people access to sufficient and reliable energy resources. This includes topics related to physical energy resources and energy infrastructure, provision of energy supply, as well as technologies for energy conservation, transportation, storage, distribution, and investments.
2. Affordability	Access to energy services should be affordable and not constitute a financial burden on consumers, notably the disadvantaged. This includes topics such as price stability and fair prices.
3. Due process	Stakeholders, namely communities, should have the ability to participate in energy policymaking processes and projects that affect them. This includes topics such as fairness and consent for decision-making, adequate impact assessment processes, remedies and compensation mechanisms, and access to arbitration and grievance mechanisms.
4. Transparency & Accountability	People should have access to transparent and accountable information on energy and the environment. This includes topics such as democratic and transparent decision-making processes, accounting, public information on revenues and policies, and measures to avoid corruption.
5. Sustainability	Energy sources should be utilized sustainably and not be depleted too quickly. This includes topics such as avoiding undue environmental damage, and sustainable use of energy resources.
6. Intragenerational equity	All people should have equal opportunities to access energy services. This includes topics such as the distribution of energy services in society between different groups.

7.	**Intergenerational equity**	Good quality of life and access to energy services should be guaranteed for future generations, too. This includes topics such as the distribution of energy services between present and future generations, and mitigation and adaptation to climate change.
8.	**Responsibility**	All actors should take responsibility for protecting the environment and reducing the negative impacts of energy production. This includes topics such as governments' responsibility to minimize environmental degradation, especially industrialized countries' responsibility for historical carbon emissions, and responsibility for future generations.
9.	**Resistance**	People should actively stand up to injustices and oppose projects that are unjust, oppressive, and violate the energy justice principles.
10.	**Intersectionality**	How the different aspects of energy justice are connected with other elements of social justice, such as race, class, gender, or power.

Energy communities are often automatically associated with positive impacts on energy justice, and positive socio-economic benefits for the citizenry (Forman, 2017). This is due to the prevailing expectations of energy communities in a local context, and, according to Bommel & Höffken, three main expectations sustain this assumption (2021). According to the first expectation, energy communities inherently have, for example, transparent decision-making processes and fair distribution of profits because procedural and distributive justice are essential to the success of community energy projects. The second expectation entails community energy projects fostering social acceptance of renewable energy, if the distribution of risks, costs and benefits are deemed fair within a community. The third is that the justice benefits mainly relate to the empowerment of community members through, for example, job creation, increasing community resilience, and democratization of the energy supply.

Some scholars have explicitly examined how justice manifests in energy communities. For example, Park looked into how to foster equal opportunities between communities concerning energy communities (2012), Mundaca et al. (2018) researched the role of energy justice in the success of community energy projects, and Lacey-Barnacle explored how the proximity of (community) energy infrastructures influences citizens' sentiment of energy justice (2020). However, the research has to date mainly focused on energy justice issues at the local community level, not considering the broader societal context in which they emerge. Thus, the research arguably does not '(yet) fully employ the inherent scope of the concept' (van Bommel & Höffken, 2021). Energy community projects do not exist in a vacuum but are intertwined with other (community) energy projects, public and private institutions, energy companies, non-member citizens, and other communities near or far, all of which may be subject or connected to energy justice issues due to energy communities.

Therefore, van Bommel & Höffken have recently argued that research must consider the issues of justice *within, between* and *beyond* energy communities. This framework widens the scope of energy justice research in energy communities to the energy system level. It also illustrates that it is by no means self-evident that energy communities will entail or foster energy justice. The authors also suggest, for example, that research should apply a cosmopolitan justice approach to better cover justice issues related to global supply chains.

2.3 New business models to scale up energy communities

Energy communities are embedded in wide socio-technical structures, and interact with energy generation and transmission companies at the energy system level. These companies

rely on various models to create, deliver and capture value with and for the communities (European Commission, 2021a; Mlinarič et al., 2019). In the energy transition discourse, emerging business models that utilize citizen-driven shared generation and consumption hold promise for the advancement of the energy transition, and share of clean energy in general. The business model perspective has been considered increasingly essential to understanding how different organizations create and capture value. According to business model thinking, an organization's long-term success depends upon its ability to create and disseminate value offerings appreciated by the market (Teece, 2010). Organizations strive to utilize resources optimally, and aim to benefit from the interaction of internal and external actors to reach the desired outcomes.

Energy community business models tend to transcend conventional profit-making logic, for example, by emphasizing environmental and social outcomes. In these business models, citizens are not just the recipients of the business offerings (Mihailova et al., 2022) but active contributors to the value creation process (Heuninckx et al., 2022). Therefore, companies involved in the energy community sphere often face the challenge of balancing the different business logic and background assumptions underlying the formation of energy communities. Conventional business projects are often founded on a neoliberal ideology. They aim to maximize economic gain, whereas community-led energy is built upon communitarian beliefs that view strong communities as an end in itself, and ideal to instigate and undertake renewable energy projects (Goedkoop & Devine-Wright, 2016). In such cases, business models function as systems that bring together stakeholders in ways that facilitate joint value creation (Fischhendler et al., 2021).

The research on energy community business models is still in its early stages. A number of studies have explored different business models incorporated in various energy community settings (Botelho et al., 2021; European Commission, 2021a; Hamwi & Lizarralde, 2017; Mlinarič et al., 2019). These business models vary in orientation, scope, value creation, and dissemination logic. The following section expands on the most widely used business models in the energy community setting, based on a study by Reis et al. (2021).

Energy cooperatives are initiatives where private citizens jointly own energy generation systems. It is the most common energy community business model in the EU, with over 1900 renewable energy cooperatives serving more than one million people (*RES*coop, 2022). These businesses may operate either for-profit to compete with other market players or non-profit to supply energy locally and reinvest potential profits in the community. Cooperatives can also engage in the management and operation of regional low-voltage distribution networks, which allows them, for example, to influence billing, put in place dynamic pricing models, and impose use-of-system tariffs (for non-members). Cooperatives may operate locally or across a wider geographical area.

> *Ecopower is the prime example of an energy cooperative in Belgium. Operating for three decades, now with more than 40,000 customers corresponding to 1.5% of the Flemish household market, it has generated 900 million kWh of green power and received 100 million euros in investments.*

The Community prosumerism model describes a group of local citizens who join together to acquire energy assets under special financing conditions, thus gaining dimensions to participate in the flexibility markets, collective energy efficiency initiatives, or local energy markets. By joining communities, prosumers increase their negotiating power with external

parties on trading conditions. In initiatives that include energy generation or storage, this can be organized collectively through (small-scale) centralized energy installations or individually through, for example, private solar roofs. Long-term power purchasing agreements are often jointly established between community members and energy companies, who purchase surplus generation and supply prosumers with the remaining power they may need. However, all the transactions may also remain within the community boundaries in local energy markets. Revenues from selling surplus energy locally or to the grid can be distributed to the prosumers directly or reinvested in the community.

> *The Salvin community in Denmark is based on community prosumerism. The energy systems were installed, and energy efficiency measures were implemented to enhance the efficient use of energy. The project aims to scale up the power to 1.5 MWp involving more than 250 households as co-owners of the facilities.*

Local energy markets are closely related to community prosumerism, with the difference that all transactions happen are conducted within community boundaries through peer-to-peer trading. Despite its name, the members of local energy markets may also be physically distant and operate virtually. Trading in local energy markets takes place on a dedicated platform where the trading conditions are negotiated directly between the market participants or through intermediaries who act as trading facilitators. Revenues may be distributed between all the market participants, not only the prosumers. The benefit of local energy markets based on proximity is that they often do not need to pay fees for their unused upstream distribution and transmission networks.

> *Farmivirta is an energy company initiated virtual local energy market in Finland. It enables small-scale energy producers to sell energy directly to customers at a price the producers themselves can determine. In 2017, 10 million kWh of energy was sold through Farmivirta*.

Community collective generation initiatives are based on collective energy generation or storage systems installed on or near the consumption sites, often multi-tenancy buildings. The communities must decide how the generated energy and potential profits from the sales are distributed. Local regulation also plays a vital role in energy distribution, for example, by determining whether surplus energy can be fed to the grid.

> *Solar Roof is the example of community collective generation in Bulgaria. Consumers initiated the process to develop a community project with an overall capacity of 28 kWp. The project generates roughly 35MWh, meeting 5–7% of the energy consumption need of the building.*

Third-party sponsored communities are initiatives strongly supported or driven by external parties, such as utilities or energy technology companies. These external parties often maintain ownership of the assets, make investment decisions, and take governance responsibilities, but local community representatives are in some way involved in the decision-making processes. Community members make long-term power purchasing agreements with the sponsor. When communities are sponsored by a utility company that owns several energy projects, it is typical to employ a pool-and-sleeve method. This supplies energy from a larger geographical area to the community members. When the sponsors are non-profit organizations or social entrepreneurs, energy is often produced more locally, community members more engaged with project development, and the revenues invested back into the community.

Rented solar panels are a third-party sponsored type of initiative launched by Helen energy in Finland. Consumers can choose the panels at one of the designated sites. The power produced by the panels is credited to consumers' overall electricity bill.

The community flexible aggregation model does not include energy generation but is based on communities providing fixed amounts of flexibility to the grid by changing their consumption patterns. Traditionally, the business model has been directed to commercial customers, and only recently applied in the community context. Community flexible aggregation may take the form of a dispatchable program, where the external operator can control members' appliances during peak periods to control the load, or a non-dispatchable program, where the members' consumption is altered through dynamic pricing signals.

Smart Otaniemi is an example of an aggregator business pilot in Finland. The solution offers EV charging aggregation, a Building automation interface, and Direct interface for big loads.

Community ESCO (community-based energy service company) is a model in which external companies partner with communities to provide energy services, for example, energy audits and energy efficiency improvements, or to engage in renewable energy supply (often combined heat and power). The business model enables citizens to acquire energy-as-a-service – they can become prosumers while the ESCO is in charge of the finance, installation, maintenance, and upstream supply. The ESCO's remuneration is solely dependent on energy savings on the customers' side. Although the community ESCO holds the decision-making power, local community members are deeply involved in the processes.

Chase Community Solar in the UK is an example of a Community ESCO. Solar panels and technical setup are installed in a locality to maximize benefits from local PV generation, energy storage, and smart solutions.

E-mobility cooperatives focus on changing transportation behavior and consumption patterns by offering car-sharing or car-pooling services. In addition to low-carbon transport, e-mobility cooperatives can offer grid flexibility through grid-connected energy storage solutions (smart charging schemes). The business model is often combined with community collective generation or community prosumerism.

Sam Mobilitat serves as an example of e-mobile cooperatives launched in Spain. It aims to offer its customers rental services for car-sharing and mobility. The vehicles used are owned by different groups such as individuals, enterprises, and public institutions.

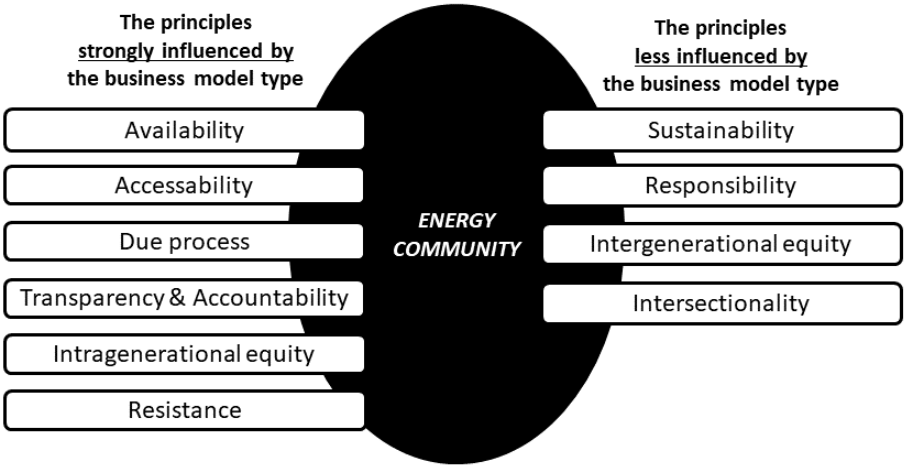
In addition to the archetypes adapted from Reis et al. (2021), we underscore the support that intermediary organizations and digital platforms can provide to those business models. The two main forms of intermediation relate to knowledge-sharing and finance, which are central resources for successful community energy investments and operations. Intermediary organizations, such as consultancy companies, non-governmental organizations, and public institutions can provide energy communities with, for example, practical knowledge and legal expertise to realize projects and facilitate networking between community groups, as well as other resources. Crowdfunding platforms operate as a vehicle to realize community energy investments. By facilitating distributed digital communities, they pool financial resources and form citizen groups around potential renewable energy projects. Knowledge-based digital services provide peer assistance

throughout renewable energy projects' lifecycle, from pre-installation initial information search to everyday operations and maintenance. This type of support may be central to all the aforementioned energy community business models. The eight community energy business model archetypes by Reis et al. illustrate the multiple ways and logics with which energy communities may operate, and how varyingly the concept of community manifests in different energy community business models. The business model typically defines the role of the community in a larger energy system, and how benefits and costs are divided between the business ecosystem actors.

3. Analysis of energy community business models in terms of energy justice

Energy communities can be regarded as a bottom-up approach to the enactment of energy justice, where citizens actively strive to realize aspects of such justice on their own terms (Forman, 2017). However, given that there are multiple energy community business models, how they impact energy justice principles also varies. In this section, we observe and analyze the different energy community business models from the perspective of the energy justice principles. The central question is whether and how a business model improves or hinders each energy justice principle. In the analysis, we attempt to consider energy justice issues at the energy system level in the broader societal context (cf. Bommel & Höffken, 2022). As there are several potential issues within each energy justice principle, we have not conducted an exhaustive analysis of all perspectives but focused on a few key perspectives.
The section is in two parts. Part one discusses the energy justice principles that, according to our reflective analysis, are strongly influenced by the business model type. Part two discusses the energy justice principles that are less influenced by the type of business model the energy communities have adopted. The analysis is more generic, at the level of energy communities overall. Our division of the ten energy justice principles into two different domains generated a new conceptual framework, for energy justice principles in the context of energy community business models. The framework is presented in Figure 1.

Figure 1. Conceptual framework of energy justice in the context of energy community business models. The business model type strongly influences the following six energy justice principles: availability, affordability, due process, transparency & accountability, intragenerational equity, resistance. The remaining four principles are less influenced by the business model type.



3.1 Principles strongly influenced by the business model type

Availability is about individuals' ability to secure uninterrupted access to energy. The vast majority of energy community business models rely on local energy generation with the involvement of local actors and stakeholders. For instance, in the case of prosumerism, collective generation and local energy markets, the underlying motivation often relates to improving access to clean energy, fighting energy poverty, lowering energy prices, or minimizing generation-related emissions. These business models increase the share of sustainable energy production and provide additional energy sources that the traditional energy sector would not realize.

Striving for increased energy self-sufficiency at the household or community level has sparked an interest in energy communities. Russia's attack on Ukraine and the resulting spike in energy prices has significantly increased interest in resilient and self-sufficient systems. Citizens who engage with *prosumerism, collective generation, local energy markets,* or even *third-party sponsored communities* can improve the security of their energy supply, but often only up to a certain point. Particularly intermittent sources, such as wind and solar, face challenges in improving supply security, while bioenergy-based solutions have the benefit of securing long-term supply. For example, with the current technology, a solar panel installation in a detached home may be only partially able to provide electricity. Thus, in these business models, connection to the transmission network and the ability to purchase energy outside the community are essential to secure constant availability.

By becoming prosumers, citizens can directly contribute to the availability of renewable energy for their own use, and collective generation can provide renewable energy for housing associations and their members. Likewise, when energy generation exceeds members' needs, excess energy can be transmitted to the grid, increasing the share of renewable energy in the overall generation mix. Local energy markets are especially good at enabling more people access to renewable energy, for example, citizens who cannot themselves become prosumers. Third-party sponsored service business models can be good for securing access to low-

income communities because they require minimal investment from the community members, as discussed further in the next section.

Through the joint ownership of energy production assets, *energy cooperatives* also contribute directly to energy availability. However, cooperatives are not necessarily tied to a specific location, and the energy produced is supplied directly to the grid. Thus, renewable energy cooperatives do not increase the absolute amount of energy available, but specifically the share of renewable energy by keeping non-renewable energy generation, such as coal-fired power plants, better at bay. Energy cooperatives are the most common form of energy communities in Europe, and also have the most considerable cumulative effect of all the business models.

Prosumerism, collective generation, local energy markets, and third-party sponsored communities currently contribute primarily to improved energy availability in the local context, impacting both the quantity and quality of energy. In contrast, cooperatives have a more substantial impact on the quality of energy produced at the regional and national level. The rest of the energy community business models – *ESCOs, flexible aggregation, and e-mobility* – indirectly contribute to energy availability by modifying consumption patterns and flattening spikes in energy demand. Thus, these business models help to assure sufficient energy availability throughout the day, and decrease the need to use non-renewable energy sources to meet peak demand, much like energy cooperatives.

It must be noted that energy communities can be crucial to enabling small and underprivileged segments of society access to uninterrupted energy supplies (Bouzarovski et al., 2020). Regarding energy availability, especially in local energy markets, one central issue is thus the "responsibilization" of citizens – shifting responsibilities from the state to individuals (Argüelles et al., 2017). It could be argued that an individual's energy access should not be solely dependent on energy community projects that require substantial financial and immaterial resources of citizens. The market's inability to provide equal access to energy should perhaps be resolved at the institutional level, not by community groups. Although local energy markets can be crucial to guaranteeing access to energy resources in remote locations, should public institutions take responsibility for realizing these projects? The 'responsibilization' issue also applies in the context of renewable energy. In the EU, energy communities are officially recognized as one of the measures to deliver the energy transition. The Clean energy for all Europeans report presents estimates that by 2030, energy communities could own 17% of installed wind capacity and 21% of solar, and by 2050 half of EU households could be energy producers (European Commission, 2019). But in emphasizing the energy communities this way, is the Union shifting part of governments' responsibilities to ordinary citizens?

Affordability. The promise of more affordable energy is a typical motivation for citizens to get involved in energy communities. However, to join in, citizens are required by most energy community business models to commit financial investment. The affordability of different business models has temporal, economic, and risk-related trade-offs.

In *community prosumerism*, joint purchasing enables members to pay a lower price for energy generation technology. However, they still need to make substantial financial investments upfront, as renewable energy technologies have long payback periods. Energy technology companies may also offer communities alternative payment arrangements, or

citizens can seek low interest loans from the financial sector, which decreases the required upfront capital. Prosumer communities that provide members with alternative financing options for lower upfront capital inputs are more accessible and affordable. However, what citizens are allowed to do with the energy they produce also matters. Legislation that enables prosumers to sell excess energy to the grid with no or minimal transaction fees is fundamental to small-scale solar energy production's profitability. Studies have also found that net metering can provide around a third more financial savings for a prosumer than gross metering (Auvinen et al., 2020), which is in the hands of the network company and not the community members. The affordability of community prosumerism is, thus, dependent on national legislation, location, and the metering practices in place.

Consequently, participating in *local energy markets* as a prosumer has the same financial considerations as in the community prosumer business model, but joining as a sole energy user is different. Local market energy prices can vary tremendously and exceed the average. Therefore, purchasing energy outside the community's borders through a grid connection is crucial to ensure affordability.

For energy *cooperatives*, gaining membership often requires citizens to buy shares in the cooperative. Members benefit through more stable energy prices or profit from energy sales, improving long-term energy affordability. In community *collective generation*, projects can be financed directly by the community members or through a housing association. Cooperatives and community generation may be more accessible as they allow small investments, whereas prosumerism requires individual households to make a more significant investment in a complete standalone system. The financial viability of all the business models for energy generation activities at the local level, including collective generation, is highly dependent on regulations that allow members to distribute electricity without fees and taxes (Auvinen et al., 2020).

Third-party sponsored service business models reduce the need for upfront capital investments but require a long-term power purchase agreement between businesses and communities (F.G. Reis et al., 2021). Affordability in the long term is highly case specific, and members are not in receipt of any additional profit, since they neither own nor operate the energy generation system. Long-term power purchase agreements carry the risk of communities overpaying for their energy, but supply stability can also positively influence affordability.

A *Community ESCO* influences affordability by decreasing its members' energy demand through energy efficiency measures or enabling them to become prosumers with an energy-as-a-service contract, where the technology is owned and operated by the company. The efficiency measures may require additional upfront costs from the citizens. In ESCO business models, citizens typically benefit from an immediate cost reduction in their monthly energy bills. The investment in energy efficiency and energy savings benefits both the ESCO and involved community members. In other words, this model is highly affordable for members, both in terms of required investments and energy use.

With *flexible generation*, communities can get cheaper energy prices if they provide additional flexibility to the grid according to the contract terms. However, in the model based on price signals, if households cannot adjust their energy use accordingly, they may face higher energy prices for using energy at the 'wrong' time. *E-mobility* business models such as

car sharing can substantially decrease the energy needed to fulfil your transportation needs, thus impacting affordability.

In energy community projects, a wide-scale diffusion of the concept eventually replaces other traditional ways of generating, distributing and using energy. In the energy market, a new balance also influences other actors in the system. Positive affordability of community energy may decay energy affordability elsewhere in the system. For example, when decentralized community geothermal heating is scaled up, the profitability of district heating solutions decreases, and the affordability of energy to those not involved with energy communities may be negatively impacted.

In the long run, what may influence affordability is how much risk the individual or the community takes or needs to take in order to realize an energy project or become a member thereof. Energy community projects may be realized in collaboration with the private sector through a shared ownership model to distribute risks (Goedkoop & Devine-Wright, 2016). This ownership model may boost citizens' confidence in community projects. However, this aspect partially conflicts with the general aspiration that the community should decide on energy projects that concern them – the degree of financial risk taken by an actor often correlates with their decision-making power (Goedkoop & Devine-Wright, 2016). Thus, private actors often drown out the community voices in shared ownership projects.

Due process. Energy community initiatives should pay closer attention to observing due process throughout the project lifecycle, as an inclusive and participatory approach can enable the sustainable operationalization of community initiatives. All relevant actors and stakeholders should have the possibility to participate in the decision-making process. Similarly, careful attention should be paid to the impact assessment process, remedies and compensation mechanisms, and access to arbitration and grievance mechanisms.

Business models based on location and led by community groups – *prosumerism, collective generation, by-community local energy markets,* and *by-community cooperatives (including e-mobility)* – have perhaps a better point of departure to establish such due process practices. Due process may be more inherent to the whole community initiative logic, as initiating and realizing energy projects will likely automatically involve many actors, most notably the community members themselves. However, this is not self-evident, as community-led projects can also be governed by a small, exclusive group of people. In most cases, community groups should also seek external expertise to execute projects professionally, and when collaborating with companies ensure the realization of good and fair contract terms. It can be crucial to engage professional services, for example, financial management, project planning, or generating legal contracts, to ensure the fairness of the whole process and avoid unexpected expenses.

Company managed projects are prone to neglect the voices of the community members. A study on shared ownership energy projects in the UK found that the community actors felt they were only engaged in the process at a late stage (Goedkoop & Devine-Wright, 2016). This notion highlights the importance of establishing a good governance mechanism, and project design, that encourage the participation of all parties, especially for projects led by external parties – *externally-led local energy markets and cooperatives (including e-mobility), third-party sponsored communities, flexible aggregation, and community ESCOs.* However, it must be noted that the organization of company driven energy community projects is inherently professional. The due process protocols might therefore be more robust

in certain project activities, such as participatory workshops. Involving the communities in the decision-making process helps ensure the righteousness of remedies and compensation mechanisms. Still, these projects could also seek external advice from specific non-profit organizations or intermediaries.

Transparency and accountability propose that initiatives should be democratic, transparent, and inclusive for the energy community members. How different actors and stakeholders can access important information, such as revenues, costs, and policies, can be seen as a measurement of good governance that can minimize corruption and ensure fair processes (Sovacool & Dworkin, 2015). The principle is very closely related to due process.

In *prosumerism, collective generation, community-led local energy markets, and community-led cooperatives (including e-mobility),* the decision-making power lies in the hands of the local members, and information is often shared openly. Due to the low hierarchy, communication channels are personal and direct, making it relatively easy for members to communicate and access information. However, it is possible that the lack of professionalization in these initiatives, as referred to in the 'due process' discussion, can also hinder the accumulation of and access to information; for example, if the information is not systematically gathered and stored anywhere, or the decision-making processes are not clear and well-documented.

In business models run by external parties, the community members may not have direct access to information. *Externally-led local markets and cooperatives (including e-mobility), third-party sponsored communities*, *flexible aggregation,* and community *ESCOs* should ensure information is openly available and actively shared with the members. Here, we see the advantages that may accrue from project professionalization, as the companies can, for example, be accustomed to utilizing information channels.

Intragenerational equity is discussed in three contexts: which communities can set up energy community projects, who can participate in energy communities, and how benefits and potential adverse effects are distributed among the members and non-members. Communities are different, and their capabilities vary, which directly influences their opportunities to engage with energy communities. Energy-vulnerable groups are often excluded from shaping the energy transition (Bouzarovski et al., 2020). For example, energy cooperatives tend to develop in areas that perform better on social cohesion (Lode et al., 2022). This is likely because energy community projects rely heavily on community members' time, expertise, and access to finance (Park, 2012)[5]. From this perspective, business models that include external organizations supporting the community to realize a project, offering both expertise and finance, may be more inclusive and advance the equal distribution of opportunities. This factor is inherent to *third-party sponsored, externally-led cooperatives (including e-mobility), flexible aggregation,* and *ESCOs.* In the rest of the business models, the involvement of external parties is not pre-determined. Intermediaries can play a crucial role as support organizations, especially for community-led energy projects. However, to ensure equal opportunities, acquiring their services should be financed

[5] A community must, for example, have the capacities to apply for funding and meet its requirements, which may include previous expertise in such projects. Where there are community energy grant schemes to ease financing, they may not cover all the project costs or only reimburse the members once projects have been executed (Park, 2012).

by public institutions and not the energy community projects themselves. Fostering networking between communities and other partners to share skills and resources, provide workshops, and share information on external resources, can encourage broader community participation (Park, 2012), and be performed by intermediaries.

The ability to participate in an energy community at the individual level is often a question of money and time. As money is already discussed under the affordability principle, we focus now solely on time. Several studies have concluded that access to energy communities often depends on who has spare time to 'donate' or specific expertise (Feenstra & Hanke, 2021). Therefore, business models that require active participation are likely to be the most exclusive. Research has found that men are still participating more than women in local energy initiatives, and are over-represented as prosumers (Standal et al., 2018, 2019)[6]. *Prosumerism* is among the business model types that require the most work and dedication from their members. Although energy technology purchases are made jointly, there are several issues to resolve and decisions to be taken by members at the household level. And to maximize the profitability of their investment, prosumers need to actively track the performance of the energy technology and monitor their energy use. The *flexible aggregation* business model also requires excess time, as it is wholly based on the members' ability and willingness to change their energy consumption patterns. From the time perspective, *third-party sponsored communities, energy cooperatives (including e-mobility), ESCOs (especially the energy-as-a-service model),* and *community collective generation* require perhaps the least active participation on the part of the ordinary members who do not have a specific organizational function in the project[7].

Energy community business models can have several benefits but also adverse side effects, both within and outside the community. The distribution of these impacts is a critical determinant of the fairness of the business model. When community groups and non-profit supporting organizations are not the sole parties realizing energy community business models, there is always the matter of whether the financial benefits are distributed evenly to the community[8]. The question of fairness also relates to whether local citizens affected by certain energy installations are able to get preferential treatment and more favorable terms for share purchases (Goedkoop & Devine-Wright, 2016). There are often some negative externalities stemming from the realization of large-scale energy projects to the local environment, such as noise, visual pollution, or decrease in property values. Thus, non-members who live nearby should be compensated for having to bear these adverse effects, for example, in the case of wind energy installations (Westlund & Wilhelmsson, 2021). Energy *cooperatives* or *third-party sponsored communities* that operate virtual power plants, where

[6] Social inequalities significantly hamper women's capabilities to participate in energy community projects. Feenstra & Hanke elaborated that although energy communities are theoretically open to all members without discrimination, women's ability to participate is limited by other household duties and the resulting lack of time (2021).

[7] In addition, citizens participating in local energy markets as sole energy buyers have limited participation requirements.

[8] In at least Denmark, Belgium, and one German state, legislation exists that obliges commercial wind energy developers to share a certain percentage of the value of their project with the local community (Goedkoop & Devine-Wright, 2016). This practically enforces commercial projects as community energy projects with a shared ownership structure.

community members do not necessarily live nearby the energy production facility, are especially prone to neglecting local non-member citizens[9]. The other energy community business models do not appear to be constrained by such substantial issues related to the distribution of benefits to citizens at the locale, and any negative externalities in play. These business models are based on location; therefore, the beneficiaries are also those impacted by the energy installations[10].

We should not neglect substantial negative social and environmental impacts downstream of the most renewable energy technologies' supply chains. Community-led energy projects in particular have minimal capacity to influence serious justice concerns, such as child labor, human rights violations, and environmental degradation in, for instance, the Republic of Congo's cobalt industry or China's photovoltaic industry. In step with any other modern, responsible business, energy community projects should seek to minimize their adverse impacts along the supply chain, for example, by purchasing energy technology with trusted sustainability certificates.

Resistance refers to an individual's ability to stand up to injustices and question unjust and oppressive practices that violate the energy justice principles. Overall, by offering a new way for citizens to participate in the energy system, it could be argued that all energy communities foster energy activism. Again, however, we see differences emerging between the business models that have been realized by communities and by companies.

Energy community business models realized by communities can improve avenues for resistance amongst the member citizens, including prosumerism, community collective generation, and by-community local energy markets and cooperatives. These business models strengthen community resistance by democratizing the energy system, and giving local communities more power in energy-related decision-making. In this regard, the community-led business models can be seen as a form of resistance to energy monopolies. For instance, in the case of prosumerism, the process tends to increase the knowledge, understanding and abilities of members to use and set up independent energy systems (Juntunen, 2014). This capacity-building improves citizens ability to resist by inculcating confidence and encouraging members to engage in endeavors that can lead to self-sufficiency and autonomy.

Table 2a. Summary of how the different energy community business models influence the energy justice principles of availability, affordability, and intragenerational equity.
(+ = positive impact, - = negative impacts, +/- = neutral impact/consideration)

	Availability	**Affordability**	**Intragenerational equity**

[9] An example of such a case is the development of two community solar PV farms in the deprived area of Lawrence Weston (Bristol) in the UK. The local community initially opposed the projects as they were not benefitting from the developments. According to Lacey-Barnacle, for energy justice to be realized in the spatial context, where energy infrastructures are deployed in deprived areas such as Lawrence Weston, the locale must be allowed to benefit from those infrastructures and be included in the process (Lacey-Barnacle, 2020).

[10] This is of course highly dependent on the 'due process' and 'transparency & accountability' principles – whether the locale has been included and heard in the decision-making process.

Community prosumerism	+ Energy security at the household level + Access to renewable energy for households' own use + The share of renewable energy in the grid (if supplied)	- Substantial upfront investment with long payback periods + Members get energy generation technology at lower prices +/- Profitability dependent on legislation	- Equal opportunities between communities: Knowledge and financial support are not self-evident and might come with additional costs - Equal opportunities between individuals: Requires substantial time and expertise to set up
Community collective generation	+ Energy security at the community level + Access to renewable energy for housing associations or individual use	+ Relatively small investment compared to prosumerism + More stable energy prices + Profit from energy sales	- Equal opportunities between communities: Knowledge and financial support are not self-evident and might come with additional costs + Equal opportunities between individuals: Does not require active participation
Local energy markets	+ Energy security at the community level + Access to renewable energy for your own and other community members' use + Energy access for vulnerable communities - Security of energy supply in a completely closed local market	+/- For energy producers, the same considerations as for prosumerism apply - For energy users, connection to the grid is important to secure the ability to purchase energy outside	For community-led local energy markets: *The same considerations apply to energy consumers as for community collective generation, and the same considerations apply to prosuming parties as for community prosumerism* For externally-led local energy markets: + Equal opportunities between communities: External organizations provide the marketplace and expertise
Energy cooperatives	+ The share of renewable energy in the grid + Access to renewable energy at the community level	+/- Relatively small investment compared to prosumerism + More stable energy prices + Profit from energy sales	- Distribution of impacts: Neglect of local (non-member) citizens; division of financial profits For community-led cooperatives: *The same additional considerations apply as for community collective generation* For externally-led cooperatives: *The same additional considerations apply as for third-party sponsored communities*
Third-party sponsored communities	+ Energy security at the community level + Access to renewable energy at the community level	+ Reduced need for upfront investments - No additional profits for the citizens - Risk of overpaying for energy with long-term power purchasing agreements	+ Equal opportunities between communities: External organizations provide expertise and financial support for communities to realize projects + Equal opportunities between individuals: Does not require active participation - Distribution of impacts: Neglect of local (non-member) citizens
Community flexible aggregation	+ Availability of energy from the grid throughout the day + The share of renewable energy in the grid	+ Reduced energy bills - Risk of higher energy bills (in the price-signal model)	+ Equal opportunities between communities: External organizations provide expertise and financial support for communities to realize projects - Equal opportunities between individuals: Requires substantial time and ability to change consumption patterns
Community ESCO	+ Availability of energy in the grid + Share of renewable energy in the grid or for members' use (in the energy-as-a-service model)	+ Reduced energy bills + No or minimal investments needed + Cheaper renewable energy (in the energy-as-a-service model) - No additional profits for the citizens	+ Equal opportunities between communities: External organizations provide expertise and financial support for communities to realize projects + Equal opportunities between individuals: Does not require active participation (in the energy-as-a-service model)
E-mobility cooperatives	+ Availability of energy in the grid + Share of renewable energy in the grid	+ Reduced energy bills	- Distribution of impacts: Neglect of local (non-member) citizens For community-led cooperatives: *The same additional considerations apply as for community collective generation* For externally-led cooperatives: *The same additional considerations apply as for third-party sponsored communities*

Table 2b. Summary of how the different energy community business models influence the energy justice principles of due process, transparency & accountability, and resistance.
(+ = positive impact, - = negative impacts, +/- = neutral impact/consideration)

<table>
<tr><th></th><th>Due process</th><th>Transparency & Accountability</th><th>Resistance</th></tr>
<tr><td>Community prosumerism</td><td rowspan="2">+ Involvement of a diverse set of actors, notably community members
+/- Requires professional execution of projects (e.g., planning and contracts)</td><td rowspan="2">+ Low hierarchy enables open and direct communication and information flow
+/- Requires professional execution of projects (e.g., documentation)</td><td rowspan="2">+ Foster energy activism
+ Give citizens more power in energy-related decision-making</td></tr>
<tr><td>Community collective generation</td></tr>
<tr><td>Local energy markets</td><td colspan="3">For community-led local energy markets: The same considerations apply as for community collective generation
For externally-led local energy markets: The same considerations apply as for third-party sponsored communities</td></tr>
<tr><td>Energy cooperatives</td><td colspan="3">For community-led energy cooperatives: The same considerations apply as for community collective generation
For externally-led energy cooperatives: The same considerations apply as for third-party sponsored communities</td></tr>
<tr><td>Third-party sponsored communities</td><td rowspan="3">- Prone to neglect community voices
+/- Potential for robust processes and protocols (e.g. participatory workshops)</td><td rowspan="3">- Information may not be accessible and actively shared
+/- Potential for robust processes and protocols (e.g. information channels)</td><td rowspan="3">+ Foster energy activism</td></tr>
<tr><td>Community flexible aggregation</td></tr>
<tr><td>Community ESCO</td></tr>
<tr><td>E-mobility cooperatives</td><td colspan="3">For community-led energy cooperatives: The same considerations apply as for community collective generation
For externally-led energy cooperatives: The same considerations apply as for third-party sponsored communities</td></tr>
</table>

3.2 Principles less influenced by the business model type

Sustainability is a common motivation for the establishment of energy communities. According to our thinking, the sustainability principle is not influenced by the choice of business model per se, but that of technology and related configurations. Energy communities increase the share of decentralized energy generation from local energy sources. Although those sources can also refer to non-renewables, such as peat or coal, energy communities are primarily associated with renewables, such as wind, solar or biomass. The use of renewable energy sources decreases carbon emissions related to energy production, which is essential to prevent global warming running at a rate linked to a rise in temperature beyond the 2 degrees Celsius level. The increased utilization of renewables reduces dependence on depletable conventional hydrocarbons, and the environmental depletion associated with drilling and fracking. In addition to these direct effects, energy communities stimulate long-lasting changes in energy consumption patterns and behaviors. The projects increase environmental awareness and knowledge of decentralized renewable energy generation among community members and external parties alike (Rogers et al., 2008). Moreover, they can contribute to capacity building and skills development, stimulating innovations in the cleantech sector to improve efficiencies and eliminate bottlenecks, in order to foster the energy transition.
Intergenerational equity refers to addressing the energy needs of the present generation without compromising the ability of future generations to meet their needs. Energy communities strengthen intergenerational equity by promoting sustainability, as discussed earlier, and thus the principle is not affected by the choice of business model. The use of

renewable energy sources inherently supports intergenerational equity, as the renewable energy reserves are infinite[11] , and the environmental externalities related to production and consumption are less devastating than with fossil fuels. Also, reducing dependence on traditional fuels prolongs the fossil reserves, making it possible for future generations to utilize these finite resources, if necessary.

Responsibility deals with protecting the environment and mitigating the negative impacts of energy generation and consumption. Different actors and stakeholders can undertake measures to minimize negative externalities, and positively influence the environment and citizenry. Energy communities can achieve this by considering sustainability principles throughout the project lifecycle, including choices related to materials and fuel sources, and establishing partnerships and collaborations that promote and enable preservation. Thus, we do not see the business model type having a significant influence on the responsibility principle.

Intersectionality should be inherent to all nine energy justice principles presented earlier. As energy communities operate locally, they should be aware of how their energy activities influence different social issues and people, especially underprivileged and marginalized groups. Gender, race, sexuality, religion, disability, or language identities, for example, can alone or in combination disproportionately impact individuals and their abilities to engage in energy activities (Sovacool et al., 2017). For example, due to the prevailing social structures, it is typical for men to initiate energy projects in households but for women to do the practical work (Standal et al., 2019). These disproportionate impacts are often neglected in energy-related businesses, and, thus, intersectional business design approaches should also be applied in energy community projects.

4. Discussion

Conventional energy systems have long remained under the influence of large entities in charge of energy generation and transmission. At the same time, ordinary citizens have remained disenfranchised, and their participation limited only to consumption. The development of decentralized energy systems and energy communities offers the potential to make energy issues more indigenous, participatory, inclusive, transparent, accessible, and affordable. Energy communities are often seen as a potential means to transform energy systems by facilitating the use of sustainable energy sources, addressing energy poverty, improving energy access, strengthening energy security, and providing consumers with the opportunity to take an active role in energy generation and transmission.

The possibility of forming and operating your own energy systems through collective initiatives strengthens people and their role in the energy system. However, widespread positive change cannot be achieved until these initiatives are enacted with the logic that they create value for all stakeholders involved or impacted in the process. It is often assumed that the development of energy communities can meet these challenges and the issues that have plagued conventional energy systems. However, in reality, the process and outcomes of energy communities vary significantly. We need to understand the inherent fundamentals of

[11] It must however be noted that renewable energy generation requires a lot of materials, many of which are rare earth elements for which there is a limited supply.

different energy community business models, and how they impact the development of a more just way of producing and consuming energy.

The purpose of this chapter, and our conceptual assessment of how the energy justice principles are exhibited in the different energy community business models presented, is to spark more focused research on just energy community business models. It is imperative for just energy transition that energy community business models are seriously assessed and considered in terms of the justice principles. Our assessment leans on the previous research, with the additional analysis of energy community business models and their impact on energy justice.

The energy community business models can advance the principles of energy justice. However, the real potential and the actual contribution of the business models on the ground cannot be attained unless the process is enacted in a just manner. Energy communities in themselves do not inherently lead to just or democratic outcomes. Bringing different actors and stakeholders together, setting up the infrastructure, and forming energy communities is only one part of the mix. There need to be operational routines, governing principles, and business models put in place that are inclusive, democratic, and participatory to further accelerate the development and acceptability of energy communities.

At the early stages of the analysis, we realized that the choice of a business model did not directly influence all the energy justice principles. Therefore, we distinguished between two energy principle groups – those strongly influenced by the business model type, and those that the business model type had less influence on. The business model types lead to different energy justice outcomes in terms of availability, affordability, due process, transparency & accountability, intragenerational equity, and resistance.

The energy community business models can be categorized according to the extent to which they are open and participatory, and how strongly they are connected to the community members and ensure their involvement. We can differentiate here between **community-led** and **externally-led** business models. The community-led models operate on community logic, including community prosumerism and collective generation. Externally-led business models operate either on commercial or non-profit logic. These models include community ESCO, third-party sponsored communities, and community flexible aggregation. Local energy markets and cooperatives can fall into either category, being either community or externally-led.

The community-led business models are better aligned to meet the energy justice principles of due process and transparency & accountability. Additionally, they can positively contribute to improving the availability of renewable energy and energy security locally. The citizens' direct involvement and close affiliation to these business models ensures that members can actively participate in the community's affairs, and play a role in the decision-making processes. However, to ensure the long-term success and functioning of the communities, they must often avail themselves of professional organizations' services for assistance in financial and managerial matters, if needed. This support can help communities ensure financial and technical resources are well managed, and that the energy community project can fulfil its desired outcomes. Perhaps surprisingly, the community-led business models did not measure up well in terms of affordability and intragenerational equity. The models required substantial commitment from the members, financially and timewise, and thus remained rather exclusive. It is important to pay closer attention to these two principles

in the business model design, to improve the social equity of the community-led business models. The digital platforms, dispersed knowledge-based communities, and intermediary organizations are all essential to supporting community-led business models to positively impact energy justice. Especially platforms that facilitate knowledge-sharing can be crucial to fostering inclusion and equal opportunities between communities. Thus, these support organizations and platforms play a fundamental role in promoting just energy communities.
It is somewhat easier for the externally-led business models to ensure positive impacts on the principles of affordability and intragenerational equity. These projects often have hierarchical structures and professionalized practices. Since an external group is in charge of enacting projects and taking financial risks, these business models decrease the responsibility and risk of ordinary citizens over the energy supply. The models also positively contribute, most notably to improving the availability of renewable energy in the energy markets. However, caution must be maintained on the principles of due process, and transparency & accountability. The externally-led business models can be less democratic, disregarding the voices of small and marginalized groups, and making participation less inclusive for its members and stakeholders. Therefore, it becomes imperative that the external parties ensure information availability and accessibility, foster participatory and inclusive decision-making processes, and align the operations with community initiatives' core values and principles. They should also pay closer attention to compensation and remedies.
Additionally, it is essential to highlight that energy communities positively contribute to the principles of sustainability, intergenerational equity, and responsibility. The impact is irrespective of business model type. Intersectionality, on the other hand, is regarded more as a design approach that is not inherent to energy communities but should be incorporated into all the business models, as well as the analysis of other energy principles (e.g., intersectional thinking in energy poverty).
Our work has some energy policy implications. During the last two decades, energy policies around the world have shifted from quantity- and cost-driven policies toward climate change mitigation-related policies. These have predominantly focused on technology and economic dimensions to support the energy transition. Interventions that focus on changing power relations, social injustices, or matters of due process are less visible. Climate change requires prompt actions, and energy policy should support those actions. At the same time, we need policies that enable sustainable energy transitions and can mobilize citizen groups to take collective action. In doing so, we need to be sensitive to possible trade-offs between the speed of transition (Newell et al., 2022), performance-related targets such as cost or scale of diffusion, and the social justice-related targets. Market liberalization, where trading principles are enabled for communities (e.g., taxation, fees), is a particularly relevant area for regulation in the energy community realm.
On the other hand, it is necessary to remain vigilant on how businesses around energy communities emerge. The rules and regulations are just about emerging, and issues such as maintaining the freedom to join or leave communities (contractual regulation), and facilitating the inclusivity of different socio-economic groups must be incorporated into the policy agendas. Overall, policies need to address how to dismantle current unbeneficial technology and business-related lock-ins, prevent new lock-ins from emerging, and at the same time foster the energy justice principles.

There are some limitations that should be considered while formulating interpretations and generalizations. First, it is essential to note that energy justice is a complex and multifaceted phenomenon influenced by various social, economic, ecological, and political factors, as well as the regional and national landscape, which transcend a single energy community initiative or business model type. Thus, it is challenging to comprehensively map the actualization and implications of energy community business models for energy justice. Second, this chapter is based on a literature review of extant energy community initiatives that have been implemented in different contexts. The analysis is based on evidence that may not have explicitly considered the (systemic) issues of energy justice. We therefore suggest that future research collects more empirical data, incorporating energy justice lenses to strengthen scholarship on this topic. Third, the study has included eight energy community business model archetypes, which are somewhat loose, high-level categories. In practice, there are many different types of model that communities have adopted, mixing various aspects of different business models, adopting hybrid approaches, or localizing these to better suit the communities' needs. This also makes it challenging to produce overarching generalizations on the findings. More empirical research to compare and contrast different business model applications under different contexts is needed to gain novel insights.

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