

Beyond profits

An exploration of energy commoning practices in local energy communities

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Abstract: *The future of both societal and climate resilience is uncertain. Each faces growing pressures that are deeply interconnected. As climate crisis intensifies, its consequences extend far beyond environmental degradation. Rising temperatures and extreme weather events now coincide with growing inequalities and distrust in democratic institutions. Regarding climate crisis, the energy transition is a central undertaking for reaching climate neutrality amongst various sectors, i.e. industry, housing, and mobility. Within this extensive transformation the ways in which energy is consumed, produced, and distributed will undergo drastic change. In context of growing instability, distrust, and inequality there is a need for viable pathways to adapt and change the existing energy system while making it more resilient, equitable, and inclusive. Empowering citizens and fostering their participation in the energy transition can not only advance the transformation but also strengthen democratic values and a sense of efficacy amongst individuals and communities. The concept of energy commoning offers a lens to explore the transformative capacities of collective energy initiatives. Energy commoning refers to practice-related activities and values along the line of production, distribution, and consumption of renewable energy. To gain a deeper understanding of the concept, this study examines energy communities as sites of energy commoning. By exploring the practices associated with commoning within these communities, the discussion gains both practical grounding and valuable insights into how energy commoning can contribute to more equitable and socially sustainable futures.*

1. From Eroding Confidence to Collective Action

Democracies around the world appear to be under pressure as trust in representative institutions declines (Valgarðsson et al., 2025, 18–20). In Germany, recent empirical studies underscore a troubling erosion of societal confidence in the capacity of the government to respond effectively to pressing challenges. Social cohesion and trust in democratic values appear increasingly fragile. The *Mitte-Studie*, published in 2023, describes a population under strain from overlapping crises—such as the COVID-19 pandemic, the Russian invasion of Ukraine, inflation, and climate change—where 42% of the respondents report heightened insecurity and more than half express a retreat toward nationalistic and authoritarian orientations, often accompanied by declining trust and weakened support regarding democratic institutions (Zick, Küpper & Mokros, 2023, 227–30). Moreover, studies have shown that while support for climate protection in Europe and Germany remains high, public confidence in the ability to address climate crisis has dropped significantly (Frick et al., 2025, 4–6).

This growing disconnect between persistent environmental concern and limited trust in the collective ability to take adequate action is particularly evident in the energy transition. The transformation of energy sector faces not only substantial technological and infrastructural challenges, but also social and political hurdles that cannot be overcome by investment in technology alone (Cloke et al., 2017, 263). Top-down measures and profit-driven decision-making harbor the risk of aggravating frustration and undermining the urgency and inclusivity required for rapid transformation. Rather than allowing trust to erode further, there is an urgent need for viable alternative pathways that empower, motivate climate action, and rebuild trust (Apajalahti & Kungl, 2022, 222–3). Those pathways evidently need to address questions of exclusion and inequality. The burdens and responsibilities in context of climate crisis are distributed highly unequally (Chancel et al., 2023). While the global north is not only responsible for a disproportionately large share of global CO₂ emissions it also tends to have greater capacity to shape energy systems and exploit natural resources than the global south. In addition, the consequences of climate change, like flooding and desertification, have a greater impact on the global south (Deivanayagam et al., 2023). Similarly, energy poverty persists as a critical issue, on global as well as regional and local scales. Lower-income communities often face higher energy costs, limited access to clean technologies, and greater vulnerability to price shocks and infrastructural

deficits (Belleflamme, 2018; Chancel et al., 2023). Subsequently, questions of social justice and equitable participation are increasingly recognized as central aspects of a successful energy transition. However, many mainstream approaches to energy transition remain centered on market-based mechanisms or technological innovation; they risk reinforcing existing disparities unless explicitly designed to address them (Cloke et al., 2017, 263–4). No single technology or policy can integrate environmental, social, and economic objectives across all societal groups and system domains. Instead, the complexity and interconnectedness of transformative efforts demands approaches that are dynamic, participatory, and context-sensitive (Sovacool, 2021). There is a consensus across disciplines within the scientific community that the energy transition does not only entail the restructuring of the energy system through technological adaptation and policy changes; it requires multifaceted and decentralized strategies (Bernstein & Hoffmann, 2019; McCauley, et al., 2019; Oliver et al., 2023). Consequently, alternative approaches that move beyond conventional economic paradigms and top-down policies, emphasizing sufficiency, equity, and human wellbeing need to be examined (Vogel & Hickel, 2023, 766).

One promising example of such an approach is the emergence of energy communities, which offer new pathways for more inclusive and participatory energy systems. By providing a form of decentralized and horizontal organization they have the capacity to democratize energy production, distribution, and consumption (Broska et al., 2022). They enable collective action and citizen-led renewable energy systems that allow for the production and provision of energy not as a commodity but as a common resource. The framing of energy as a common resource, that should be accessible and serve the common good has close connections to the concept of energy commons. Unlike market-based models that treat energy as a commodity, the energy commons perspective reimagines energy as a collectively governed resource, foregrounding relational, social, and ecological dimensions over profit maximization (De Angelis, 2017; De Angelis & Harvie, 2014). Beyond considering energy as a common resource, energy communities are also valued for their ability to “[...] increase awareness, knowledge, and intention to adopt low-carbon technologies and other sustainable measures” (Broska et al., 2022, 2). Within this context, the concept of energy commoning can offer a valuable lens for exploring socially and culturally embedded practices performed by energy communities (Brandtner et al., 2023). Energy commoning, understood as a dynamic, ongoing process of collectively managing shared resources, highlights the relational and

practical dimension of energy (Bollier, 2021). It draws attention to how communities organize, negotiate, and sustain collective action, embedding energy transitions within local cultures, values, and everyday practices (Kaandorp et al., 2024). This focus on relationality and practice stands in contrast to purely economic or technocratic approaches, offering a richer, more holistic understanding of what a just and effective energy transition might entail. Moreover, energy commoning extends beyond shared resources and goods, such as means of energy production, distribution infrastructure, and renewable energy itself, that are often referred to as energy commons. The concept of commoning highlights the social connections, cultural practices, and relationships within energy communities, while also embracing diverse ways of knowing, performing, and imagining energy (Cloke et al., 2017, 264). By understanding energy commoning as a transformative practice, it can challenge the status quo and create community-centered alternatives. The collective engagement in commoning practices within energy communities can foster trust and cohesion and empower democratic participation (De Angelis, 2017; Holloway, 2010).

This text aims to explore energy commoning within local energy communities as a promising pathway for local energy transition. By investigating how collective practices shape values, governance, and social relations, it responds to the urgent need to move beyond narrow technological fixes and top-down approaches. The following analysis contributes to the practical understanding of energy commoning, grounding it in real-world cases, focusing on the research question: How do local energy communities engage in energy commoning, and how do these practices influence their shared values and activities? To answer this, the article first lays out the conceptual foundations of energy commons, emphasizing commoning as a dynamic, practice-oriented lens that captures the diverse ways communities collectively manage energy. It then synthesizes theoretical and empirical research from case studies to map the field and identify key themes. Building on these insights, the article proposes an analytical framework to further examine energy commoning and its potential in the energy transition. Ultimately, this work aims to explore how energy commoning can empower citizens, foster social cohesion, and rebuild trust contributing to a more inclusive, democratic, and resilient energy transition capable of addressing effects of both climate and societal crises.

2. From resource-based Commons to relational commoning

This section introduces the evolving concept of energy commons and presents energy commoning as a dynamic lens for exploring energy communities. The notion of energy commons that are neither governed by the market nor controlled top-down by the state can be traced back to Ostrom's (1990/2005) work on common-pool resources (CPR). Her contribution marked a significant development in commons theory addressing the tragedy of the commons and privatization paradigms (Ostrom, 1990/2005). Garrett Hardin's concept of the "tragedy of the commons" describes a world in which individuals, inevitably acting in their own self-interest, exploit shared resources without contributing to their maintenance, ultimately undermining collective outcomes (Hardin, 1968, 1243–8). This view of human behavior and shared resources reinforces the assumption that commons are inherently vulnerable to overuse and mismanagement, thereby requiring oversight and regulation by either a centralized state authority or private entities to ensure their sustainability. Ostrom (1990/2005) opposes this top-down approach by providing empirical evidence from around the world showing that communities can and do successfully self-govern shared resources. However, both Hardin and Ostrom's foundational works conceptualized commons primarily as tangible, often finite resources—such as fisheries, forests, or irrigation systems. This resource-based view, while influential, is limiting: it overlooks the intangible and non-depletable dimensions of commons, such as social relationships, collective processes, and shared knowledge, which are central to the practice of commoning (Brandtner et al., 2023, 920). Ostrom's later work began to address these dimensions, notably with the concept of "knowledge commons" (Hess & Ostrom, 2007, 66–8); however, her frameworks remained anchored in the governance of defined systems.

A broader shift in commons research since the 1990s—sometimes called the "New Commons" (Hess, 2008)—has moved the field beyond natural resources, incorporating digital, urban, and collaborative commons as well as their social and cultural embeddedness. More recent scholars such as De Angelis (2017) have called for a deeper shift—from managing resources to enacting alternative social relations—which signifies a "social turn", emphasizing collective action, cultural embeddedness, and the relational constitution of commons (Bollier & Helfrich, 2012; De Angelis & Harvie, 2014; Linebaugh, 2008). Yet, as Bauwens et al. (2024) note, literature on social or relational commons remains fragmented, and definitions often remain fuzzy. Bollier

(2021, 351) highlights that “[...] a commons consists not just of a resource, but of a community that manages a resource by devising its own rules, traditions, and values [...]”. However, despite this recognition, he continues to anchor the commons in the realm of resources. In contrast, De Angelis and Harvie (2014) argue for a more radical approach: seeing the commons not as a resource, but as a site of social practice and contestation, where alternative value systems are enacted. This approach shifts the focus from the materiality of the commons to the social relations, practices, and contestations that constitute commoning. They emphasize that commoning is not merely a means of managing resources but is inherently transformative, capable of generating new forms of social organization, cooperation, and value creation (Bollier, 2021, 351–2; De Angelis & Harvie, 2014). This shift away from static definitions of the commons toward an understanding rooted in commoning—emphasizing practices, relationships, and processes—offers a compelling lens for exploring various fields (Euler, 2018, 15).

2.1 Energy Commoning: Definitions and Analytical Value

The field of energy commons exemplifies these theoretical developments. While the energy transition is often framed in terms of technological deployment, market incentives, and regulatory design, such approaches risk neglecting the social and relational practices that are integral to fostering transition and engaging communities (Bauwens et al., 2024, 9–10; Sovacool, 2014, 25). This gap is especially consequential for energy commons, where the viability and transformative potential of community-led initiatives depend on precisely these social dynamics (Caffentzis & Federici, 2014, 1102).

Energy commons are frequently linked to the idea of energy democracy (Atutxa et al., 2024; Feldpausch-Parker et al., 2021; Nadesa et al., 2023). According to Burke and Stephens (2017, 37), energy democratization involves three interconnected aims: resisting the dominance of fossil fuel-driven energy agendas, reclaiming social and public control over renewable energy sources, and restructuring energy systems to promote democratic participation and environmental sustainability. Together, these goals position energy democracy as a transformative process that challenges existing power structures while advancing more equitable and ecologically responsible forms of energy governance that are closely tied to the idea of commoning. Especially regarding renewable energy sources like sunshine and wind the commons concept is positioned as a means to oppose the extraction and enclosure of

natural resources by centralized market actors “[...] reconceptualizing energy as a commons rather than as a commodity, owned and managed by communities deploying systems of rules for energy conversion and use.” (Burke, 2021, 209). Regarding energy democracy, commoning is particularly significant when considering the intersection of energy, wealth, and justice. By focusing on the practices and relationships that constitute commoning, scholars and practitioners can better understand how collective energy initiatives might address, rather than reproduce, existing inequalities in access, participation, and value creation (De Angelis & Harvie, 2014). In doing so, energy commoning becomes not only a technical or organizational alternative but a potential vehicle for advancing social justice and mitigating the deep-seated inequities through democratic and collective action.

Yet, the practical reality is complex. State involvement—especially in grid infrastructure and regulation—remains significant, and many energy communities operate within hybrid models that blend market, state, and collective logics (Burke & Stephens, 2017, 39). Following Ostrom (2005) the commons should be neither state-led nor controlled by private organizations. This raises the question: Is it meaningful to speak of energy commons when collective organization is partial, or when communities are embedded in larger networks and legal frameworks? Szulecki (2018, 35–6) suggests shifting focus from whether energy, its modes of production, distribution and management qualify as commons to how communities navigate and reshape these structures through collective action. In a similar vein, Brandtner, Douglas, and Kornberger (2023, 921) propose the notion of relational commons as they promote a “[...] theory of meaningful social interaction, not a theory of property or natural resources [...]” highlighting relational and social phenomena as fundamental to the commons.

Drawing on De Angelis’s (2017) notion of boundary commoning, Holloway’s (2010) idea of “cracks in capitalism,” and Euler’s (2018) call to shift from goods-based to practice-based definitions, in the following, I conceptualize energy commoning as an analytic and empirical lens for studying relational, social, and informational commons. Energy commoning thus refers to the ongoing, collective social practices through which communities engage with, reshape, and co-produce energy systems (Kaandorp et al., 2024). It is less about full ownership or ideal-typical governance, and more about the relational, informational, and procedural dimensions of collective action. This broad definition enables the inclusion of investment-driven cooperatives, regionally networked communities, and hybrid models, provided they are

grounded in collective practices and shared governance. Local energy communities are likewise defined broadly and not limited to a type of organization or size constraints: they may be geographically rooted but can also operate at regional scales or as part of wider networks, provided their activities are collectively organized and they engage in the production, distribution, or management of renewable energy (Atutxa et al., 2020).

Despite growing interest and ongoing research in energy commons and communities, there is often little differentiation between tangible, intangible, goods-based and social commons. This conceptual fuzziness is understandable, given the interconnected nature of energy systems, but it risks obscuring the social practices, relationships, and knowledge flows that constitute energy commons and shape communities. Especially when linking energy commons and energy communities, the existence of commoning is often simply assumed without critical examination of the degree, forms, or implications of these practices. This article addresses this gap by adopting a practice-oriented lens: rather than debating whether an initiative is *truly* a commons, it investigates how communities navigate state and market constraints, co-produce energy systems, and enact commoning through everyday relationships, governance, and knowledge-sharing. By foregrounding the procedural, relational, and knowledge-based dimensions of energy commoning, this approach offers a more nuanced and inclusive framework for understanding the transformative potential of collective energy initiatives. Furthermore, the lens of commoning also foregrounds forms of value creation that are often overlooked in conventional economic frameworks—such as trust, solidarity, social inclusion, and environmental care—thus enabling a richer understanding of the transformative capacities of collective energy initiatives.

3. Methodology

The following analysis aims to explore energy commoning by not only engaging with the concept on a theoretical level but also by examining case studies that relate energy communities to energy commons and commoning. For this reason, an integrative literature review is conducted to systematically draw on existing theoretical and empirical work, not only to summarize key findings but to distill central themes and conceptual insights by identifying patterns and connections, thereby synthesizing the findings in a comprehensive framework (Snyder, 2019, 335–8). While this study adopts a practice-oriented lens to

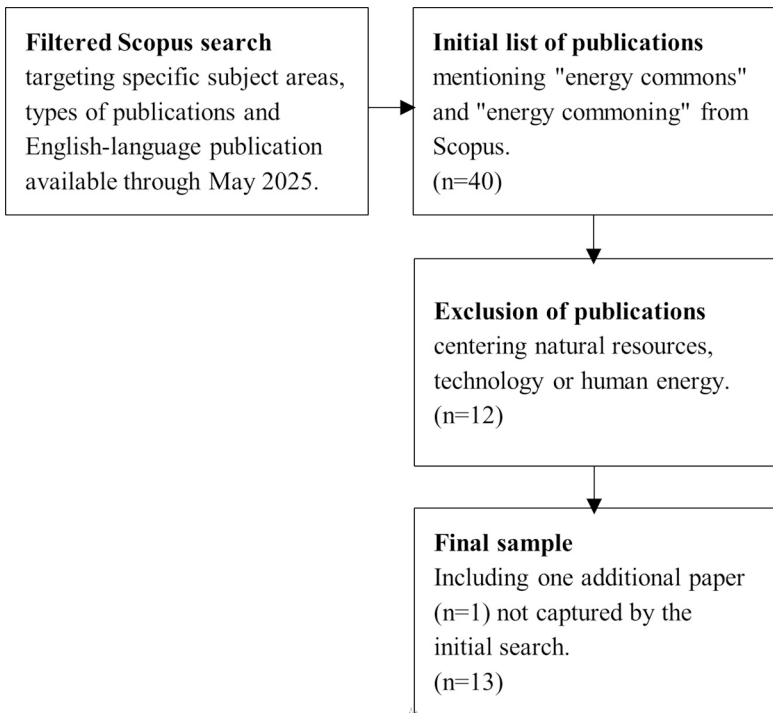
understand energy commoning, it draws primarily on academic literature that documents and analyzes practical cases. This approach was chosen for several reasons. First, the field of energy commoning is still emerging and much of the available knowledge is captured in published case studies and empirical analyses grounded in research projects. Second, academic publications often provide rich descriptions of community practices alongside critical reflection informed by both practical perspectives and theoretical foundation. However, it must be acknowledged that such accounts may carry theoretical biases or interpretations shaped by authors' frameworks. The analysis therefore is conducted cautiously, drawing from a diverse range of publications. Finally, given constraints related to time, resources and access existing literature represents an efficient way to map current knowledge and various representation of commoning practices in energy communities. Regarding the extent of research, it should be noted that this is an explorative review. It does not capture the full scope of research on energy commons and commoning. Instead, it offers a focused analysis that highlights and integrates key issues related to energy commoning and energy communities.

3.1 Sample selection

As illustrated in Figure 1, relevant academic and grey literature was identified using the Scopus database, chosen for its broad coverage of publications. The search included all English-language publications available as of May 2025, with no limitations on the starting date, thereby broadening the scope of the relevant literature.

Based on the research question the search was narrowed down to “energy commons” and “energy commoning” and restricted to potentially relevant subject areas—social sciences (SOCJ), energy (ENER), environmental science (ENVI), earth and planetary sciences (EART), arts and humanities (ARTS) and business and management (BUSI)—as well as curated document types—article (ar), book chapter (ch) and book (bk).¹

1 The initial search query was formulated as follows: TITLE-ABS-KEY("energy commons" OR "energy commoning") AND (LIMIT-TO (SUBJAREA,"SOCJ") OR LIMIT-TO (SUBJAREA,"ENER") OR LIMIT-TO (SUBJAREA,"ENVI") OR LIMIT-TO (SUBJAREA,"EART") OR LIMIT-TO (SUBJAREA,"ARTS") OR LIMIT-TO (SUBJAREA,"BUSI") OR LIMIT-TO (SUBJAREA,"ECON") OR LIMIT-TO (SUBJAREA,"AGRI") OR LIMIT-TO (SUBJAREA,"HEAL")) AND (LIMIT-TO (DOCTYPE,"ar") OR LIMIT-TO (DOCTYPE,"ch") OR LIMIT-TO (DOCTYPE,"bk"))

Figure 1: Sample selection

The initial literature search produced 40 entries for further screening. The relevance of each paper was assessed, selecting only those that engaged explicitly with energy commons or energy commoning, either through theoretical analysis or empirical examination. Particular attention was given to studies situated within the context of energy sharing, collective energy governance or energy communities. Papers were excluded if they used the term commons in a broader or unrelated sense, for example, referencing fossil fuels (e.g., oil and gas) as common-pool resources or human energy (e.g., motivational, physical, or emotional energy) as a collective resource. In addition, publications primarily focused on the technological integration of energy systems, or the digital and IT dimensions of energy production and management were also excluded, as they fell outside the conceptual scope of this review. The literature search was complemented by manually adding relevant papers identified through previ-

ous work.² Ultimately, a total of 13 publications (n=13) were included in the final sample for the full-text thematic analysis. For a structured overview of the papers included see Table 2.

3.2 Thematic analysis

Core themes and key dimensions of energy commoning were identified using a deductive thematic analysis approach, drawing on established frameworks in qualitative research (Ahmed et al., 2025; Braun & Clarke, 2006; Fereday & Muir-Cochrane, 2006). As a result of scoping coding a coding guide was developed based on concepts and categories found in the selected literature (see Table 1). This thematic coding guide provided a structure for examining underlying patterns, tensions, and interconnections within the sample. The deductive guide provided the foundational structure for the subsequent thematic analysis, while also allowing space for inductive insights to emerge during the coding process (Braun & Clarke, 2006). This blended approach, using deductively derived themes while remaining open to inductive findings, ensured both theoretical grounding and responsiveness to additional insights (Fereday & Muir-Cochrane, 2006). The dimensions, themes and codes sketched out in the thematic coding guide not only enabled a systematic exploration of underlying practices of energy commoning but also served as a fundamental base for the development of the analytical framework.

Table 1: Thematic coding guide

Key dimension	Themes	Codes
Relational	Collective governance	e.g. democratic decision-making processes, polycentricity
	Participation	e.g. financial investment, community action
	Collective engagement	e.g. trust, care

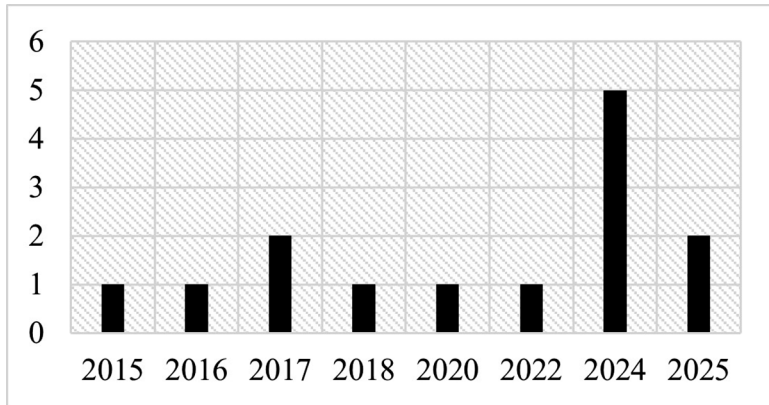
- 2 After careful consideration, one supplementary article was selected based on its direct thematic relevance. While supplementing systematic searches with targeted additions can introduce potential bias, this step was taken transparently and is supported by the article's clear relevance and contribution to thematic completeness.

Key dimension	Themes	Codes
Social	In-/Exclusion	e.g. financial power, housing stock
	(In-)Justice	e.g. social cohesion, spatial inequalities
	Socio-economical sustainability	e.g. support for the local economy, consumption behavior
Informational	Types of knowledge	e.g. community values, operational knowledge
	Knowledge exchange and informal learning	e.g. information sharing, active communication
	Transparency and data collection	e.g. horizontal privacy, awareness campaigns

4. Results

The review focused on how the examined contributions conceptualize, frame, and evaluate energy commoning in local energy communities. While not all papers explicitly used the term energy commoning, each selected study was included based on its substantive engagement with the concept, whether through exploring how communities and practices shape the constitution of energy commons, or by highlighting the transformative potential of reimagining energy systems beyond commodity logics, emphasizing democratization of the energy system and social justice. Regarding the number of publications over time, a slight upward trend from 2024 on is notable, though given the total number of publications reviewed (n=13) this incline can only be understood as a first indication and needs to be examined more broadly.

Figure 2: Number of publications on energy commons and commoning research over time 2015-May 2025.



Source: Own illustration

The reviewed publications originate from a wide range of journals, reflecting diverse disciplinary perspectives, including energy studies (e.g. Yang et al., 2021), social sciences (e.g. Campbell, 2024), geography (Hastie et al., 2025), law (e.g. Hoops, 2025), and technology (e.g. Giotitsas et al., 2015). While most contributions are from peer-reviewed journals, one reviewed work is part of an edited book (Cervas & Giancattarino, 2017). In terms of methodological approaches, empirical case studies constitute the largest share of the sample, representing over 60 percent of all studies reviewed (see Table 2). This indicates a strong emphasis on real-world, context-specific inquiry within the field. The prominence of case studies is consistent with broader trends in commons research, as noted in previous reviews (Bauwens et al., 2024; van Laerhoven et al., 2020). Case studies offer detailed insights into localized practices and dynamics, underscoring the importance of understanding how commons operate within diverse and often complex social-ecological systems. Though not all the publications can be classified as case studies, they are all at least partially empirical and reference specific spatial contexts. The spatial references concentrate in western Europe but the articles reviewed also include examples from the US, Chile, Nepal and South Korea (see Table 2).

Table 2: List of analyzed articles

Author	Approach	Spatial reference
Yang, S., Chen, W., & Kim, H. (2021)	Comparative case study	Seoul, South Korea
Kaandorp, C., Moreno Pessoa, I. T., Pesch, U., van de Giesen, N., & Abraham, E. (2024).	Single case study	Amsterdam, Netherlands
Hastie, H., Dawney, L., & Butler, C. (2025)	Qualitative study	Multiple UK cities, UK
Giotitsas, C., Pazaitis, A., & Kostakis, V. (2015)	Conceptual study	Kythnos, Greece & Huatacondo, Chile
Atutxa, E., Zubero, I., & Calvo-Sotomayor, I. (2024)	Comparative empirical study	Various initiatives, Spain
Hoops, B. (2025)	Comparative empirical study	Various initiatives, Germany
Acosta, C., Ortega, M., Bunsen, T., Koirala, B., & Chorbani, A. (2018).	Single case study	Haarlem, Netherlands
Lee, J., Byrne, J., & Seo, J. (2023)	Case study	Delaware, USA & Seoul, South Korea
Atutxa, E., Zubero, I., & Calvo-Sotomayor, I. (2020)	Comparative empirical study	Rubí, Barcelona & Basque Country, Spain
Campbell, B. (2024)	Single case study	Chitwan District, Nepal
Cervas, S., & Giancatarino, A. (2017)	Case study	California & Philadelphia, USA
Islar, M., & Busch, H. (2016)	Comparative case study	Samsø, Denmark & Feldheim, Germany
Melville, E., Christie, I., Burningham, K., Way, C., & Hampshire, P. (2017)	Single case study	Multiple neighborhoods, UK

Regarding the conceptualization of the commons, the sample reflects the diversity of commons and commoning in academic literature. Approximately half of the reviewed publications align with a goods-based commons concept. The authors refer to means of energy production (Yang et al., 2021), energy infrastructures (Giotitsas et al., 2015), energy cooperatives (Acosta et al., 2018; Hoops, 2025; Melville et al., 2017), or locally produced renewable energy (Islar

& Busch, 2016) as commons. However, it is essential to note that the publications identified as aligning with a goods-based conception of the commons, to varying degrees, extend beyond merely framing the commons as shared resources. For example, Islar & Busch (2017, 315) describe how common good in the context of energy is “[...] structured around ‘socially-related’ commons such as locally produced energy, the local economy and internet access.” In the same vein, Melville et al. (2017, 14) highlight the potential small-scale commons approaches “[...] to motivate more sustainable energy consumption practices, whilst providing social benefits of a greater sense of belonging, agency and social connection [...]”. The reviewed publications explicitly going beyond the goods-based concept highlight practices of commoning that encompass values of care (Campbell, 2024; Hastie et al., 2025), democratic participation (Cervas & Giancattarino, 2017) and community building (Atutxa et al., 2024; Lee et al., 2023) as well as collective governance (Atutxa et al., 2020; Kaandorp et al., 2024).

4.1 Exploring dimensions of energy commoning

During the thematic analysis, publications with a clear reference to commoning or those exploring the social and relational aspects of energy commons offered relevant insights into the relational, social, and informational dimensions of the commons. These findings provided the initial foundation for the thematic analysis. In addition, the publications grounded in a goods-based conception contributed valuable insights and revealed meaningful thematic intersections that enriched the analysis.

Energy commoning is widely understood not as a fixed structure, but as an evolving set of social practices, relationships, and governance processes. It entails collective ownership, participatory decision-making, and shared responsibility in managing energy systems. Practices include peer-to-peer microgrid operations (Giotitsas et al., 2015), democratic decision-making processes (Cervas & Giancattarino, 2017), time-donation or resistance funds (Atutxa et al., 2024) and community-driven warmth provisioning (Hastie et al., 2025). Commoning emphasizes cooperation, trust, and decentralization, contrasting them with market logics and centralized energy infrastructures. It is embedded in cultural, social, and material contexts, as seen in Nepal’s biogas systems (Campbell, 2024) or the local contexts of community energy projects in Germany and Denmark (Islar & Busch, 2016).

4.2 Relational dimension

The relational dimension of commoning focuses on how energy is governed, how actors interact with one another, and how collective agency is exercised. Several studies underscore the centrality of participatory governance in shaping these relationships. Atutxa et al. (2024), in their comparative study of Spanish energy commons, show how sociocratic models are employed to build consent-based, transparent governance, navigating inequality and ensuring all members are heard in decision-making processes. In their prior research on the scalability of energy communities Atutxa et al. (2020) identify loss of participation as a consequence of growth in communities. This implies that the size of communities plays a significant role in shaping the active engagement and participation of their members. The empirical findings of the study suggest that as the single communities grow “[n]etworks are created on the basis of joint action and mutual trust and knowledge” to enable energy commons to expand and grow (Atutxa et al., 2020, 12). In Amsterdam, Kaandorp et al. (2024) illustrate how relational energy commoning is enacted through intermediaries like *Platform 02025*, which connects citizens, professionals, and state actors to challenge the centralized and technocratic nature of the urban heat transition. Commoning practices in this case include free advisory services, peer exchange events, and lobbying, all aimed at reconfiguring the governance structure of energy systems to increase local influence and procedural justice.

Melville et al. (2017) highlight the interconnectedness of energy commons and accountability. Their UK-based study of a community demand-response trial aimed to explore how community accountability for individual energy consumption shapes everyday energy practices. The interviews conducted showed that despite privacy concerns and time restrains the participants welcomed the idea to take responsibility on a local level as it “[...] appealed to their sense of community, desire to connect with others, compassion and recognition of different people’s needs and circumstances, and the desire to work together with others in mutually supportive relationships” (Melville et al., 2017, 19).

Regarding diverse forms of collective organization, Hoops (2024) identifies five types of energy commons among German cooperatives, revealing a wide spectrum from participatory self-management to investment-oriented models with passive membership. This “empirical reality of disbursed dividends and the normative ideal of an Energy Commons without any financial pur-

pose [...]” (Hoops, 2025, 23) contrasts commoning practices and more conventional, market-oriented energy governance. The case of investment-oriented initiatives demonstrates that acts of commoning, such as shared ownership, collective decision-making, or localized governance, can still emerge within frameworks that are partially embedded in market logics. Rather than a strict binary, the boundary between commoning and mainstream energy provision appears porous, with practices potentially drifting toward or away from commons-based principles over time. This highlights both the conceptual flexibility of commoning and its analytical usefulness in capturing hybrid forms of energy governance that operate at the intersection of economic profits, civic engagement, and institutional normalization.

4.3 Social dimension

The social dimension of energy commoning concerns itself with questions of equity, inclusion, mutual support, and everyday routines. Campbell’s (2024) ethnographic work in Nepal offers a vivid account of layered commoning in a rural biogas initiative, where collective practices—such as shared access to pastures and reciprocal herding—were foundational to the biogas system. Here, energy commoning was embedded in broader patterns of everyday life and cultural meaning, rather than being limited to technical or financial arrangements. When political leadership disrupted access to communal land, it destabilized the energy system, demonstrating the fragility of the commons under shifting governance regimes. This illustrates how commons and commoning can propose a means to overcome inequalities and pluralize wealth production and value creation but also highlights their ongoing vulnerability to structural power and economic inequalities, as such initiatives can still be overtaken or undermined by broader political or economic shifts.

Hastie et al. (2025) push this analysis further into the urban context by exploring “warm spaces” in the UK during the energy crisis of 2022–2023. These spaces, often hosted in libraries or community centers, provided not only physical warmth but also social connection, food, and access to care, functions which reframe energy provision as a shared, caring infrastructure. Though not formal commons, these spaces enacted commoning through relational, needs-based provisioning and anti-stigmatizing design. Within the warm spaces different “[...] hubs offering communal digital and computing access, community spaces providing parent and child groups, skills-based activities and board games” emerged (Hastie et al., 2025, 2). The study highlights how

everyday practices of care, especially in times of crisis, can temporarily realign local energy systems toward social solidarity and inclusion.

Other studies foreground the relevance of commoning practices for economic inclusion. Acosta et al. (2018), in their case of the *DE Ramplaan* solar cooperative in the Netherlands, emphasize the importance of flexible design, mutual trust, and phase-based development in making the project accessible and socially robust. Similarly, Cervas and Giancattarino (2017) document how energy democracy movements in California and Philadelphia mobilize resources for solar investment in low-income and renter communities, using tools like Green Zones and Energy Investment Districts to institutionalize energy equity.

Social inequalities—including wealth disparities and energy poverty—are particularly pronounced within the social dimension of energy commoning. Factors like financial resources, place of residence, or proximity to infrastructure can limit the ability of marginalized groups to access clean energy solutions or participate in community initiatives. Entrance fees that restrict memberships, for example, can be exclusive (Atutxa et al. 2024; Hoops 2025). To overcome this restriction, some communities offer alternatives like “resistance funds based on mutual support and solidarity [or] the option to donate time instead of money [...]” (Atutxa et al., 2024, 20).

Spatial disparities also play a crucial role in determining the capacities of individuals and communities to partake in energy commoning. In the mini-PV case studies of Seoul (Yang et al., 2021), high-density housing was perceived as an obstacle preventing the inhabitants from using PV-systems to locally and collectively produce renewable energy in their living environment. They were able to overcome this difficulty. Leadership from apartment office managers, combined with the creative use of shared resources (e.g., collective repair funds), facilitated collective ownership of decentralized solar systems. In Spain, Atutxa et al. (2024, 24) found out that communities are facing “[...] spatial and material limits” which will force them to decline new members when there is no more space to increase their energy production further. Furthermore, spatial inequalities like the distribution of heating infrastructures, the quality of housing development, or segregation patterns can limit access to and the potential of energy commoning in local contexts (Kaandorp et al., 2024).

4.4 Informational dimension

Informational commoning refers to the process by which knowledge is created, shared, and utilized to empower collective action and decision-making. Many energy commons rely on informal learning, peer exchange, and networks shaped by situated knowledge rather than top-down information pipelines. In Amsterdam, Kaandorp et al. (2024) show how civic platforms function as knowledge intermediaries, enabling distributed learning about heating alternatives and rights. In addition, a number of regular networking and knowledge-sharing events were recorded and partially attended by the researchers, like the monthly “energy breakfast” (Kaandorp et al., 2024, 3).

Melville et al. (2017) add nuance by showing the limits of information sharing in a UK-based community demand-response pilot. While collective incentives were welcomed, participants resisted mutual monitoring or publicizing household-level data due to fears of surveillance and social pressure. This highlights the fine line between transparency and coercion in informational commoning, as well as the need for trust-sensitive design when energy data is involved.

Lee, Byrne and Seo (2023) place knowledge production at the heart of their conceptual model of energy democracy. They argue that energy transitions require not just technological diffusion but the cultivation of what they term an interactive set of “[...] motivating, operational, and organizing principles” (Lee et al., 2023, 60); each rooted in shared values, democratic structure, and local context that are closely tied to knowledge and empower communities to imagine and realize sustainable and just futures. Informational commoning thus becomes a cornerstone of civic capacity, enabling communities to articulate alternatives and navigate complex transitions.

In their Californian case study, Cervas and Giancattarino (2017) highlight how campaigns fostered community engagement and broader public outreach. A similar dynamic can be observed in Feldheim, Germany. Islar and Busch (2016) describe how Feldheim’s ambitious renewable energy project gained significance over time, particularly through external attention and interest. As a response, the village established the *Neue Energien Forum*, an information center for renewable energy, reflecting a shift toward broader public engagement and knowledge sharing.

The informational dimension of energy commoning also addresses inequality. Access to knowledge, technical expertise, energy literacy and the availability of information about renewable energy options is often unequally

distributed along the lines of wealth and education (Sovacool et al., 2019). This can reinforce existing divides, as those with greater resources are better able to navigate complex systems, access subsidies, or adopt new technologies. Effective commoning thus depends on creating inclusive learning environments and transparent communication strategies that empower all community members, regardless of socioeconomic status (Hastie et al., 2025).

4.5 Towards an energy commoning framework

Concluding this iterative review process, beginning with a deductive thematic coding guide and evolving through close engagement with both empirical and conceptual literature, I developed a framework that structures and presents the key insights gained. Rather than merely summarizing findings, this framework is designed to operationalize the diverse dimensions of energy commoning for future research and practice. The initial coding guide served as a starting point, focusing on relational, social, and informational aspects; however, ongoing analysis revealed the necessity to adapt and broaden these categories in response to the complexities encountered within energy commoning practices. This approach aligns with methodologies in related fields, where frameworks are dynamically shaped by integrating theoretical synthesis with empirical evidence to identify context-sensitive, practice-oriented dimensions (Bauwens et al., 2024). In developing the analytical framework, special attention has been paid to how each dimension interacts with the structural realities of wealth inequality, exclusion and trust in the energy transition. In the following section, each dimension is presented and briefly described. The framework provides general themes, key aspects and guiding questions for each dimension. This format is chosen to make the framework applicable to empirical research settings, as it, for example, can serve as a starting point for developing interview guides. It allows for both broad exploration and more targeted research designs depending on the context.

Table 3: Analytical Framework regarding the Relational Dimension of Commoning

Themes	Key Aspects	Guiding Questions
Collective Governance	Modes of governance (e.g., sociocracy, energy democracy); integration into broader networks, size/scope of the organization	How are decisions made? How do members relate to each other? Is the community networked?
Participation & Engagement	Active participation, empowerment, mobilization, shared responsibility	Is active participation expected or required? What roles do members take on?
Community Practices	Community events, informal communication, member integration	How do members interact regularly? How are new members integrated?

The relational dimension focuses on the modes of collective governance, participation, and the enactment of agency within energy communities. The literature consistently highlights that the success and durability of energy commons depends not only on formal rules or ownership structures but on the quality of relationships, trust, and mutual engagement among participants. This dimension was adapted from the initial coding guide to place greater emphasis on the diversity of governance models (e.g., sociocracy, polycentricity), the fluidity of participation (ranging from active to passive forms), and the importance of informal community practices such as peer exchange, regular events, and the integration of new members. These aspects reflect the theoretical shift from resource-based to practice-oriented understandings of the commons, where the focus lies on how collective agency is enacted and negotiated in everyday settings. When analyzing collective governance and participation, it is essential to consider how economic and social status influences who can participate and whose voices are heard in decision-making processes. In addition, the size and scope of a community can drastically impact how members interact and relate to one another and the community as a whole.

Table 4: Analytical framework regarding the Social Dimension of Commoning

Themes	Key Aspects	Guiding Questions
Inclusion & Accessibility	Time donations, financial contributions, entry barriers, fee waivers	What mechanisms ensure inclusivity? What may exclude participation or can reinforce existing inequalities?
Equality & Justice	Social/spatial inequalities, fairness in benefit distribution, internal tensions	How are benefits shared? Are different needs and experiences considered?
Everyday Practices	Routine tasks in energy production and maintenance; local or circular economic activities	What daily tasks are involved in operating the system? What routines shape participation?

The social dimension addresses issues of inclusion, equity, and the reproduction of everyday life within energy commoning. While the initial coding focused on exclusion, justice, and socio-economic sustainability, the literature review underscored the need to broaden this dimension to capture the multiple ways in which energy commons intersect with social inequalities, access barriers, and local livelihoods. The studies reviewed highlight that commoning is not only about distributing benefits, but also about creating mechanisms for participation (e.g., solidarity funds, time donations), negotiating internal tensions and embedding energy practices in the routines and values of local communities. This dimension is therefore shaped by both distributive and procedural justice concerns, aligning with theoretical arguments that stress the socially embedded and transformative potential of commoning. Value creation and wealth within energy commons are plural and extend well beyond economic considerations, encompassing intangible outcomes such as community cohesion, mutual support, and the advancement of social justice. The framework addresses social commoning as it shapes both individual and collective capacities for change.

Table 5: Analytical framework regarding the Informational Dimension of Commoning

Themes	Key Aspects	Guiding Questions
Knowledge Generation	Situated knowledge, know-how, 'learning by doing,' development of shared norms and goals	How is knowledge developed and maintained? How are shared values shaped?
Knowledge Sharing & Learning	Peer learning, informal training, collective troubleshooting, learning events	How is knowledge exchanged in daily practice? Who has access to key knowledge?
Transparency & Communication	Internal communication, openness of decision-making, external communication, data handling	How is information shared within and outside of the community? How transparent are processes?

The informational dimension explores how knowledge is generated, shared, and mobilized to empower collective action in energy commons. The initial coding guide focused on types of knowledge, knowledge exchange, and transparency. However, the literature review revealed additional nuances, such as the role of informal learning, peer-to-peer networks, and the tensions between transparency and privacy. This dimension was thus refined to include not only the mechanisms of knowledge production and dissemination but also the cultivation of shared values, the design of inclusive learning environments, and the management of information flows within and beyond the community. Theoretical work on the commons emphasizes that informational commoning is crucial in building civic capacity and enabling communities to articulate and pursue alternative energy futures.

In summary, the analytical framework presented here is the result of a combination of deductive coding and inductive adaptation, shaped by the interplay between theoretical perspectives and empirical findings. By foregrounding the relational, social, and informational dimensions, the framework offers a comprehensive and flexible tool for analyzing the dynamic processes of energy commoning and for understanding how these processes are shaped by, and in turn shape, broader questions of justice, inclusion, and sustainability in the context of energy transitions.

5. Concluding remarks

In this contribution, energy commoning has been assessed as a promising approach to energy transition. One that transcends profit-driven logics and centers added values such as social cohesion, trust, and community empowerment as integral outcomes of restructuring energy systems. Against the backdrop of intensifying climate crises, rising inequalities, and eroding trust in democratic institutions, this research explored energy commoning as a promising pathway for fostering societal and climate resilience. Within the context of energy transition the concept of energy commoning served as a dynamic and practice-oriented lens for analyzing collective action within local energy communities. Building on an integrative literature review, this contribution has synthesized key themes across relational, social, and informational dimensions, resulting in the development of an analytical framework to guide future empirical and theoretical research in this field. The analysis demonstrates that energy commoning is not a fixed structure or set of rules, but an evolving constellation of practices, relationships, and governance processes embedded in diverse local contexts. The analysis demonstrates how energy commoning is not merely an alternative model for resource management, but a dynamic set of practices deeply embedded in local contexts, practices that have the potential to reimagine how energy systems are governed, experienced, and shared.

By examining local energy communities through a practice-oriented lens, this study has moved beyond narrow technological fixes or top-down policy approaches. Instead, it reveals how collective action, rooted in relational ties, social inclusion, and knowledge sharing, can generate new forms of agency and belonging. The multidimensional analytical framework developed here captures these complexities by foregrounding three interrelated dimensions: relational (how governance structures foster participation and trust), social (how inclusion, equity, and everyday routines shape access), and informational (how knowledge is produced, shared and mobilized). These dimensions are not static categories but reflect ongoing negotiation processes within communities as they respond to shifting challenges and opportunities.

The findings underscore that successful energy commoning depends on more than formal ownership or infrastructure; it is sustained by mutual trust, participatory decision-making, flexible organizational models, and mechanisms for overcoming exclusion. Yet persistent barriers remain: economic disparities can limit participation; spatial inequalities affect access; informational divides risk reinforcing existing power imbalances. As such, while

energy commoning offers significant promise for building more equitable and resilient systems at the community level, its transformative potential will depend on addressing these structural challenges. The concept of energy commoning is frequently linked to the democratization of energy systems. However, the review produced little results regarding the capacity of energy commoning in facing political uncertainty and fostering trust in democratic institutions. There appears to be a tension—which require further investigation—between the transformative potential and radical change of energy commoning on the one hand, and, on the other, the need to collaborate with local administrations and build functional networks that bridge state, market, and civil society.

It is important to acknowledge several limitations inherent to this review. Regarding the relatively small sample ($n=13$) as well as the broad and cross-disciplinary field of commons and commoning, the review does not capture the full diversity of energy commoning practices. Additionally, nuances and debates within the literature on energy commons may not be fully addressed. Furthermore, the landscape of energy commoning is rapidly evolving, with new initiatives, policies, and crises (such as energy price shocks or climate events) continually reshaping the field. As such, the findings and framework presented here should be seen as provisional and subject to ongoing revision. Moreover, the framework has not yet been applied to new empirical material or a specific case study. It is intended to guide future research and support the analysis of energy commons in diverse contexts. Further development and the practical application and evaluation of the framework are necessary to improve and validate the proposed dimensions, themes and guiding questions.

Looking forward, future research is necessary to gain a better understanding of the transformative potential of energy commoning. For this purpose, the proposed analytical framework should be applied and tested across diverse contexts to assess its robustness and refine its dimensions. Comparative studies could illuminate how different governance models, policy environments, and cultural settings shape energy commoning practices in local contexts and over time, while also clarifying how these practices intersect with broader patterns of trust, social cohesion, and inequality. Greater attention is needed to how energy commoning can address barriers to participation for marginalized groups and foster genuine inclusion and equity, rather than inadvertently reproducing existing divides. Further investigation into the role of policy, institutional frameworks, and hybrid governance models will be essential to un-

derstanding the enabling and constraining factors that shape energy commoning on the ground. Transdisciplinary and participatory approaches, involving practitioners and community members, will enrich theoretical development and ensure that future research remains grounded in lived realities.

Ultimately, this article argues that empowering citizens through participatory forms of collective action, such as those embodied in energy commoning, is essential for advancing just transitions capable of addressing both climate change and deepening social divides. By operationalizing key themes across relational, social, and informational domains—and remaining attentive to issues like exclusion or trust—the proposed framework supports both critical scholarship and practical experimentation toward more inclusive democratic futures. In doing so, it responds directly to the urgent need for viable pathways that make our energy systems not only greener but fairer—and ultimately more resilient in the face of interconnected societal challenges and climate crisis.

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