



Review

In and beyond the home: A literature review on the spatial relationality of energy poverty

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ABSTRACT

Energy poverty is increasingly being recognised as a socio-spatial phenomenon shaped by geographically variable and locally contingent factors. However, to discover the full potential of space in this field, we need to perceive it as more than just a physical surface with a few measurable factors that indicate spatial distribution and differences of energy-related sources, infrastructure and technical systems. This review draws on constructivist approaches in human geography treating space as a social and relational construct to transcend the static spatial approaches. It presents a review of academic literature at the intersection of space and energy poverty with the aim of uncovering underlying relations and dynamic processes that make a difference to the form, structure and drivers of this phenomenon. The findings of the review show that the spatiality of energy poverty goes beyond the material inefficiency and infrastructural failures. Rather, it is continuously shaped across space and time by multi-scalar political, economic, socio-cultural and institutional relations among social actors, entities and structures through three dynamic processes: *creating*, *reinforcing*, and *navigating*. This review extends the conceptual boundaries of energy poverty and provides a theoretical ground for further research possibilities at the space-energy poverty nexus. It emphasises the need to shift from household-scale policy designs to ones that address broader relational and multi-scalar dynamics to achieve a more inclusive and just energy system. Lastly, it presents insights from relational space theories to aid critical inquiries into the intersectionality of this phenomenon.

1. Introduction

Energy poverty (EP) — the inability to attain a socially and materially necessitated level of domestic energy services [1] — affects many households in Europe [2] and around the world [3]. Over the last decade, it has been widely recognised as a dynamic problem, shaped by a range of factors that can increase the likelihood of experiencing it at any time [4,5]. Its dynamic nature is further influenced by geographically variable and locally contingent conditions, which have prompted a ‘spatial turn’ [6] in the energy poverty literature [7–9]. Growing interest in spatial dimensions can be attributed, firstly, to the advances in the field of energy geographies that connect and spatialise the socio-political and physical aspects of energy through a “whole systems approach” [10–13]. Second, it can be linked to the debates on energy justice, addressing the fairness and equity in the distribution of costs and benefits at all stages of the energy systems, including production,

distribution, and consumption [14–18]. Such antecedents have opened an avenue for researchers to conceptualise energy poverty as an aspect of energy injustice that occurs across distributional, recognitional, and procedural dimensions and intersects with broader patterns of socio-spatial injustice [19–21].

This spatial turn in EP research has rightly made spatial science a part of this conversation and offers researchers an opportunity to extend the theoretical boundaries around the concept of energy poverty through rich theoretical foundations of space (see [22–25] for a comprehensive overview). Yet, space has always been a contested concept in human geography, encompassing both positivist approaches that define space in terms of measurable, quantifiable factors and constructivist approaches that interpret it as a socially constructed phenomenon [23,26]. To date, space has been largely incorporated into the energy poverty literature through its positivist and Euclidean understanding, often relying on spatial indicators (see [27] for a

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comprehensive overview of Euclidean space). By using spatial analytical methods to map or to measure the energy-related sources, infrastructure of homes or neighbourhoods, they contributed to the understanding of how energy poverty or energy burden is geographically distributed [28–31]. However, despite this positivist tendency of spatial discussions in the field, energy poverty is inevitably related to the relations that move beyond the material and infrastructural inadequacy of space. Moreover, a substantial body of work examines complex and invisible social, economic, and institutional relations that contribute to the geographical unevenness or contingency of energy poverty without explicitly engaging with spatial discussions [32–35]. These relations inevitably affect space and spatial configurations (both material and beyond), shaping the spatiality of energy poverty. Nevertheless, little previous research has addressed these underlying relational mechanisms that cause uneven geographical outcomes through the lens of spatial theories. Such an attempt has the potential to reveal the full analytical power of spatial thinking for advancing future socio-political inquiries into energy poverty.

In this review article, we present a theoretical discussion to better connect with the critical social inquiries over energy poverty through a deliberate emphasis on the role of social space. Contrary to the Euclidean spatiality, framing space as a neutral physical structure of a few (measurable) parameters, we adopt a relational perspective premising that space is also socially constructed by a set of relations in cultural, economic, and political processes operating within and around it [22,24,25,36–38]. Through this perspective, we argue that energy poverty is not a spatially “given” phenomenon, existing “out there”. Rather, as long as space is open to the networks and relations [22–24], energy poverty is constructed in a set of continual processes across space and time. Where and how energy poverty unfolds depends on multi-scalar spatial relations established in highly complex and uneven ways. In line with this argument, this review aims to move beyond the static spatial conceptualisation of energy poverty and to explore its relationally constructed nature through a literature review that addresses the following questions:

- 1) What socio-spatial relations make a difference to the form, structure and drivers of this phenomenon?
- 2) How and in what processes do these relations construct energy poverty in and beyond the home?

The relational perspective has long been deployed in the debates on the nexus of energy and space [39–42]. It has also been mobilised in energy poverty research to explore the linkage between urban poverty, energy poverty and institutional changes of post-socialism in Eastern European countries [7,43,44]. However, it has yet to materialise into a comprehensive explanation of how diverse and multi-scalar relations affect the spatiality of energy poverty. This perspective is useful for the field of EP as it positions the domestic home as part of broader relations, manifesting across different geographical scales [26,45,46]. Therefore, it opens up new avenues for social science research to reconsider energy poverty as a constructed phenomenon in and beyond the home.

Our methodology is based on a review of the literature at the interface of space and energy poverty. The analytical process is guided by the principles of reflexive thematic analysis [47]. By adopting an iterative approach [48], we first inductively grasped the patterns of meaning across 55 articles and deductively interpreted them through the insights from our five relational perspectives. Our review makes threefold contributions. Firstly, by revealing the multi-scalar spatial relations that shape energy poverty, it sheds new light on the complex nature of this phenomenon. Through the insights from the literature review, we have identified three spatial processes in which energy poverty is relationally constructed: creating, reinforcing, and navigating. These dynamic, recursive, and open processes call for a rethinking of energy poverty as a phenomenon that is continuously reshaped, resisted, or transformed by potential relations constituted in and through space. Secondly, it contributes to policymakers and stakeholders, aiming to develop more inclusive and equitable energy policies by providing practical implications

about what kind of (contested or consensual) spatial relations affect energy, between whom (actors or entities) and at what geographical scales. The last contribution is to the spatial theory we have used. This review not only uses relational spatial theory but also enriches it by integrating insights from diverse sub-perspectives and increasing its adaptability for research that examines the intersectionality of energy poverty.

The paper is structured as follows: The next section (2) lays out the relational understanding of space in five different perspectives and explains how they can provide a framework for the spatiality of energy poverty. Section 3 explains the methodological steps of the literature review. In Section 4, we report our descriptive and data-driven findings. Section 5 presents a discussion, highlighting implications for concept, theory, policy and practice. The paper concludes in Section 6 with the concluding remarks, implications for future research and limitations of the study.

2. A relational approach to spatiality of energy poverty

Proposing “space” as an explanation of energy poverty, rather than only a carrier of the latter, is complex and requires delving into a constructivist notion of space that accounts for how socio-spatial environments arise, stabilise, and evolve. Therefore, the relational theory in human geography is rightly part of this debate as it offers rich foundations to understand social space, anything happening in it and their dualistic relations (see [22–24,38,46,49,50] for a comprehensive overview). It not only conceptualises space as a social product of ongoing relations, but it also provides a theoretical foundation to understand how the overlaps of consensual and conflicting spatial relations shape and reshape any phenomena in a given place [51].

“Thinking space relationally” [50, p. 3] has become important in human geography since the late twentieth century. It has been discussed in various subfields such as economic geography [52,53], actor-network theory [54,55], and development theories [56,57]. The concept of relational space falls outside the absolute view in which space is seen as a fixed, closed, discrete container for any object(s) or relations in it (see [27] for a general overview). It goes beyond the “Euclidean” perspective that seeks measurable factors such as height, depth, size and proximity to explain space and anything occurring in it [58–60]. Instead, space is perceived as flexible, open and engaged with objects and relations in and around it [61,62]. This means that space is not an autonomous entity in and of itself; rather, it is dynamic and (always) subject to change and becoming by possible relations, processes, and practices of any kind [63]. Soja uses the concept of “spatiality” to highlight the distinction between space per se (or contextual), and the created space of social organisation and production [[24], p:209, [64], p:80].

Within human geography, relational theory has been influenced by a select range of approaches, including the humanistic geographical approach, social constructivism, structuration theory, geographical materialism and poststructuralism [65]. In Fig. 1, we illustrate how these perspectives are informed by context—the surrounding circumstances—and the power dynamics between actors. Then, we present the theoretical foundations of each in chronological order below.

The antecedents of relational theory can be traced back to the work of Whitehead [67] and Leibniz and Clarke [68], who argued that space is not an independent entity but emerges from dynamic interactions between entities and is inherently intertwined with ongoing social processes. On this ground, humanistic geography emerged in the 1950s as a response to positivism in geography and shed light on the **symbolic and phenomenological dimensions of space** beyond its material dimensions [69]. Studies initially focused on the interaction between humans and space to highlight how individuals perceive, experience and actively shape the world around them [70]. Then, by prioritising subjective experiences, emotions and meanings, they highlighted the deep connections people form with places and the significance of these bonds in shaping identity [71]. From this perspective, any context is shaped by

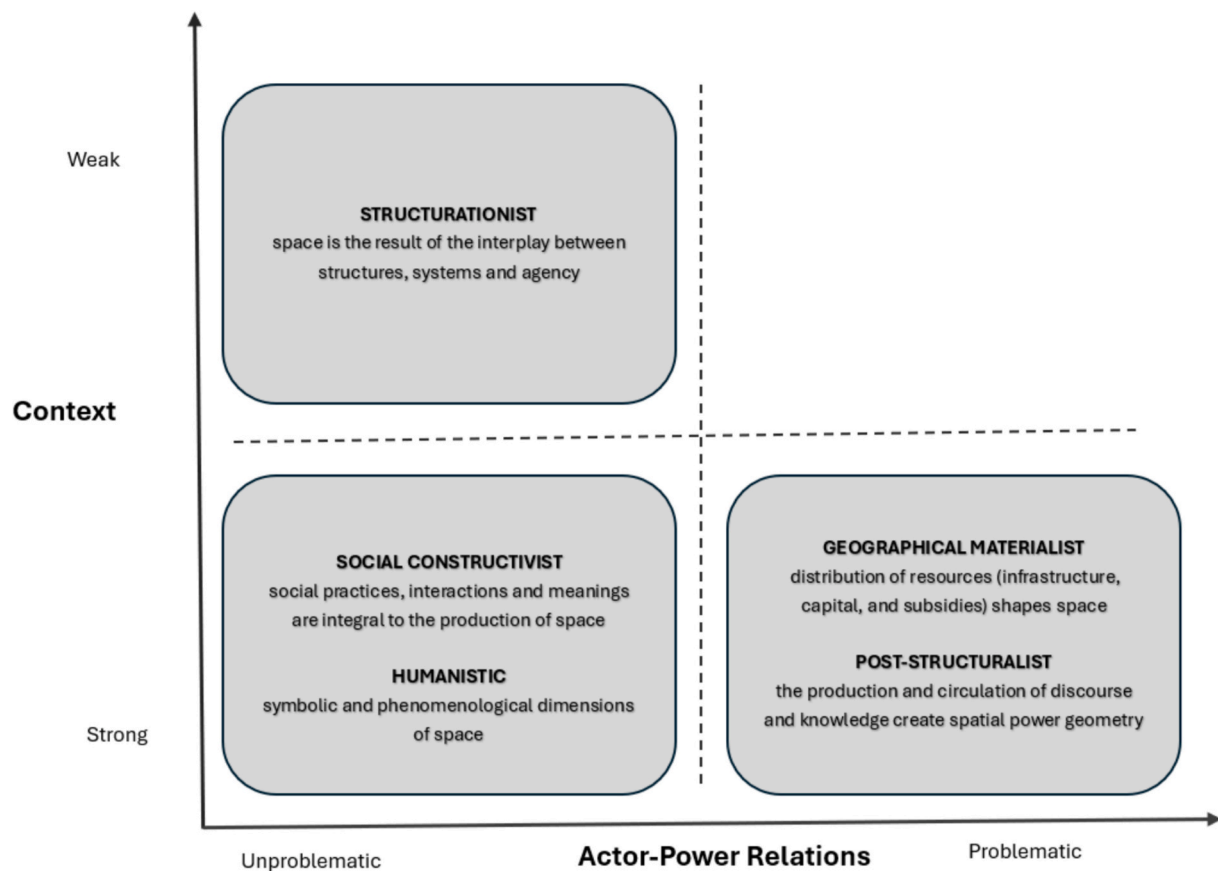


Fig. 1. Relational Perspectives at the Intersection of Context and Actor-Power Dynamics.
Source: Reworked from [65,66].

human spatial experience and the symbolic meanings attached to it. Those experiences and meanings are, in turn, integral to the reshaping of space. Therefore, conflicting power dynamics between the actors shaping the space are not prioritised. Instead, the focus is on the role of humanistic emotions, spatial experiences, and the dual relationship between space and humans.

Lefebvre [38] synthesised these ideas and developed the relational theory into a coherent framework. He foregrounds that (social) space is a (social) product made by economic, political and cultural relations. On the one hand, Lefebvre incorporates a Marxist geo-materialist approach and argues that capitalist economic relations produce and re-organise space to serve their needs. On the other hand, he also embraces social constructivist and human-centred approaches and includes mental and social dimensions of space into his spatial triad (perceived-conceived-lived spaces). He argues that alongside modes of economic production, **social practices, interactions and social meanings in everyday life** are integral to the production of space (Ibid.). This means that there are no fixed or granted meanings for space or place. Rather, people interact with each other in (social) space, interpret these interactions and construct spatial meanings within different contexts. By adopting an intersectional constructivist perspective, later studies in cultural geography, environmental psychology, and sociology have examined the role of space in social identity construction (e.g., [36,71,72]). They argue that not only do people make spaces, but spaces actively make people through socio-spatial norms and formal or informal institutions [73,74]. Social identities such as gender, race, ethnicity, and sexual orientation are constructed within sociocultural and political contexts that vary across geographies, societies and historical periods [75,76]. Space plays a contextual role in this process, representing life worlds where self, other, and community converge or diverge [77,78]. These spatial contexts are neither entirely fluid nor completely determined by power

relations. Rather, they are moderately shaped by social practices, interactions and meanings.

Giddens' [79] structuration theory also provides a theoretical foundation for relational space. According to this theory, structures and systems provide a contextual framework within which actors operate. Structures here refer to some patterns in the social world that affect individuals and are composed of rules or norms (e.g., class structures, economic structures, etc.). Systems refer to patterns of relations in groupings of all kinds, from small groups to social networks to large organisations (e.g. social and cultural systems, legal systems) [79]. While power dynamics exist in the structures and systems, they are not deterministic and do not directly dictate human actions in space. Therefore, the context may seem less active in shaping space. However, they are not fully passive; rather, formed and reformed by human actions, agency and practices over time [79,80]. In this sense, space functions both as a stage (where social actions take place) and it is an outcome of the **interplay between structures, systems and agency** in an ongoing process.

While Harvey's early work, such as *Explanation in Geography* [81], adhered to a systematic and positivist approach to spatial analysis, his later works on social justice [37,82], capitalism [83], and post-modernism [84] trace a relational trajectory in geography through his engagement with critical theory and Marxist approaches. Integrating space into the contradictory dynamics of capitalism, Harvey underscores that space is not fixed or permanent but rather a process of carving out temporary "semi-permanence" from the continuous flow of economic, political, physical, and socio-cultural relations under capitalism [37,85]. He uses historical and geographical materialism to examine how **the distribution of resources, such as infrastructure, capital, and subsidies**, shapes space and society in accordance with the logic of capitalism [83]. This means that while capital and capitalist fixed investments prioritise

profitable regions for accumulation, it simultaneously marginalises others, creating spatial inequalities such as urban ghettos, peripheries, and less developed regions. These processes of spatial restructuring are deeply intertwined with class struggles, labour dynamics, and power conflicts, reshaping social relations in spatial terms and revealing the inherent socio-economic injustices inherent in capitalism [37]. Therefore, context in this perspective is highly active in shaping space and is informed by the contradictory relationship between social and economic actors.

Harvey's view of social justice is extended by post-structural and post-colonial approaches that address relational space through *the production and circulation of discourse and knowledge* [46,53,80,86]. Like Harvey, these approaches conceptualise space as a process of becoming, emerging from the dynamic interplay of physical, economic, social, and cultural relations [22,23,26,87]. These processes are (always) open to relations and interactions [46]. Despite the coexistence of multiple sets of relations, a competitive dynamic and a “power geometry” often emerge between them as they strive for influence over the configuration of spaces [46, pp. 25–6]. Contexts are informed by this power geometry and highly affect the space. Space becomes a contested arena, infused with power relations, where dominant alignments temporarily hold sway while others experience subordination through discriminatory discursive practices [22,46]. Yet, it is never permanently fixed, but it is constantly subject to a process of becoming on the negotiation ground of power, discourses, and representations [22,37,45,61,87].

In short, for relational thinkers, the spatial project is never completed; rather, it is in the ongoing process of production and reproduction through various forms of relations that can emerge at any time and place. These relations do not manifest at a single geographical scale. Instead, they manifest at multiple scales, ranging from the individual experience in the home to the social interactions and global capitalist relations. Additionally, they are not one-directional or linear but multi-directional and recursive, emerging and affecting each other simultaneously. Most importantly, while these relationships construct space, they simultaneously create, reshape, and transform various forms of spatial differences and inequalities.

In this review, we adopt an integrative theoretical approach, drawing insights from each perspective rather than privileging one over the others, to comprehensively understand the spatial relations that shape energy poverty. For instance, geographical materialism emphasises the role of the distributional resources, such as infrastructure, capital, and subsidies, in shaping space and society. It therefore offers a framework for understanding socio-material energy inequalities across geographies that are shaped by uneven capitalist economic and political relations, particularly from a distributional perspective. Structuration theory complements this perspective by providing insights into the interplay between structures and systems constraining people's energy capacities and various forms of agency (individual or collective) trying to navigate those constraints. Social constructivism offers a valuable framework for understanding how social practices, interactions and social meanings attached to space shape people's experiences of energy-related difficulties. On the other hand, post-structuralism is a useful ground to depict the processes through which vulnerable identities to energy poverty are unevenly constructed through the production and circulation of discourse and knowledge in society. Finally, the humanistic perspective provides invaluable insight into understanding the lived experiences and coping mechanisms of energy-poor households, focusing on the role of subjectivity, emotional engagement and spatial practices in place-making.

3. Methodology

Our study is based on a literature review of 55 scientific articles on the intersection of space and energy poverty. To do so, we followed a hybrid methodology informed by three review types. First, we

systematically scoped, conducted, and screened the articles using an explicit protocol informed by a systematic review, including a well-defined search strategy, key terms, and inclusion-exclusion criteria [88–90]. Later, we followed an interpretive and reflexive approach informed by semi-systematic and integrative reviews during the data extraction, analysis and synthesis [47,91]. These review types for data analysis processes were chosen for the following reasons: A semi-systematic review provides a flexible ground for applying qualitative data analysis approaches (such as our reflexive thematic analysis), which allows for the researcher's interpretation of the results rather than only synthesising and reporting them [47]. Our review is also integrative as we apply relational theories of space. Integrative reviews are useful to reconceptualise or develop the preliminary conceptualisation of a phenomenon by adding/complementing additional lenses. They provide a new way of thinking about the essence of the studied phenomenon [92,93]. Through such a hybrid version of literature review, we aim to expand the theoretical boundaries of energy poverty by uncovering the socio-spatial relations from the existing literature and interpreting them through spatial theories.

3.1. Defining the scope and conducting the review

After deciding on suitable review approaches according to our research questions and aim, we developed a systematic search strategy that included search terms, appropriate databases, and inclusion and exclusion criteria, following the research questions. We focused on capturing a wide range of terminology commonly used in the energy poverty literature. Despite the claims of a global North vs. South dichotomy in the conceptual binary, “*energy poverty*” and “*fuel poverty*” terms are used almost interchangeably in the literature to define domestic energy deprivation [1]. Therefore, we used these terms as keywords in the search string. We also included “*energy vulnerability*” and “*energy precarity*” as they are cognate terms often found in the energy poverty literature that refer to the social, economic and political relations making people precarious and vulnerable [4,94]. These keywords in the first part of the search string offer nuanced understandings of the phenomenon, such as its temporally variable nature or the role of household external and internal factors that increase the risk of falling into energy poverty. Since we aimed to obtain papers that contribute to the geographical unevenness or contingency of energy poverty, we included “*space*”, “*spatial*”, and “*geography*” as relevant keywords in the second part of the string. These keywords allow us to reach the papers that consider energy poverty as a phenomenon shaped by complex spatial relations, place-based contexts, and geographical inequalities, even though they do not explicitly incorporate spatial discussions. After testing various combinations through a trial-and-error process, we developed a final search string structured using Boolean operators to group related terms: (“*energy poverty*” OR “*fuel poverty*” OR “*energy precarity*” OR “*energy vulnerability*”) AND (“*space*” OR “*spatial*” OR “*geo**”).

Second, we searched the papers using the defined research string above in the “TOPIC” field (Title, Abstract, Keyword Plus and Authors' Keywords) in the Clarivate/Web of Science (WOS) Core Collection databases. While we acknowledge that limiting our search to WOS-indexed publications may introduce selection bias and exclude relevant literature indexed in other databases, we selected Web of Science due to its high quality and peer-reviewed sources with rigorous indexing [95–97]. Additionally, WOS performed advanced Boolean search functionality and strong compatibility with our structured search strategies. Furthermore, Web of Science's topic search includes Title, Abstract, Author Keywords, and Keywords Plus. As Keywords Plus is algorithmically generated from the titles of cited references, it has broadened our search scope beyond terms explicitly used by the original authors, and we reached some relevant articles through it.

The initial search was conducted across the SCI-EXPANDED, SSCI, A&HCI, and ESCI databases within the WOS, and it resulted in 462

articles. As the relationship between space and energy is an emerging topic, we aimed to reach as large a sample of papers as possible. Therefore, we didn't employ any strict criteria for publication years or the geographic scope. However, we included only research articles, reviews, and early-access papers as document types for a practical screening. The rationale for this selection is to obtain only peer-reviewed papers with high conceptual rigour and methodological quality. Papers from irrelevant research areas (e.g., pharmacology, neuroscience, chemistry) were excluded. We also considered papers only written in English according to the authors' language proficiency (see [98] for a detailed discussion). Applying these selection criteria resulted in 386 articles, which we exported to Excel for screening. For a practical screening, we established inclusion and exclusion criteria in alignment with our research questions and aim, as stated in Table 1. In the title and abstract screening, we excluded 268 papers that did not meet the inclusion criteria.

Later, we obtained the full text of the remaining 118 papers and reviewed their full texts. We discarded 63 papers that did not meet our inclusion criteria but had not been identified during the abstract and title screening. Ultimately, 55 studies were included in the data extraction and analysis stage. The overall review process is detailed in the PRISMA flowchart [99], as shown in Fig. 2.

3.2. Data extraction and analysis

This stage of the methodology involves the analytical process through which we extracted, interpreted, and synthesised the data from the remaining sample of papers, and it is structured around three sub-stages. During the entire data analysis process, we used the MAXQDA data management software, which enabled the secure storage of a large volume of data and facilitated the categorisation of codes. The entire content of each article was reviewed and coded by the lead author. However, to enhance the consistency, rigour, and transparency of the coding process, the other two authors performed data extraction on a random sample of the data. Their results were then cross-checked with the lead author's findings to promote analytical dialogue, bounce around ideas, and identify potential oversights in the data [47]. To increase the inter-coder reliability, all coders have been trained to engage with the data in the same way (reflexively and collaboratively), drawing on Yardley's [100] principles of rigour and transparency in qualitative studies. We prioritised open dialogue and critical discussions between the coders to compare the themes, surface diverse interpretations and

strengthen the trustworthiness of the analysis.

The analytical process is guided by reflexive thematic analysis to explore and interpret patterned meaning across our qualitative dataset [47]. Reflexive approach to TA aligns well with our epistemological position, informed by critical realism [101], as it enables researchers to actively engage in meaning-making through their own emic understandings of the underlying generative mechanisms that shape spatial patterns of energy poverty. Although it recognises that no researcher is a-theoretical, it does not impose predefined codes on the researcher early in the process [47]. It allows codes and themes to emerge and evolve throughout the analysis, guided by the researcher's reflexivity (ibid.).

Aligning with our analysis approach, we adopted an iterative strategy for data extraction that fosters a dialogue between the raw data in the reviewed papers and the theoretical frameworks informing the research [48]. We didn't force the data to fit into pre-defined theoretical codes driven by our theoretical framework. Rather, at the first stage of analysis, we stayed close to the raw data to identify sentences in which implicit or explicit spatial relations were discussed (a process similar to Strauss and Corbin's [102] open coding). As we inductively identified each segment of data, we labelled them with the simple and precise codes/short phrases (e.g. neoliberal economy; marginalisation; community advocacy) that capture the essence/meaning of sentences. This process generated 42 primary codes. Later, we read these codes again and grouped those with matching ideas into 13 first-order categories, represented by the rectangles in Fig. 3.

The initial codes indicate that energy poverty is influenced by diverse driving factors and complex relationships that manifest across different geographical scales, ranging from the household to regional and global levels. For instance, codes such as "uneven development", "liberal energy market", or "socio-economic impoverishment" refer to macro-level economic-political relations, "liberal housing market", "political underrepresentation", "discrimination" refer to institutional, systemic and social-cultural relations at a country or regional level, "community advocacy", "coping strategies" refer to household and local level relations.

At the second stage of analysis, we then returned to the data and reread the social, political, economic or institutional contexts in which energy poverty is situated. The second stage of analysis aims to address our first research question: *What socio-spatial relations make a difference to the form, structure and drivers of this phenomenon?* Building on this question, we reinterpreted the initial codes to develop broader themes. While doing this, we also returned to the theoretical approaches outlined in Section 2, drew on the insights and compared the underlying logics shared between the initial codes and the theoretical anchors of each approach. For instance, codes such as neoliberal economy, lack of investment, austerity, liberal energy market, shown in the 1. and 2. categories, refer to macro-level political and economic relations that shape the **distribution of resources, such as infrastructure, capital, and subsidies** across space, as the geo-materialist lens widely argues. So, by following this iterative mode between data and theory, we transformed the first-order categories into second-order themes reflecting political, economic, social, and institutional relations underlying energy poverty. This stage generated six second-order themes.

At the third stage of analysis, we moved from second-order themes toward more abstract aggregate dimensions. To guide this step, we asked our second research question for each theme: *How and in what processes do these relations construct energy poverty in and beyond the home?* This process was not linear but involved going back and forth between data segments, codes, themes, and our theoretical framework. We identified the similarities across themes, specifically, recurring patterns in how different relations shape energy poverty in similar ways. For example, themes related to politico-economic conditions (1.theme) and historically embedded failure of governance (2.theme) refer to structural processes in which initial conditions for energy inequality are created. Similarly, themes involving systemic and institutional

Table 1
Inclusion and Exclusion Criteria for Screening.

Inclusion Criteria	Exclusion Criteria
Studies that examine how economic and political relations shape the spatial distribution of resources, affecting energy poverty.	Studies that focus exclusively on dwelling characteristics (e.g., inefficiency, size, age) without engaging with broader socio-spatial relations.
Research that explores the role of discourse, systemic power imbalance and discrimination in rendering identities energy vulnerable.	Studies that rely solely on index-based or statistical methods to spatially analyse energy poverty without addressing relational or contextual dynamics.
Studies that discuss how institutional structures, systems, and individual or collective agency interact to shape energy poverty outcomes.	Studies that do not engage with the political, historical, or social processes shaping energy poverty and treat it as a neutral or isolated issue in space.
Studies that highlight the role of social practices, interactions and social meanings in shaping people's experiences of energy-related difficulties	
Studies that engage with the lived experiences of energy-vulnerable populations and the ways they navigate and respond to their conditions.	

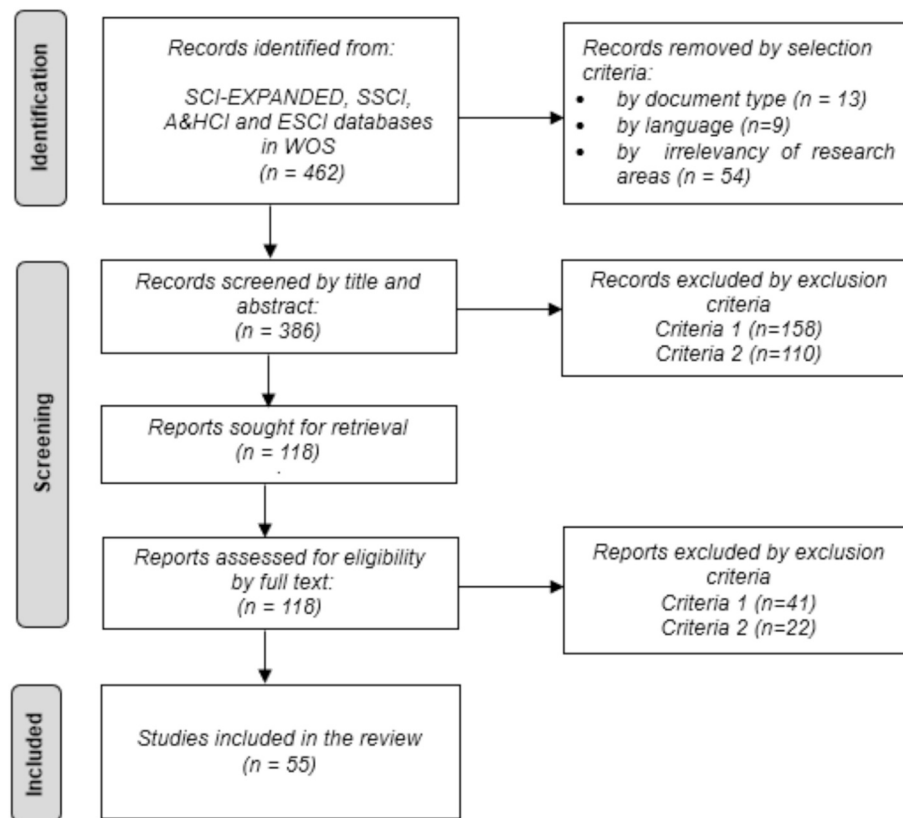


Fig. 2. PRISMA flow diagram for the literature review process [99].

challenges (3) and normative values (4) generally reinforce existing inequalities. Lastly, strategies and practices used by households (5) or communities (6) to cope, adapt, or resist energy poverty refer to the navigation of these inequalities. We, therefore, grouped these themes according to the similar broader processes they reflect. This step allowed us to identify three overarching processes by which energy poverty is relationally constructed across macro to micro scales: (1) **creating**, (2) **reinforcing**, and (3) **navigating**. In Fig. 3, we provide a simplified illustration of the data structure and further explanation in the following section, together with the analytical anchors that informed their development.

4. Findings

As anticipated in Fig. 3, our data reveal three main processes through which energy poverty is constructed through spatial relations. In this section, we first provide a general overview of the reviewed studies, followed by a detailed examination of each of these processes.

4.1. Overview of the studies

There has been a clear increase in the number of studies focusing on the spatial dimensions of energy poverty since 2007, which indicates a growing awareness about the prominence of space in the cause and consequence of this problem (Fig. 4). Empirical studies based on qualitative methodologies (light blue bars, $n = 30$) are the most common, reflecting a preference for methods that enable a deeper understanding and interpretation of the contextual depth of energy poverty. However, our data pool encompasses a diverse range of methodologies, including quantitative studies and spatial analysis ($n = 17$), mixed-methods research ($n = 4$), and conceptual/review papers ($n = 4$).

The reviewed papers reveal a broad spectrum of relationships that contribute to the construction of energy poverty. These relationships

range from micro-level household dynamics to the capitalist economic forces that shape regional development and the political-institutional interactions that bridge these scales. All these relations manifest in space and, in turn, actively produce and reproduce it. Papers do not focus on a single type of relationship occurring at one specific geographical scale; rather, they interconnect various types of relations across multiple scales. For example, while many studies discuss macro-level, neoliberal economic relations and their impact on energy markets, particularly in terms of rising energy prices and affordability, these effects manifest differently depending on the research focus. They may influence meso-level dynamics, such as the uneven distribution of energy subsidies at the national level, or micro-level responses, such as household coping mechanisms. Therefore, categorising each study strictly by type of relation is not feasible. Instead, they are best synthesised through an interpretive and multi-scalar lens that captures the interconnected nature of these relations.

Nevertheless, depending on the geographical contexts, certain types of spatial relationships become more prominent. In Western Europe, relations covering a broad range of topics such as liberal energy markets [103], high energy prices [34], inadequate social support systems [104], discriminated identities [20], and core-periphery dependency [105] are commonly discussed in the studies. Energy poverty in the transition economies in Central and Eastern Europe (CEE) is often addressed through the relations intertwined with historical institutional and economic legacies [106,107]. In the studies focusing on Southern Europe, it is addressed through austerity policies and institutional challenges in the aftermath of significant economic crises [108].

On the other hand, energy poverty in countries of the global South has generally been examined as a result of limited energy infrastructure, access-related problems [109], and exploitative economic relations [110]. Additionally, cultural norms and habits related to fossil fuels, as well as the negative health impacts on women, are highlighted as relations affecting energy poverty [111]. In East Asia, systemic constraints

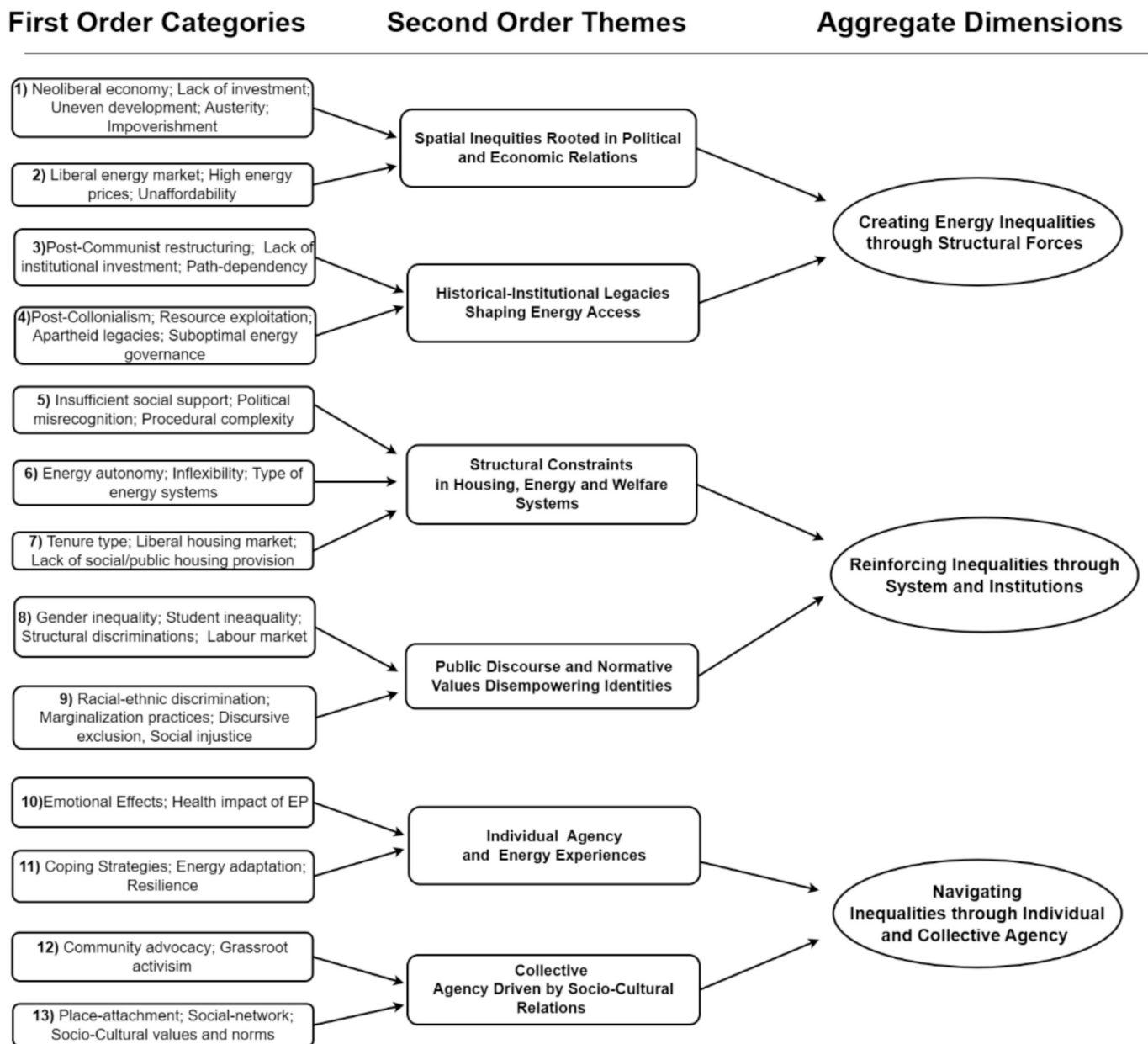


Fig. 3. Data structure and analysis.

in the affordable housing market are prominent with its influence on the energy problem [112,113], while EP is addressed through institutional barriers in energy flexibility, and the lack of public support in Australia [114,115]. Lastly, research in North America tends to focus on energy poverty as a result of income disparities, regional energy costs and racial inequalities [116,117]. These regional perspectives demonstrate that energy poverty is not a uniform condition but is relationally shaped by diverse structural, institutional, and socio-cultural factors specific to each geographical context.

4.2. Creating energy inequalities through structural forces

This aggregate dimension refers to the macro-level processes through which energy poverty is structurally created. A significant body of reviewed literature sheds light on these processes through which political-economic systems and historically embedded governmental structures generate the material and social conditions that give rise to energy deprivation [33,118]. These processes involve the allocation of

fixed investment in energy infrastructure and housing as well as the distribution of subsidies [32,109,111]. In this sense, it shapes where and how energy vulnerabilities emerge as a consequence of large-scale social, political, and economic relations.

Across the reviewed papers, two types of macro-level relations contribute to the creation of energy vulnerability across different spatial and temporal contexts.

4.2.1. Spatial inequities rooted in political and economic relations

Capitalist political and economic relations, along with the socio-spatial inequalities that they produce, are very prominent underlying causes of the spatial contingency of energy poverty in the reviewed literature. Initial codes (e.g. neoliberal economy, lack of investment, austerity, liberal energy market) shown in the 1st and 2nd categories are addressed as main reason for energy poverty in most of the papers [106,111,118]. Therefore, drawing on the anchor from a geographical materialist perspective, we interpreted this group of initial codes as reflecting how macro-level political and economic relations shape the

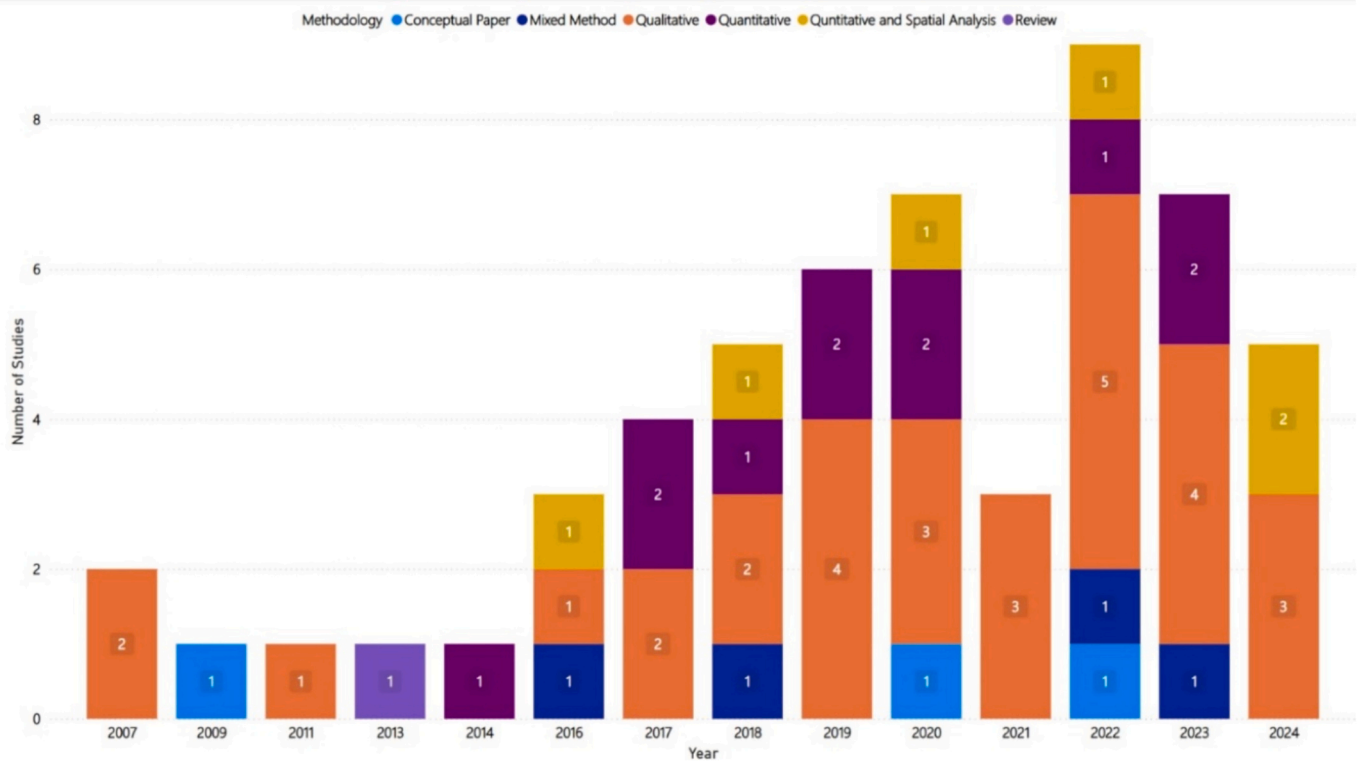


Fig. 4. Descriptive statistics.

distribution of resources, such as infrastructure, capital, and subsidies across space. These relations contribute to geographically uneven conditions of energy deprivation. This led us to the second-order theme “*Spatial Inequities Rooted in Political and Economic Relations*,” which highlights how energy poverty is not only a result of broader structural forces but also of their spatially differentiated impacts.

At the international level, these relations are particularly evident in the papers focusing on the energy poverty in the Global South, where differences in capital accumulation drive uneven socio-spatial and economic development [111,118–120]. These studies show that energy poverty in the Global South is characterised by access-related challenges to clean energy and high dependency on fossil fuels, stemming from limited modern energy investment and socio-spatial and economic underdevelopment. They prove that energy poverty is not an individual or isolated problem in particular locations. Rather, prior inequalities that give rise to EP are determined by capitalist economic relations that prioritise profit-maximising in cross-country investments.

At the regional level, the effect of uneven political and economic relations is particularly prominent in the form of the EU’s ‘energy divide’. In this sense, Bouzarovski & Tirado-Herrero [106] identify CEE and Southern Europe as energy poverty peripheries in contrast to the ‘core’ of EU nations with a lower incidence of energy poverty. These trends are also evident in peripheral and rural areas of developed countries, where energy poverty is shaped by investment gaps, deteriorating infrastructure, and economic marginalisation [34,35]. For instance, Golubchikov and O’Sullivan [105] conceptualise the high spatiality of energy poverty in Wales through the lens of “energy peripheralisation”. They argue that Wales’ energy poverty stems from the politico-economic disadvantages of the region, including limited investment, deteriorating infrastructure, sparse and low-income populations, and weaker political representation compared to the core.

Our review shows that the impact of economic and political relations at the national level is particularly emerge during national economic crises when institutional challenges emerge, state benefits are cut, austerity policies are enforced, and socio-economic vulnerabilities are

deepened. As discussed by Desvallées et al. [121] and Petrova and Prodromidou [108], the emergence of diverse socio-demographic groups as the ‘new energy poor’ in Greece and Spain reflects the consequences of neoliberal austerity policies of the government in the aftermath of the 2008 global financial crisis, including the shift from permanent jobs to precarious employment, limited public funds for low-income households, and scaling back on public and private investment in the residential sector (e.g. housing development, retrofitting projects) and energy infrastructure.

4.2.2. Historical-institutional legacies shaping energy access

Another group of codes focuses on the historically rooted institutional and infrastructural structures that continue to create and sustain the spatial patterns of energy inequalities. Initial codes, shown in the 3rd and 4th categories (e.g. post-communist restructuring; path-dependency, resource exploitation, apartheid legacies), are widely dominant in the papers discussing how long-term institutional legacies and political transitions affect present energy systems and governance. Therefore, by drawing on the structurationist anchor, which emphasises the interplay between structure, systems and agency, we interpreted these codes as pointing to a second-order theme of “Historical-Institutional Legacies Shaping Energy Access.” This theme captures how embedded energy and governance systems continue to create spatial energy inequalities.

This situation is particularly prominent in the studies examining energy poverty in post-communist economies of Central and Eastern Europe (CEE). The energy poverty of this region is framed as a consequence of systemic path dependency, intertwined with emerging economic and political relations during the post-communist restructuring era [43,44,122]. Neoliberal economic dynamics (e.g. industrial closures, labour force downsizing, declining wages, and rising unemployment) and new institutional arrangements in the energy sector, driven by the liberalisation and marketisation of state monopolies, are the most addressed relationships in the studies [106]. Studies also discuss how these changes have led to a sharp increase in energy tariffs and a

reordering of social welfare governance, resulting in weakened or absent household support mechanisms [104]. Bouzarovski et al. [123] reveal that new economic and institutional relations coupled with infrastructural legacies such as energy-inefficient building stock and energy infrastructure and pushed more households into energy poverty in these countries.

A similar impact of historical legacies on energy inequalities is evident in the papers that examine the post-colonial countries in Africa. High fossil fuel dependency in these countries is widely attributed to colonial economic and political relations, which prioritised global exploitation over domestic investment alongside the abundance of traditional solid fuels [110,124,125]. Scholars argue that these dynamics persist in the contemporary energy system through colonial institutional legacies and reinforce structural energy inequalities [109,126,127]. A clear illustration of how exploitative political, institutional and economic relations reinforce energy hardship can be found in the study conducted by Chipango [32] in rural Zimbabwe. The paper argues that while neoliberal market dynamics socio-economically impoverish agrarian-dependent communities through unfair crop payments, in parallel, colonial government legacies and energy companies perpetuate spatial energy inequalities by not providing appropriate energy infrastructure to the peasant communities, which pushes them toward energy backsliding.

4.3. Reinforcing inequalities through systems and institutions

While capitalist economic and political relations play a dominant role in creating inequalities through the uneven distribution of resources, they are not the sole determinants of the spatial form of energy poverty. The everyday functioning of systems and institutions operating within the national contexts is addressed in the papers, as they often constrain people's ability and capacity [34,113,123,124,128]. This aggregate dimension captures how energy poverty is continually reinforced through multiple spatial relations stemming from socio-cultural and economic structures, systems, and institutions. In this sense, this process resonates with the capability approach of Middlemiss et al. [129] and Day et al. [130], in which energy poverty is conceptualised not merely as a lack of resources, but as a condition that emerges through constrained capabilities by relational and institutional structures, thereby affecting individuals' ability to sustain wellbeing and exert agency. The following two second-order themes illustrate how these dynamics operate through formal institutional structures and informal public discourses, as discussed in the literature.

4.3.1. Structural constraints in housing, energy and welfare systems

Everyday functioning of formal institutions is widely addressed in the reviewed literature, as they highly affect people's energy-related decisions [35,103,131]. Prevailing initial codes (e.g. tenure type, liberal housing market, energy system inflexibility, insufficient social support, political misrecognition) shown in 5–6–7th categories reveal that there is an ongoing tension between housing, energy and welfare systems and everyday practices of coping, adaptation, and resistance. Therefore, we interpreted these codes by drawing on the anchor from a structurationist perspective that sees space as an outcome of the **inter-play between structures, systems and agency** in an ongoing process. This led us to the second-order theme “*Structural Constraints in Housing, Energy and Welfare Systems*”. This theme illustrates how agency is not absent but is constrained within systemic and institutional structures that define what is possible, permissible, or accessible for households. It captures how structural constraints embedded in housing markets, energy systems, and public support mechanisms limit households' ability to respond to or alleviate energy poverty.

The first systemic constraints in the literature stem from the market-oriented housing provision system, characterised by high rents and high purchase prices, accompanied by insufficient social or affordable housing provision. Scholars discuss how these systemic forces constrain

access to homeownership, particularly in metropolitan areas, and trap many vulnerable households in long-term, disadvantageous tenancy conditions within the private housing sector [35,94,103]. The tenancy situation is widely attributed as a vulnerability factor in many reviewed articles since tenants lack autonomy and often depend on landlords to undertake energy efficiency measures [107,112,113,117,132]. This situation is even exacerbated in student flats or multiple occupancy houses as their short-term tenure reduces their power vis-à-vis landlords [94,133]. In such conditions, households are either trapped in energy poverty or forced to relocate to lower-cost housing, which is often low in building efficiency. Therefore, the market-driven housing system and the landlord-tenant dynamics reinforce household energy hardship. Furthermore, as discussed by Grossmann et al. [134], it shapes a new spatial pattern of energy poverty, leading to a distinct form of “housing segregation” in big cities, where low-income tenants mostly concentrate in housing that is prone to energy poverty.

The second systemic constraints stem from the mismatch between the type of energy system or infrastructure and household energy demands. While constantly rising energy prices in the market-driven energy sector decrease energy affordability all around the world, particular types of energy infrastructure and systems are attributed as vulnerability factors in the literature. These include monopolistic structures of energy supply and district heating systems, particularly in CEE [107,123], a lack of smart or individual consumption meters [43,135], and pre-payment methods in energy systems [114,124]. Since they all constrain household energy autonomy and flexibility upon accommodating their energy consumption according to demands (e.g. switching off or substituting with cheaper tariffs), they are more likely to reinforce households' energy vulnerability.

The final constraints, reinforcing household energy inequality, arise from either insufficient (or lack of) public support for vulnerable households or systemic barriers to reaching them. The literature underlines that although poor households can benefit from social welfare systems (e.g., housing and energy subsidies, social funds) in many countries, how these subsidies are poorly designed to address the heterogeneity of energy-vulnerable households or difficult to access them due to institutional and systemic barriers such as conditional bureaucracy, representational injustice of identities and misrecognition [35,104,108,131,135,136]. Furthermore, as evidenced by Kaufmann et al. [137], institutional and structural barriers, such as a lack of effective communication and information, negatively affect the participation of citizens in retrofitting projects, which deteriorates their energy poverty situation.

4.3.2. Public discourse and normative values disempowering identities

Structures and systems in the literature extend beyond formal ones discussed above and encompass socially and politically constructed (informal) constraints. Many studies challenge the spatial neutrality of energy poverty, which assumes equal socio-technical and regulatory systems for each social and cultural identity [94,138]. They reveal that the spatialisation of energy poverty also reflects various forms of identity-based injustices created by socio-cultural and political systems such as gender discrimination [128,139], racism and ethnical discrimination [9,20,32] or normative values related to age and lifestyle [94]. Prevailing initial codes (e.g. gender inequality, racial-ethnic discrimination, student inequality, discursive exclusion, marginalisation practices), shown in the 8–9th categories, highlight how people are often rendered invisible or irrelevant in energy-related narratives, policies, and decision-making arenas. Therefore, we interpreted these codes through a post-structuralist lens, addressing space through the **production and circulation of discourse and knowledge** and created a second-order theme “*Public Discourse and Normative Values Disempowering Identities*”. This theme emphasises how power is exercised through dominant discourses shaping whose needs are acknowledged, whose vulnerabilities are prioritised, and whose identities are legitimised. It captures the idea that normative values and expectations about

who is deserving of support or what counts as vulnerability often silence the lived experiences of energy-poor groups, thus reinforcing energy inequalities through cultural and symbolic mechanisms.

In the reviewed literature, gender discrimination is the most addressed force that reinforces energy inequalities. Socio-economic and political discriminatory practices such as structural inequalities in the labour market and welfare provision, oppression and disadvantage in terms of basic rights, and socio-cultural normative values about women's role in domestic work disempower women and reinforce their energy-related vulnerabilities [139,140]. Studies show that even in the same neighbourhood and in the same building conditions, women, especially those who are single, elderly, or have children, are more likely to be energy-poor [116,128]. Studies also reveal that women are more vulnerable to the adverse physiological and mental health effects of energy poverty [140]. Particularly in the countries of the Global South, where women are primarily responsible for household tasks and have limited participation in the labour force due to strict social and cultural norms, they face negative health consequences and various challenges associated with energy poverty [111,120]. These discussions have been furthered by intersectionality studies that link gendered vulnerability to other axes of discrimination, such as class, race, and ethnicity [128,139,141]. For instance, as explored by Chen et al. [116] and Brown et al. [138], while all female-headed households from different racial and ethnic backgrounds face higher energy burdens than male-headed households, this situation is even worse for Black women in the US.

Ethnic and racial discrimination is the second most discussed force in the literature that disempowers identities, particularly those of minority and migrant statuses in big cities. Studies reveal that complex assemblages of discourses, knowledge and socio-political power reinforce energy inequalities of ethnic and racial groups through narratives of marginalisation or associated policies [20,142]. Studies reveal that traveller and Gypsy communities in the UK [131] and Ireland [9], Roma communities in peripheral neighbourhoods in Spain and Romania [143], Bedouin villages in Israel [144] face historical and structural discrimination such as discursive exclusion, intolerance, disrespect in housing, energy and welfare systems alongside social life. The lack of formal data on their inadequate and, in some cases, informal spatial arrangements, together with the mutual mistrust and prejudice between public authorities and communities, further deteriorate the conditions by creating barriers to applying for social allowances [131,143].

Students and young adults are also disempowered by normative values and judgments related to age in the literature. As shown in the studies conducted by David and Kodoušková [103] and Morris and Genovese [133], young adults and students living in predominantly rented or shared accommodations face distinct forms of discrimination and disempowerment. As discussed by Petrova [94], on the one hand, due to a limited economic budget during an early stage of life, they are trapped in rented or shared accommodations. On the other hand, their energy hardship is often socially and politically normalised by prevailing social norms and judgments regarding their more fluid and transient lifestyles (ibid.). Therefore, these normalisation practices reinforce their energy inequalities by preventing their representation at the social and political level.

4.4. Navigating inequalities through individual and collective agency

The reviewed studies, particularly those following a phenomenological approach, highlight the processes through which energy poverty is experienced, contested, and negotiated through a range of everyday practices. On the one hand, they explore the negative emotional and physical experiences of households caused by energy poverty [94,115,132,136]. On the other hand, they shed light on different forms of agency that are improved by individuals and communities to navigate energy poverty. Building on these discussions, this aggregated dimension captures the role of active agency in navigating energy inequalities, not as resistance in the abstract, but as embedded in social networks,

cultural values, emotional experiences, and embodied routines. It includes both community-level mobilisation rooted in shared meanings and social ties, and individual coping strategies that reflect resilience and adaptation under constrained conditions. The following two second-order themes illustrate the collective and individual ways in which people respond to energy deprivation across different spatial contexts.

4.4.1. Individual agency and energy experiences

Many studies in our paper pool discuss how inadequate energy access affects the mental and physical well-being of people. The prevailing initial codes (e.g. emotional effects, health impact), shown in the 10th category, refer to emotional, psychological and health consequences of EP, such as fear, anxiety, specific illnesses or social stigma, exclusion or shame [94,115,132,136]. As argued by David and Kodoušková [103] and Martiskainen et al. [35], these are both consequences of energy poverty and, in turn, its drivers, as they discourage people from seeking help.

On the other hand, people try to navigate their energy hardship through diverse forms of individual agency, improved at home. The initial codes in category 11th (e.g. coping strategies, energy adaptation) refer to the households' everyday energy practices and more transformative strategies to manage their energy consumption [108,115]. We interpreted these initial codes through the anchor of the humanistic perspective that emphasises the **symbolic and phenomenological dimensions of space** and the anchor of the structurationist perspective that sees space as an outcome of the **interplay between structures, systems and agency**. This interpretive mode led us to create a second-order theme of *“Individual Agency and Energy Experiences”*. This theme emphasises that energy poverty is not only associated with the material aspect of space but also the emotional and symbolic aspects. People experience and make sense of energy-poor spaces and respond to structural inequalities within their own capabilities. People's responses are shaped by their relationships with their homes, their perceptions of comfort, their feelings, and the social dignity they ascribe to their lived environments [35,94,145].

People affected by energy poverty initially modify everyday practices and routines in their domestic space to reduce their energy costs. They typically change household cleaning routines, spend more time in shared living rooms or public places such as a library or school, wear warmer clothes, or turn off the heating [35,94]. Studies demonstrate that domestic relations and social roles among household members play a mediating role in modifying energy-related practices. For instance, people living in shared accommodations adjust their energy consumption in a way that balances the responsibilities of living together [94,103,105].

The literature also discusses that, depending on the financial capacity/savings, geographical conditions and home-ownership situation (as discussed above), households take more transformative and environment-friendly measures such as implementing solar panels or retrofitting dwellings [121,137]. However, depending on the geographical conditions, declining purchasing power leads households to revert to or stockpile cheaper fossil fuels [123]. This situation is common in rural and peripheral areas, where alternative sources are more accessible and usable due to weaker regulatory constraints [32,120,146]. Moreover, households, particularly in the countries in the Global South, prefer fuelwood despite the co-existence of modern fuels due to its deep-rooted role in cultural and ethnic practices or norms, besides its versatility [103,120,147]. As discussed by Moles-Grueso & Stojilovska [145], these norms and cultural preferences also play an important role in their willingness to adopt official energy poverty and energy transition policies. This situation underlines that understanding household-level agency mechanisms and the socio-cultural reasons, norms, or beliefs behind them is crucial for gaining political insight into energy transition strategies from the perspective of inhabitants' everyday epistemologies.

4.4.2. Collective agency driven by socio-cultural relations

Studies, particularly from the perspective of an urban political ecology, discuss how collective forms of agency, such as citizen advocacy groups and grassroots activism, help to navigate energy inequalities [107,121]. Our initial codes (community advocacy, grassroots activism, place attachment, social networks) shown in 12- 13th categories refer to the collective form of agency established in diverse ways in each geographical context. As discussed by Petrova and Prodromidou [108], these actions are deeply rooted in social networks, place-attachment, and socio-cultural norms, which provide both the emotional grounding and the organisational capacity to act. Therefore, we interpreted these codes by drawing on the anchor of a social constructivist lens that focuses on the role of **social practices, interactions and social meanings** and the anchor of structurationist perspective that focuses on the **interplay between structures, systems and agency** in the production of space. This led us to create our second-order theme, “*Collective Agency Driven by Socio-Cultural Relations*”. This theme emphasises that agency is not only exercised individually but also emerges collectively, through socio-cultural practices and social interactions, established in different spatial contexts.

Communities respond collectively to energy vulnerability, drawing strength from their social ties, shared values, and place-based identities. In examples such as tenant movements in Poland, citizen movements in Macedonia [107] and social movements in Barcelona [121], people reclaim their lived environment, energy and housing rights in the face of the power imbalance of the whole system. In other examples, communities collectively demand and fight for investment in renewable energy initiatives or energy efficiency to alleviate energy hardship [33,148,149]. They all show that socio-spatially constructed networks and relations among people, place attachment and community values provide emotional and practical support to effectively organise a collective movement [103,108].

5. Discussions

Compared to the advancement of operational definitions and analytical measurement methods, the theoretical development of energy poverty has remained limited. Our study first expands the conceptual boundaries of energy poverty and contributes to ongoing spatial discussions in this literature. It provides an enacting theoretical ground for further academic research on energy poverty from a socio-spatial perspective. Our findings from the literature review reveal the multi-scalar and dynamic spatial relations that make a difference to the form, structure and drivers of this phenomenon. In that sense, they strengthen our argument that energy poverty is not a spatially “given” and fixed phenomenon. Rather, it is a subject to change and becoming through three dynamic processes in which space plays a contextual role: *creating, reinforcing, and navigating*.

In the first process of “creating”, larger structural forces, particularly capitalist economic and political relations, accompanied by historical and institutional legacies, lay the foundation for socio-spatial energy inequalities. Our findings show that due to capitalism's profit-maximising logic in relation to space, some places, deemed less profitable for investment, often experience low capital flows in the energy and housing sectors [105,117]. Lack of economic and spatial investment triggers a chain of socio-economic and institutional consequences, including rising unemployment, economic unrest, institutional challenges, declining incomes in the market, and obsolescence of existing energy infrastructure and housing stock over time. Over time, these dynamics create both access-related and affordability-related energy inequalities across different geographical contexts. The underlying logic of this process aligns with Harvey's geo-materialist idea, which posits that the contemporary world is not purely natural but is instead produced and reproduced through the circulation of money within the capitalist system [83,p. 332].

Our engagement with Harvey's geo-materialist perspective connects

our review strongly with critical scholarship in energy and environmental studies. For instance, Huber [150] emphasises the broad role of energy in the social production of space by illustrating the uneven processes through which energy infrastructures, investments and consumption patterns materially shape urban environments. Complementing this perspective, we shed light on the parallel processes through which not only urban spaces, but also spatial patterns of energy poverty are socially produced by capitalist economic and political relations. Our review also resonates with the work of Newell and Mulvaney [151] in that they discuss the political economy of energy transition. As they argue in the paper, structural inequalities and institutional power shape where and for whom energy poverty unfolds, primarily through their influence on the distribution and governance of energy systems. Then, these dynamics continue to restructure society and space by creating new ways of injustice, such as uneven energy transition policies that disproportionately affect those already living in energy poverty. As we evidenced through the work of Kaufmann et al. [13], institutional and structural barriers, such as a lack of effective communication and institutional neglect, hinder people's participation in retrofitting projects and deteriorate people's energy condition. Therefore, together with these works, we claim that energy poverty and transition processes are not merely technical or environmental phenomena but are actively produced through material and spatial relations of power, capital, and governance. As long as the resources, infrastructure, capital, and subsidies remain asymmetrically distributed through those relations, the spatialisation of energy poverty and energy transition will continue to be uneven and will reflect broader patterns of socio-spatial inequalities.

The second process, “reinforcing”, refers to systemic and institutional constraints at the national level, rooted in formally or informally institutionalised relations. On the one hand, studies aligning with structurationism and post-structuralism indicate that systemic constraints in the formal functions of housing, energy and welfare systems reinforce the existing inequalities in society [35,103]. On the other hand, they reveal that informal socio-cultural systems in society—dominated by heterogeneous power, injustice, and conflicting norms and values—even further deteriorate the conditions for particular identities [143,144]. Therefore, energy poverty is particularly reshaped as a manifestation of socio-spatial injustice during this process in a way that disproportionately affects certain social identities. Across all studies, vulnerable identities are predominantly concentrated in deprived neighbourhoods (e.g. transitory-low rent and poor energy performance housing) and disadvantaged locations that have other types of service problems, such as a lack of public amenities and transport (see [20,128]). This is because space is both a contested arena—infused with power relations and injustices—and a product of those relations that reflect inequalities in society.

The third process, “navigating”, consists of collective or individual forms of agency against energy inequalities at the community or household level. Despite the dominant role of political and economic relations, along with systemic and institutional constraints in creating and reinforcing energy poverty, this process is not linear and one-directional. Rather, it is dynamic, recursive and continuously open to being reshaped. In the reviewed examples, residents' emotional, historical, and symbolic ties to place particularly serve as powerful drivers of collective agency and local mobilisation [33,107,121,148,149]. This is a compelling finding for area-based policy design, as it highlights the success of social place and people's place-attachment in advocating for their environments in the face of dominant power structures. It is particularly useful for the design of local energy communities to tackle energy poverty. For instance, Sareen et al. [152] argue that energy communities are socially and spatially constructed initiatives, embedded in spatially situated networks of infrastructures and institutions. Therefore, recognising and supporting local meanings, and community shared values has the potential to make energy communities more inclusive, participatory and long-term durable.

The second contribution of this review is to the policy design, aiming

to alleviate energy poverty. In this review, by adopting a relational perspective, we revealed diverse and mostly invisible relations that shape the spatial nature of EP. A set of multi-scalar structural and institutional dynamics—ranging from the household to regional and cross-regional levels—shape where and how energy poverty unfolds. This means that although energy poverty manifests at the household level, it is not the result of household failure in financial capacity or energy consumption habits. Rather, it is a multi-layered outcome, produced through a series of uneven processes that over people's individual capacity. This finding also aligns with and supports the ongoing discussions in the literature. For instance, Bouzarovski and Simcock [19] argue that spatial injustices in energy are deeply rooted in uneven infrastructural development, material deprivation, and policy neglect that operate across scales. Recognising this relational nature of EP requires shifting from market-based and technical solutions toward addressing the broader systems and spatial structures that generate and sustain energy inequalities. Policies aiming to promote long-term socio-spatial energy justice must address the root causes of inequality in the distribution of resources, subsidies, infrastructure, and energy governance, as well as the structural constraints embedded in housing and welfare systems. In addition, equitable and just energy poverty policies should incorporate more inclusive and effective governance mechanisms that are sensitive to the diverse lived experiences, needs, and capacities of marginalised identities and social groups.

The final contribution is to the human geography and relational spatial theory we have employed. Although it has long been utilised in human geography, it remains fragmented across various sub-fields, applied at different spatial scales, and limitedly operationalised to address specific socio-spatial challenges. This review not only applies relational spatial theory but also enriches it by integrating insights from diverse sub-perspectives, discussed in Section 2. Redefining the complex and multi-scalar nature of spatial relationality through the energy poverty phenomenon enhances the theory's adaptability to further intersectionality inquiries.

6. Conclusion

Energy poverty is increasingly being recognised as a socio-spatial phenomenon shaped by geographically variable and locally contingent factors [7,8]. Despite growing interest in spatial discussions in this field, the notion of space has largely been reduced to positivist and Euclidean understandings, which are primarily concerned with measuring and mapping the geographical distribution of energy poverty and energy burden. There has been limited interest in constructivist approaches focusing on the open and network-dependent nature of space to explain how space and spatial relations matter in energy poverty. In this review, we adopt five diverse relational perspectives from spatial theories, each of which explains how space is continuously produced and reproduced

through various forms of relations established at any point in an ongoing process [22,24,25,36–38]. Drawing on these perspectives, we examine how multiscale and mostly invisible spatial relations contribute to the dynamic nature of energy poverty.

In conclusion, our findings reveal that energy poverty is shaped not only by the individual characteristics of the home—whether material or socio-demographic—but also by multi-scalar social, economic, cultural and political relations among social actors, entities and structures in each spatial context. These relations are embedded in structural forces, systems, and institutions, creating and reinforcing energy inequalities and collective or individual agencies navigating them. All relations are constructed within space, interacting with one another in both opposition and alignment across time and geographical scales, ranging from the domestic home to national and regional contexts. Energy-poor spaces emerge from these interrelations as (temporarily) co-produced arenas, yet they are not fixed but rather open to change and transformation through possible relationships. They are continually produced and reproduced through interactions in ongoing processes.

A key limitation of this review, as with any systematic literature review, lies in the scope of the sample. By focusing on peer-reviewed articles and limiting the analysis to English-language publications, relevant contributions from books and studies in other languages may have been overlooked. Additionally, while this review highlights the socio-spatial dimensions of energy poverty, further empirical research is needed to deepen the understanding of how specific spatial relations—such as institutional dynamics, infrastructural inequalities, or localised socio-economic conditions—shape energy poverty across different regions and social groups. Investigating these aspects through case studies or comparative analyses may provide a more nuanced understanding of the relational processes in which energy poverty is constructed and inform more context-sensitive policy interventions.

CRedit authorship contribution statement

Saziye Bal: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Methodology, Conceptualization. **Amparo Merino:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Methodology, Conceptualization. **Sergio Tirado Herrero:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Conceptualization.

Declaration of competing interest

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

Appendix A. List of reviewed studies

N ^o	Reference of papers	Methodology	Country/Region	N ^o	Reference of papers	Methodology	Country/Region
1	(Petrova, 2017)	Mixed Method	UK/Western Europe	28	(Kumar, 2020)	Quantitative	Rural India /South Asia
2	(Robinson, 2019)	Quantitative	England/Western Europe	29	(Harrison & Popke, 2011)	Qualitative	Carolina/North America
3	(Capetillo-Ordaz et al., 2024)	Quantitative; Spatial Analysis	Madrid/Southern Europe	30	(Sánchez et al., 2020)	Quantitative; Spatial Analysis	Madrid/Southern Europe
4	(David & Kodoušková, 2023)	Qualitative	Czech Republic/Central Europe	31	(Chipango, 2022)	Qualitative	rural Zimbabwe/Southern Africa
5	(Lehtonen et al., 2024)	Quantitative; Spatial Analysis	rural Finland/Northern Europe	32	(Buzar, 2007a)	Qualitative	Macedonia; Czech Republic/Balkans; Central Europe
6	(Martiskainen et al., 2023)	Qualitative	United Kingdom/Western Europe	33	(Desvallées et al., 2020)	Qualitative	Barcelona/Southern Europe

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(continued)

N ^o	Reference of papers	Methodology	Country/Region	N ^o	Reference of papers	Methodology	Country/Region
7	(Robinson et al., 2018)	Quantitative; Spatial Analysis	England/Western Europe	34	(Bouzarovski et al., 2023)	Comparative Analysis	Serbia; Montenegro; Ukraine; Georgia/ Southeastern Europe, Eastern Europe, Eurasia
8	(Bouzarovski et al., 2022)	Qualitative	UK/ Western Europe	35	(Chen et al., 2022)	Quantitative; Spatial Analysis	North America
9	(Varo, 2024)	Qualitative	Girona/ Southern Europe	36	(Mashhoodi & Bouman, 2023)	Quantitative	Netherlands/ Western Europe
10	(Bouzarovski & Herrero, 2016)	Quantitative	Poland, Czech Republic, Hungary/ Central Europe	37	(Sovacool & Del Rio, 2022)	Mixed Method	Northern Ireland/ Western Europe
11	(Simcock et al., 2021)	Qualitative	Poland/ Central Europe	38	(Sovacool, 2013)	Review	Myanmar/ Southeast Asia
12	(Kodouskova & Boruta, 2022)	Qualitative	Slovakia/ Central Europe	39	(Vandeninden et al., 2022)	Quantitative	Burkina Faso/ West Africa
13	(Hilbert & Werner, 2016)	Qualitative	New York/ North America	40	(Plumridge-Bedi, 2018)	Qualitative	Bangladesh/ South Asia
14	(Fuller et al., 2019)	Qualitative	China/East Asia	41	(Buzar, 2007b)	Qualitative	Eastern and Central Europe
15	(Golubchikov & O'Sullivan, 2020)	Conceptual Paper	Wales/Western Europe	42	(Castan-Broto et al., 2020)	Quantitative	Mozambique/ Southern Africa
16	(Petrova & Prodromidou, 2019)	Qualitative	Greece/Southern Europe	43	(Monyei et al., 2022)	Conceptual Paper	Sub-Saharan Africa
17	(Phillips & Petrova, 2021)	Qualitative	Southern Africa	44	(Willand et al., 2021)	Qualitative	Australia
18	(Reames, 2016)	Quantitative; Spatial Analysis	Kansas City/ North America	45	(Grossmann et al., 2014)	Quantitative	Germany/Western Europe
19	(Teschner et al., 2020)	Qualitative	Romania; Israel/ Eastern Europe; Middle East	46	(Jewitt et al., 2020)	Qualitative	Nigeria/West Africa
N ^o	Reference of papers	Methodology	Country/Region	N ^o	Reference of papers	Methodology	Country/Region
20	(Kaufmann et al., 2023)	Qualitative	Netherlands/ Western Europe	47	(Vassiliades et al., 2022)	Qualitative	Global South
21	(Moles-Gruoso & Stojilovska, 2021)	Qualitative	Barcelona; Macedonia/ Southern Europe; Balkans	48	(Grealy, 2023)	Qualitative	Australia
22	(Stojilovska et al., 2024)	Qualitative	Macedonia, Poland, Spain/ Balkans, Central Europe, Southern Europe	49	(Büscher, 2009)	Conceptual Paper	Southern Africa
23	(Forster et al., 2019)	Qualitative	England/ Western Europe	50	(Dugoua et al., 2017)	Quantitative	rural India/South Asia
24	(You & Kim, 2019)	Quantitative	Seoul//East Asia	51	(Brown et al., 2023)	Quantitative	North America
25	(Bouzarovski et al., 2015)	Mixed Method	Hungary/ Central Europe	52	(Stock & Sovacool, 2023)	Mixed Method	India /South Asia
26	(Morris & Genovese, 2018)	Quantitative	UK / Western Europe	53	(Waitt & Harada, 2019)	Qualitative	Australia
27	(Baptista, 2018)	Qualitative	sub-Saharan Africa	54	(Martiskainen et al., 2017)	Qualitative	UK/Western Europe
				55	(Cloke, et al., 2017)	Qualitative	Global South

Data availability

Data will be made available on request.

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