Who gets measured, matters: Data (in)justice in EU energy poverty metrics

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ABSTRACT

Despite emphatic political rhetoric promising just energy transitions, the harsh reality of energy poverty in Europe remains a stark contradiction. Vulnerable communities are not only largely excluded and sometimes negatively impacted by energy transitions but are increasingly facing a reality where living without energy is their new norm due to worsening socioeconomic and infrastructural conditions, with significant societal impacts. These energy divides manifest in the use of alternative fuels for heating (including firewood and household waste), forced energy rationing, and dangerous coping strategies. However, these issues, and more besides (e.g. summer cooling, unreliable electricity supply), are absent from mainstream indicators due to the dominance of narrow techno-economic frameworks, based on indicators designed 30 years ago that fail to account for the complexities of energy poverty, leading many people to fall through the cracks of measurement and policy. This is a particularly pertinent issue in the context of the EU's flagship €87 billion Social Climate Fund, which has drawn heavily from this narrow data provision in designing support for energy poor households. This paper will reveal historically excluded groups within official energy poverty monitoring frameworks based on in-depth reviews of code books and other documentation for official EU surveys, considering both sociodemographic and energy poverty-related variables. This research applies a critical quantitative research approach, with data feminism as an evaluative framework, acknowledging the role of data in reproducing (and disrupting) existing power relationships, reviewing the rules embedded in the system(s), and identifying intervention points for more socially just data.

Keywords

Energy justice; Energy poverty; Fuel poverty; Eurostat; Metrology; Data politics

Acknowledgements

The support of the European Research Council is gratefully acknowledged, with funding for the project 'Energy Divides in Europe: Closing Gaps in Understanding for Transformative Alleviation of Energy Poverty' (101170962 - EnCUENTA). This paper also builds on discussions held within COST Action 'European Energy Poverty: Agenda Co-Creation and Knowledge Innovation' (ENGAGER 2017–2021, CA16232) supported by COST (European Cooperation in Science and Technology — www.cost.eu), and the project 'UKRI-GCRF Energy Solidarity in Latin America: generating inclusive knowledge and governance to address energy vulnerability and energy systems resilience' (ES/T006382/1) funded by the Economic and Social Research Council (UK).

Introduction

There has been emphatic political rhetoric across Europe promising just and sustainable energy transitions, with no one left behind. Yet at the same time, soaring energy prices, exacerbated by COVID-19 and the Russo-Ukrainian War, have made energy poverty (EP) one of the biggest European policy challenges. EP occurs when a household is unable to attain a level of energy services (e.g., heating, ICT use, lighting) that allows full participation in society (Thomson et al., 2017), leading to serious adverse consequences for health, wellbeing, social inclusion, education, and economic growth. EP, sometimes referred to as fuel poverty, is distinct from income poverty due to the mediating role of infrastructure, building quality, and energy market arrangements. EP is a form of energy injustice (Walker and Day, 2012), and represents a key barrier to just transitions, with marginalised communities not only largely excluded from participating in the energy transition but increasingly facing a reality where living *without* energy is their new norm. Over the past 9 years, the concept of EP has gained increased significance as a policy issue, with the European Commission backing an EU Energy Poverty Observatory in 2016 and its successor the Energy Poverty Advisory Hub in 2021, alongside financing 40+ EP alleviation projects (Longo et al., 2020), and integration within the Green Deal. Yet despite this huge mobilisation of resources, significant inequalities persist, in part due to the application of narrow monitoring frameworks that obscure complex issues. A key issue is that energy studies is a traditionally technical field of study dominated by physics, engineering, and economics (Lutzenhiser and Shove, 1999). It is only in the last decade that we have seen a formalisation of 'energy social science' as a distinct discipline (Sovacool, 2014), with scepticism towards social scientists persisting (Müller, 2023). One major consequence has been the privileging of certain knowledge forms over others, namely 'objective' statistical metrics over qualitative forms of data. This is especially true for EP, which suffers from poor integration of qualitative data regarding the lived experiences of EP within monitoring indicators (Middlemiss et al., 2020).

Indicators play a pivotal role in shaping policy and research outcomes, acting as influential lenses that, when overly static or narrowly defined, can constrain understanding, perpetuate data injustices, and limit the effectiveness of strategies to address complex multidimensional issues such as EP (Thomson et al., 2017). For example, there is evidence that recent crises have pushed people to harmful coping strategies, including forestry 'theft' and peat cutting for heating fuel, making improvised heaters from candles, and self-disconnecting from electricity, but these forms of EP are absent from mainstream indicators, resulting in a significant underestimation of the real size and nature of EP. Indeed, on a pan-European scale, the main policy indicators of EP have remained almost entirely unchanged for nearly 30 years (Thomson et al., 2017), in turn creating exclusion biases within EP policies, meaning households that fall through the cracks in traditional conceptualisations of EP may not receive support. EP is an issue that has seen considerable political change, while also demonstrating significant conceptual stagnation with a high degree of 'stickiness' for subpar concepts and indicators, creating a situation where political rhetoric fails to match with current knowledge and tools.

This paper presents a preliminary review of key EP policy documents within the European Union - principally centring on Member States' National Energy and Climate Plans – to determine the range of indicators currently being operationalised, before critically reviewing their limitations and exclusion biases. The following Background section provides an overview of key literature on this topic, while the Methodology outlines the main data sources and overarching conceptual framework. Subsequently, the Results and Discussion section moves through three main topics, namely the level of recognition of EP by Member States, the EP metrics operationalised by Member States, and the key data and knowledge gaps. The paper ends with a short Conclusions section that advocates for a radical reimagining of data, co-designed with affected communities.

Background

Despite broad agreement in recent years that EP is a complex multi-dimensional issue with numerous configurations (Primc et al., 2019, Thomson et al., 2022), the most enduringly 'sticky' conceptualisation of EP since the 1990s has been the triad of drivers comprising low income, high energy prices, and poor building efficiency (Boardman, 1991), with many policy operationalisations simply focusing on the ratio of income to energy costs. This approach has been criticised for presenting a narrow techno-economic view of EP (Stojilovska et al., 2022) leading some scholars to present alternative frameworks, most notably the energy vulnerability framework by Bouzarovski and Petrova (2015), but to date these frameworks have not been widely integrated within policy nor have they moved the needle on metrics. For example, the European Commission's 2023 Recommendation on EP reinforced the narrative of there being three root causes: "high energy expenditure in proportion to the household budget, low levels of income, and low energy performance of buildings and appliances" (European Commission, 2023: p.1).

On a European-scale, the main policy indicators used to monitor EP have remained almost entirely unchanged for nearly 30 years, since the launch of the European Community Household Panel survey in 1994, precursor to the current EU Statistics on Income and Living Conditions (EU-SILC) (Thomson et al., 2017). Energy, and the all-important end services it provides, has become an integral part of life, with complex dependencies unimaginable three decades prior. Our nations have also undergone significant processes of reshaping during this time, with multiculturalism now the fabric of many societies. Policymakers often look at broad trend data, which already tends to mask the mechanisms that produce inequality (Hatch et al., 2023; Sareen et al., 2020), but if the complexities of our modern societies and ways of living are not represented within data as a starting point, the inevitable outcome is significant exclusion biases in energy and climate policies.

EP is almost always framed in terms of individual-level factors, yet despite this framing, few articles take an intersectional perspective (Jessel et al., 2019), the main exception being Großmann and Kahlheber's (2017) comprehensive intersectional analysis of EP in Germany. As such, there are many under-explored dimensions of vulnerability to EP arising from personal characteristics. For example, research on the links between energy, racial and ethnic inequalities has been almost non-existent in Europe (Bouzarovski et al., 2022). The largest survey used by many EU institutions and national governments to understand and monitor EP, EU-SILC, does not ask about racial or ethnic origin. Similarly, only a handful of European studies have been conducted on disability, namely research exploring EP among disabled people in England (Snell et al., 2015), followed by pan-EU analysis of energy consumption by Ivanova and Middlemiss (2021) but using data from 2010. Despite around a ¼ of people in Europe having some form of disability, no information about disability is captured within Eurostat's Household Budget Surveys for people who are employed, children or pensioners (Ivanova and Middlemiss, 2021). Relatedly, González-Pijuan et al. (2023) state that children are mostly only considered within the wider family context, with children characterised as passive subjects in energy policy, and as such their needs may be overlooked. Collectively, there are substantial knowledge gaps concerning the individual and cumulative effects of various personal characteristics (namely gender, sexuality, disability, age, class, religion, race, and ethnicity) on energy needs and vulnerabilities,

The individual-level focus has also obscured the role of institutions and energy market arrangements in worsening EP. For example, energy suppliers have faced significant insolvency issues in recent years, with the collapse of more than 30 energy supply companies in the UK alone since 2021, with significant costs transferred to household bills that go beyond normal price increase expectations, while in Germany, a large social housing provider has forced energy rationing on their tenants due to financial vulnerability, overlooking individual energy needs. Similarly, as a result of the Russo-Ukrainian War and rapid increases to natural gas prices, the use of wood-burning stoves has increased significantly across Europe, triggering a substantial increase in the price of firewood,

wood pellets and other solid fuels - by 96.3% in the case of Germany (Statistisches Bundesamt, 2022). In all three cases, data is typically not captured within EP frameworks, creating gaps in our understanding.

Significant research gaps also exist with regards to evaluating EP monitoring and governance processes. While authors have drawn attention to limitations in the design of mainstream indicators (Thomson and Snell, 2014; Thomson et al., 2017; Tirado Herrero, 2017; Castaño-Rosa et al., 2019), a major shortcoming in this work has been the lack of intersectional perspectives, and the absence of frameworks for understanding and conceptualising data injustices perpetuated by official data, meaning that we do not know how many people nor which groups are being systematically excluded from official statistics and policies, in turn limiting institutional capacity to ensure that no one is left behind in the energy transition.

Methodology

This research involved a two-stage, review approach. In the first stage, a review of key EU documents pertaining to EP was undertaken to understand how EP is framed and what indicators are employed to measure the phenomenon. Analysed documents included the recast Energy Efficiency Directive 2023/1791, National Energy and Climate Plans (NECPs) for all 27 countries for the period 2021-2030, with a specific focus on the draft updated NECPs submitted in 2023 and 2024, and European Commission recommendation and assessment documents on EP and the NECPs (2023a, 2023b). A key limitation to note here is that some, but not all, Member States have since submitted final updated NECPs in 2024 and 2025, however, to ensure consistent analysis across all 27 countries, this paper focuses on the draft updated NECPs only. Moreover, the English translations for all NECPs were used, which may introduce some small errors into the analysis as several MS use automatic machine translation. While the Social Climate Fund is a key policy instrument of interest, it is still in the process of being implemented, thus at this stage the paper does not include analysis of Member State plans. This analysis is unlikely to be possible until later in the year as plans were due to be submitted by 30/06/2025, but as of 1st July, the European Commission confirmed that only Sweden had submitted their plan (Guillot, 2025).

In the second stage, an evaluation of the data injustices associated with key EP indicators was conducted, drawing from official survey documentation, and existing literature on this topic (such as Tirado Herrero, 2017; Thomson et al., 2017). The main surveys considered within the analysis include the EU Statistics on Income and Living Conditions, Household Budget Surveys, and National Censuses. This evaluation process was informed by the critical quantitative research approach, with data feminism as an evaluative framework, which means acknowledging the role of data in reproducing (and disrupting) existing power relationships (Hatch et al., 2023), reviewing the rules embedded in the system(s), and identifying intervention points for more socially just data. Data feminism, and the larger movement of data justice, goes beyond “the naive view of data as a neutral tool for measuring social problems” (Hatch et al., 2023: p.2), aimed at disrupting the status quo from a just perspective.

Results and Discussion

Historically, there has been strong resistance by the European Commission to formally recognising and addressing the issue of EP (Thomson et al., 2016). Yet as outlined in the Introduction, EP has become a central policy issue for the European Commission in recent years, resulting in the integration of EP within numerous policy frameworks, including the flagship Social Climate Fund. One of the biggest governance shifts has been the introduction of an EU-wide definition of EP within the recast Energy Efficiency Directive 2023/1791, signalling movement towards a more harmonised approach in how EP is addressed across Europe:

"'energy poverty' means a household's lack of access to essential energy services, where such services provide basic levels and decent standards of living and health, including adequate heating, hot water, cooling, lighting, and energy to power appliances, in the relevant national context, existing national social policy and other relevant national policies, caused by a combination of factors, including at least non-affordability, insufficient disposable income, high energy expenditure and poor energy efficiency of homes" (Article 2, 52).

Within this Directive and a later Commission Recommendation on EP (European Commission, 2023a), Member States have been asked to define and measure EP within their NECPs according to their national contexts, with reference to a range of Eurostat indicators. The subsequent sections of this paper explore how Member States have interpreted this task, and the range of indicators operationalised with NECPs.

Recognition of EP by Member States

Analysis and classification of NECPs submitted 2023-2024 reveals significant divergence in the extent to which Member States recognise EP as a distinct issue that cuts across social and energy policy. Table 1 presents a typology of EP recognition, ranging from recognition of EP as a multidimensional issue, and recognition of EP as an issue but seen through the lens of general poverty and/or income, through to a lack of recognition for EP as a distinct issue, with EP treated as part of general poverty and/or social policy. A fourth category captures the minority of Member States who did not provide any information on EP.

Table 1 Typology of energy poverty recognition within NECPs. Source: own analysis

Categorisation of EP recognition (number of Member States)	**Member States (number of mentions of "energy poverty" in NECP)**
Recognise EP as a multidimensional issue (17)	Austria (57) Belgium (124) Bulgaria (45) Cyprus (47) Czech Republic (52) France (31) Greece (32) Ireland (51) Italy (57) Lithuania (38) Netherlands (48) Poland (20) Portugal (70) Romania (17) Slovakia (75) Slovenia (21) Spain (94)
Recognise EP but see it through the lens of general poverty/income (3)	Croatia (53) Estonia (23) Luxembourg (24)
Do not recognise EP as a distinct issue, instead see it as part of general poverty / social policy (4)	Denmark (14) Finland (13) Germany (8) Sweden (5)
No information provided (3)	Hungary (5) Latvia (1) Malta (11)

In the majority of cases (17), Member States recognise EP as a distinct, multidimensional issue. For example, Belgium notes: "*The various studies and statistics indicate that energy poverty has economic, structural and technical causes and that a holistic approach is needed*" (Federal Government of Belgium, 2023: 170). However, among these 17 countries, Slovakia is an interesting anomaly, simultaneously stating that EP spans both energy and social policy and has a range of potential causes, while also positioning EP as a problem of income poverty since there is almost universal energy access: "*Energy poverty is often a consequence and part of income poverty, as in Slovakia the availability of the necessary quantities of energy and water is primarily a matter of household finances and not of physical lack of energy and water. Over 99 % of households are connected to electricity, more than 66 % consume natural gas…"* (Ministry of Economy of the Slovak Republic, 2023: 96).

A further three Member States recognise EP as an issue, with accompanying descriptions/definitions, however, the issue is seen through the lens of general income poverty and/or social policy. For example, in Croatia, EP is defined exclusively in terms of the level of household income. Interestingly, none of the Nordic Member States recognise EP as a distinct issue (along with Germany), which broadly mirrors earlier work by Hesselman et al (2019) which showed that Nordic countries did not appear to have targeted COVID-19 measures for energy, such as energy bill support schemes or extended disconnection protections.

In its EU-wide assessment of the draft updated NECPs, the European Commission (2023b) raised a number of concerns, including the fact most Member States are still lacking a clear definition of EP and/or have not yet carried out a comprehensive assessment of the number of households in EP with accompanying targets for reduction. Further concern was raised about the lack of structural policies and measures to alleviate EP, including from the Social Climate Fund (European Commission, 2023b: 14). Criticisms were also put forward about insufficient information for the preparation of the future Social Climate Plans, and generally poor synergies between the NECPs and other policy instruments such as the Just Transition Fund (European Commission, 2023b: 17).

EP metrics operationalised by Member States

Analysis of NECPs also reveals divergence among Member States in terms of the specific metrics operationalised by Member States, both in terms of the range of indicators used in the plans, and whether they chose to engage with the four EP indicators suggested in the recast Energy Efficiency Directive 2023/1791. Figure 1 provides a breakdown of usage across a total of nine indicators identified within the NECPs, namely:

- Inability to keep home warm during winter*
- High energy expenditure
- Arrears on utility bills*
- At-risk-of-poverty rate*
- Low energy expenditure / 'hidden EP'
- Inability to keep home cool during summer
- Leaking roof, damp walls, floors or foundation, or rot in windows or floor*
- Recipient of social assistance
- Poor energy efficiency

Those marked with an * were suggested within the recast Energy Efficiency Directive.

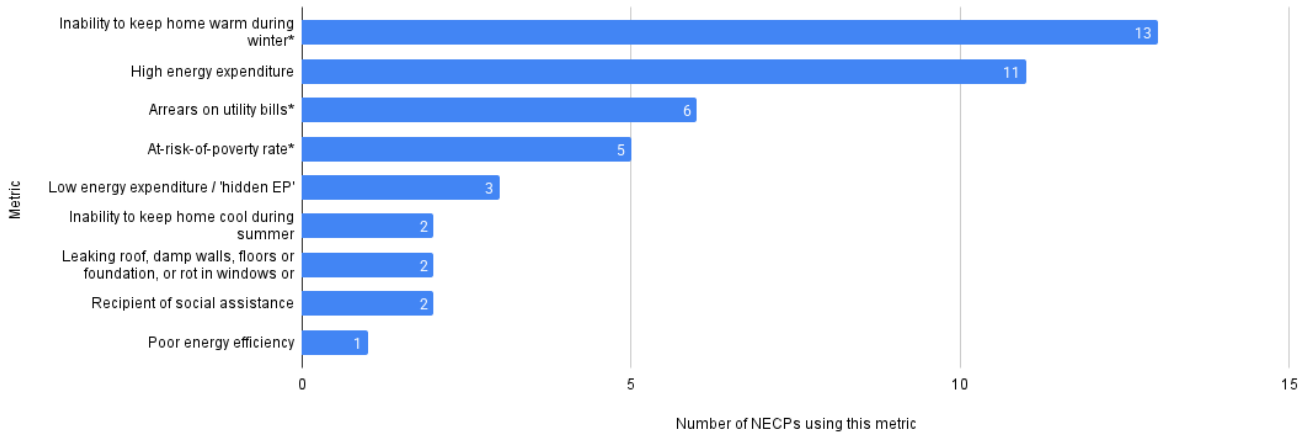

Figure 1 Energy poverty metrics operationalised within draft NECPs (2023-2024). Source: own analysis

In general, quite a limited range of indicators were used across the NECPs, with many countries relying solely on the 'inability to keep the home warm' indicator, which is a self-reported measure that has been criticised for its cultural subjectivity, and poor alignment with expenditure-based indicators (Thomson et al., 2017). A key exception to this was Spain, who in addition to applying four indicators (high and low energy expenditure; inability to keep home warm; arrears on utility bills) carried out supplementary analyses of climatic zones, and disaggregated analyses of different household types.

A key observation to be drawn is the lack of standardisation across Member States, with no single metric appearing across all NECPs, suggesting strong potential for divergence in how Member States understand and attempt to alleviate the issue of EP, given that each indicator presents a different face of the multifaceted problem. That said, indicators provided by Eurostat, and those recommended by the European Commission, were among the most popular metrics, which does provide some level of standardisation across countries. On the other hand, this comes at the expense of Member States using nationally-derived metrics such as energy efficiency/performance ratings (featured in just one NECP), and receipt of social assistance, which may help to provide more nuanced insights. Cumulatively, the nine indicators operationalised within the NECPs also exclude a range of important dimensions, as the subsequent section explores.

Key data and knowledge gaps

The indicators employed in the NECPs broadly align with the classic triad of EP drivers outlined earlier, namely low incomes, high energy prices, and poor energy efficiency. Table 2 presents a synthesis of these indicators, outlining some of the key data and knowledge gaps, indicating various ways for people to fall through the cracks in EP measurements and alleviation policies.

Table 2 Summary of key gaps within energy poverty metrics

Dimensions	Mainstream official indicators	Key gaps in data & understanding
Low income	▪ Total household income. ▪ Equivalised median income. ▪ At-risk-of-poverty rate ▪ Recipient of social assistance.	▪ In-kind support via social relations. ▪ Financial risks by intersectional characteristics.
High energy prices	▪ Predicted (via building models) or actual energy expenditure. ▪ Self-reported inability to pay to keep the home warm / cool. ▪ Arrears on utility bills.	▪ Energy models assume everyone uses energy in the same way, regardless of gender, ethnicity etc. ▪ Focus on grid-supplied gas and electricity, little to no data on alternative energy forms (e.g. oil, bottled gas). ▪ Energy payment methods and tariffs. ▪ Frequency and intensity of utility bill arrears. ▪ Energy disconnections (self- and supplier-led). ▪ Informal sourcing of energy (e.g., firewood). ▪ Seasonal fluctuations in energy prices & use. ▪ Consumer engagement with energy markets. ▪ Everyday energy-related social practices.
Poor building efficiency/quality	▪ Leaks, damp & rot in the home. ▪ Energy Performance Ratings.	▪ Appliances and their efficiency/age (e.g. fridge). ▪ Type of heating and cooling systems.
Other & cross-cutting		▪ Coping strategies used to mitigate energy poverty. ▪ Quality of energy supply (e.g. power cuts). ▪ Intersectional effects across multiple identities. ▪ Frequency & outcome of energy supplier complaints. ▪ Level of energy service provisions (e.g. temperature). ▪ Climatic & extreme weather contexts ▪ Knowledge about energy support schemes.

Notes: based on insights from Thomson and Snell (2014); Thomson et al. (2019); Thomson et al. (2017); Todd and Steele (2006); Bouzarovski et al. (2022); Sareen and Thomson (2019).

Two overarching observations can be drawn. Firstly, that EP studies has suffered from the limited production, use, and integration of qualitative evidence (Gayoso Heredia et al., 2024; Middlemiss et al., 2020), despite acknowledgement that the lived experience can be a productive site for revealing the complex configurations of EP (Middlemiss et al., 2020), often capturing circumstances that are invisibilised by mainstream statistical indicators. Secondly, there has been insufficient focus on the mediating role of personal characteristics, as confirmed by an earlier global review of EP literature by Jessel et al (2019), who found few articles take an intersectional perspective, the main exception being Großmann and Kahlheber's (2017) comprehensive intersectional analysis of EP in Germany. As outlined from the outset, the way people interact with and seek to provision energy in the home has radically changed in recent years, especially since Europe's energy crisis, yet the main indicators used to monitor EP have remain almost entirely unchanged for nearly 30 years.

Conclusions

The continued privileging of techno-economic knowledge forms and approaches, combined with the 'stickiness' of indicators and the triad EP framework over several decades, has created a situation whereby we are under-equipped to comprehend the full extent and nature of EP in Europe, nor the associated health and environmental impacts. Moreover, it undermines the credibility of the EU's ambition for just energy transitions that promise to "leave no one behind."

Analysis of 2023-2024 NECPs reveals significant divergence in how European countries are working to address EP. While most Member States now recognise EP as a distinct multidimensional issue, others – including influential countries such as Germany and Sweden - refuse to recognise EP as an issue, with a corresponding lack of definitions nor metrics in their NECPs. Among those Member States who did engage with the task of measuring EP, a relatively limited range of indicators have been employed, creating a range of exclusion biases that obscure institutional, infrastructural, and individual factors. The result is a patchwork of approaches insufficient to drive the scale of change required to meaningfully alleviate EP, a point the European Commission has acknowledged.

If Europe is serious about tackling EP as a pillar of its Green Deal and Social Climate Fund, it must radically reimagine how energy inequality is measured. This means developing metrics fit for the 21st century - capturing diverse needs, emerging vulnerabilities, and the complex ways EP manifests today. Crucially, these data systems must be designed from the bottom up, co-created with those experiencing EP, so that future policies and investments reflect not only the numbers, but the lives behind them.

References

Boardman B. (1991). *Fuel poverty: from cold homes to affordable warmth*. London: Belhaven Press.

Bouzarovski, S., Burbidge, M., Sarpotdar, A., and Martiskainen, M. (2022). The diversity penalty: Domestic energy injustice and ethnic minorities in the United Kingdom. *Energy Research & Social Science*, 91, 102716. https://doi.org/10.1016/j.erss.2022.102716

Bouzarovski, S. and Petrova, S. (2015). A global perspective on domestic energy deprivation: overcoming the energy poverty-fuel poverty binary. *Energy Research & Social Science*, 10: 31-40. https://doi.org/10.1016/j.erss.2015.06.007

Castaño-Rosa, R., Solís-Guzmán, J., Rubio-Bellido, C., and Marrero, M. (2019). Towards a multiple-indicator approach to energy poverty in the European Union: A review. *Energy and Buildings*, 193: 36-48. https://doi.org/10.1016/j.enbuild.2019.03.039

Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (recast). Retrieved 3 June 2025 from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ%3AJOL_2023_231_R_0001&qid=1695186598766

European Commission (2023a). *Commission Recommendation (EU) 2023/2407 of 20 October 2023 on energy poverty*. Brussels: Official Journal of the European Union.

European Commission (2023b). *EU wide assessment of the draft updated National Energy and Climate Plans: An important step towards the more ambitious 2030 energy and climate objectives under the European Green Deal and RePowerEU*. Brussels: Official Journal of the European Union.

Federal Government of Belgium (2023). Draft update of the Belgian National Energy and Climate Plan. Retrieved 3 June 2025 from https://commission.europa.eu/publications/belgium-draft-updated-necp-2021-2030_en

Gayoso Heredia, M., Sánchez-Guevara Sánchez, C., Neila González, F. J. (2024). Integrating lived experience: Qualitative methods for addressing energy poverty. *Renewable and Sustainable Energy Reviews*, 189, Part A, 113917. https://doi.org/10.1016/j.rser.2023.113917

González-Pijuan, I., Ambrose, A., Middlemiss, L., Tirado-Herrero, S., Tatham, C. (2023). Empowering whose future? A European policy analysis of children in energy poverty. *Energy Research & Social Science*, 106, 103328. https://doi.org/10.1016/j.erss.2023.103328

Großmann, K., and Kahlheber, A. (2017). Energy poverty in an intersectional perspective. *Energy poverty and vulnerability. A global perspective*. Routledge, London.

Guillot, L. (2025). 'EU countries blow climate deadline, putting funds for vulnerable people at risk', Politico, 1 July. Retrieved 1 July 2025 from https://www.politico.eu/article/eu-countries-blow-climate-deadline-putting-funds-vulnerable-people-risk/

Hatch, M.E., Raymond, E. L., Teresa, B.F. & Howell, K. (2023). A data feminist approach to urban data practice: Tenant power through eviction data, *Journal of Urban Affairs*, 1–20. https://doi.org/10.1080/07352166.2023.2262629

Hesselman, M., Varo, A., Guyet, R., Thomson, H. (2021). Energy poverty in the COVID-19 era: Mapping global responses in light of momentum for the right to energy. Energy Research & Social Science, 81, 102246. https://doi.org/10.1016/j.erss.2021.102246

Ivanova, D. and Middlemiss, L. (2021). Characterizing the energy use of disabled people in the European Union towards inclusion in the energy transition. *Nature Energy*, 6: 1188–1197. https://doi.org/10.1038/s41560-021-00932-4

Jessel, S., Sawyer, S., Hernandez, D. (2019). Energy, Poverty, and Health in Climate Change: A Comprehensive Review of an Emerging Literature. *Frontiers in Public Health*, 7. https://doi.org/10.3389/fpubh.2019.00357

Longo, D., Olivieri, G., Roversi, R., Turci, G., Turillazzi, B. (2020). Energy Poverty and Protection of Vulnerable Consumers. Overview of the EU Funding Programs FP7 and H2020 and Future Trends in Horizon Europe. *Energies*; 13(5):1030. https://doi.org/10.3390/en13051030

Lutzenhiser, L. and Shove, E. (1999). Contracting knowledge: the organizational limits to interdisciplinary energy efficiency research and development in the US and the UK. *Energy Policy*, 27(4): 217-227. https://doi.org/10.1016/S0301-4215(99)00012-9

Middlemiss, L., Straver, K., Hesselman, M., Tirado Herrero, S., Feenstra, M., Hargreaves, T., Meyer, S., O'Sullivan, K., Sareen, S., and Thomson, H. (2020). *Making the Most of Qualitative Evidence for Energy Poverty Mitigation: A Research Agenda and Call for Action*. ENGAGER, Policy Brief 3. Retrieved 6 May 2025 from

https://www.engager-energy.net/wp-content/uploads/2020/02/ENGAGER-Policy-Brief-No.-3-February-2020-Making-the-Most-of-Qualitative-Data-for-EP-Research-and-Action.pdf

Ministry of Economy of the Slovak Republic (2023). Draft update of the Integrated National energy and climate plan for 2021-2030. Retrieved 3 June 2025 from https://commission.europa.eu/publications/slovakia-draft-updated-necp-2021-2030_en

Müller, K. (2023). "Objective" numbers in energy research: Trust, order, governing and methodology. *Energy Research & Social Science*, 106: 103310. https://doi.org/10.1016/j.erss.2023.103310

Primc, K., Slabe-Erker, R., and Majcen, B. (2019). Constructing energy poverty profiles for an effective energy policy. *Energy Policy*, 128: 727-734. https://doi.org/10.1016/j.enpol.2019.01.059

Sareen, S., Thomson, H., Tirado Herrero, S., Gouveia, J.P., Lippert, I., and Lis, A. (2020) European energy poverty metrics: Scales, prospects and limits. *Global Transitions*, 2: 26-36. https://doi.org/10.1016/j.glt.2020.01.003

Sareen, S., and Thomson, H. (eds.) (2019). Moving beyond the state of the art in energy poverty measurement. ENGAGER project. Retrieved 6 May 2025 from: https://www.engager-energy.net/wp-content/uploads/2019/12/WG2-report-November-2019-1.pdf

Snell, C., Bevan. M., and Thomson, H. (2015). Justice, fuel poverty and disabled people in England. *Energy Research & Social Science*, 10: 123-132. https://doi.org/10.1016/j.erss.2015.07.012

Sovacool, B.K. (2014). What are we doing here? Analyzing fifteen years of energy scholarship and proposing a social science research agenda. *Energy Research & Social Science*, 1: 1-29. https://doi.org/10.1016/j.erss.2014.02.003

Statistisches Bundesamt (2022). Inflationsrate im November 2022 bei +10,0 %. Retrieved 6 May 2025 from https://www.destatis.de/DE/Presse/Pressemitteilungen/2022/12/PD22_529_611.html

Stojilovska, A., Guyet, R., Mahoney, K., Gouveia, J.P., Castaño-Rosa, R., Živčič, L., Barbosa, R., Tkalec, R. (2022). Energy poverty and emerging debates: Beyond the traditional triangle of energy poverty drivers, *Energy Policy*, 169: 113181. https://doi.org/10.1016/j.enpol.2022.113181

Thomson, H., Day, R., Ricalde, K., Brand-Correa, L.I., Cedano, K., Martinez, M., Santillán, O., Delgado Triana, Y., Luis Cordova, J.G., Milian Gómez, J.F., Garcia Torres, D., Mercado, C., Castelao Caruanai, M.E., Giannini Pereira, M. (2022). Understanding, recognizing, and sharing energy poverty knowledge and gaps in Latin America and the Caribbean – because conocer es resolver. *Energy Research & Social Science*, 87. https://doi.org/10.1016/j.erss.2021.102475

Thomson, H., Simcock, N., Bouzarovski, S., and Petrova, S. (2019). Energy poverty and indoor cooling: an overlooked issue in Europe. *Energy and Buildings*, 196(1): 21-29. https://doi.org/10.1016/j.enbuild.2019.05.014

Thomson, H., Bouzarovski, S., Snell, C. (2017). Rethinking the measurement of energy poverty in Europe: a critical analysis of indicators and data. *Indoor and Built Environment*, 26(7) 879–901. https://doi.org/10.1177/1420326X17699260

Thomson, H., Snell, C. and Liddell, C. (2016) Fuel poverty in the European Union: a concept in need of definition? People, Place and Policy, 10: 5-24. https://doi.org/10.3351/ppp.0010.0001.0002

Thomson, H., and Snell, C. (2014). *Fuel Poverty Measurement in Europe: a Pilot Study*. University of York.

Tirado Herrero, S. (2017). Energy poverty indicators: A critical review of methods. *Indoor and Built Environment*, 26(7): 1018-1031. https://doi.org/10.1177/1420326X17718054

Todd, S., and Steele, A. (2006). Modelling a culturally sensitive approach to fuel poverty. *Structural Survey*, 24(4): 300 – 310. https://doi.org/10.1108/02630800610704436

Walker, G., and Day, R. (2012). Fuel poverty as injustice: Integrating distribution, recognition and procedure in the struggle for affordable warmth. *Energy Policy*, 49: 69-75. https://doi.org/10.1016/j.enpol.2012.01.044